

Form and Safety in Plyometric Training

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There is no limit to the variety of plyometric exercises that can be devised. It is possible to analyze each movement pattern of every sport skill and design a plyometric drill for that specific skill. However, for the best results in explosive power training, and safe and efficient utilization, progressions are the key.

For safety it is important to begin with the simpler, more fundamental drills and progress to the more complex and difficult. As you improve in strength and performance, then you can advance to the more difficult drills.

The drills and exercises presented in this article will proceed in a learning progression. The methods employed are exactly the manner in which they should be taught and mastered.

Jumps

Attaining maximum height (projection of the hips upward) is sought in jumping. While lead-up footwork can vary, jumps are usually performed involving both legs in the take-off and landing.



Figure 1 (above) and Figure 2 (right): Box jump

Pogo

This is the first exercise in the teaching and learning of jumping. The posture, landing, and take-off positions for vertical hip projection begin with these simple lower leg executions.

This exercise begins from an upright stance with the knees slightly bent, chest out, and shoulders back. Begin by emphasizing a vertical take-off, projecting the hips upward for height, using only the lower portion of the legs. The arms and shoulders of the upper body are used in an upward “blocking” fashion. Emphasize slight flexion and extension of the knee, and more flexion of the ankle and foot. Upon take-off, the ankle must lock the foot into a “toe-up” position (dorsi-flexion) maintaining this locked position throughout to ensure sturdy contacts and quick, elastic take-offs.

Squat Jump

This is a basic drill for developing power in the legs and hips, and is applicable to many sports.

Assume a relaxed upright stance with feet placed about shoulder width apart. Begin by flexing downward to a half-squat position; immediately check this downward movement and explode upward as high as possible, extending the hips, knees, and ankles to maximum length as quickly as possible. Initially, the landing is frozen, with no steps taken. Progression for this drill is from single response, to multiple response with a pause between repetitions, and then finally multiple responses (initiating the jumping phase just prior to reaching the semi-squat position again).

Box Jumps

The benefit of using a box for jumps is to lessen the forces of impact upon landing, aid in the execution of good landing mechanics, and provide a target for vertical hip projection (see figures 1 and 2). The box height should be set from mid-thigh to hip height. The following progressions for optimal box jumping rely on starting positions from an approximate arms length distance away from the landing platform.

- Static Squat: a semi-squat stance is taken, with feet positioned hip width and arms back in readiness to thrust forward.
- Counter-move: an upright stance with the same foot positioning and a quick flexion into semi-squat and subsequent explosive take-off.
- Step: one foot remains in the previous position under the hip, while the other foot is placed behind.
- Lateral step-bound: positioned approximately one and one-half steps directly to the side of the normal take-off position, push off with the outside foot and lead with the inside leg into a lateral move to a two foot take-off from the original take-off spot.



Figure 3: Knee tuck jump

Double Leg Butt Kick

This drill is used as the first of many movements that practice the transference of force. This drill also combines the act of flexing the knee joint to allow for upward lift with the lower leg. Using a quick counter-movement, extend the hips for vertical height and upon full extension tuck the toes up and pull the heels upward into the buttocks.

Knee Tuck Jump

This drill is performed in the usual progression of single response, multiple response with pause, and finally the multiple response method.

Begin by rapidly dipping down to about the quarter-squat level, and immediately explode upward. Drive the knees high toward the chest and attempt to touch them to the palms of the hands (see Figure 3).



Figure 4: Depth jump—start

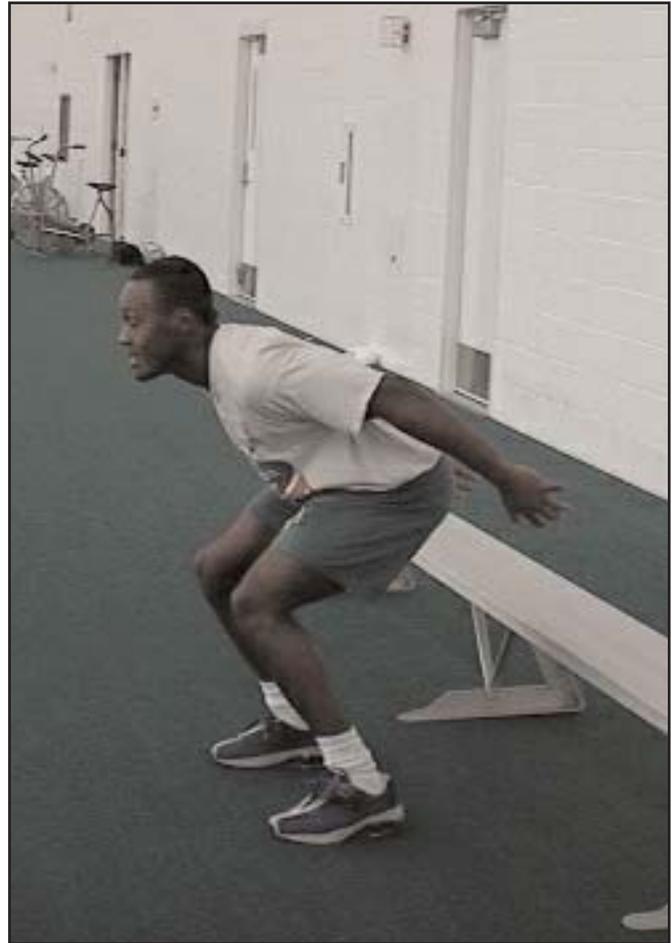


Figure 5: Depth jump—landing

Split Jump

These jumps are good for developing striding power for running and cross-country skiing. Assume a split stance with one leg extended forward with the lead knee over the midpoint of the foot and the other leg back with the knee bent and located underneath the hips and shoulders.

Jump as high and straight up as possible. Block with the arms to gain additional lift. Upon landing, retain the split stance position, bending the knees to absorb the shock. It is important to keep the shoulders back and in line with the hips to maintain proper stability.

Scissor Jump

The initial movement of the scissor jump is identical to that of the split jump. Switching of the legs occurs in midair, and must be done very quickly before landing. Attainment of maximal vertical height and leg speed are stressed in this exercise.

Depth Jump

For this drill, an elevated surface (box or bench) approximately 12 to 28 inches in height is used. The step should not be higher than 18 inches if the athlete weighs more than 220

pounds. The landing surface should be forgiving, yet resilient. The depth jump is "shock methodology" via standing at the edge of the platform (see Figure 4). The objective of this position is to slide or fall off, rather than to jump or step off, and set a landing rhythm. As the drop occurs prepare for landing by flexing at the knees and hips (see Figure 5). Progression into the drill begins with repetitions of landing only. As proper landing position is achieved, efficient and immediate take-offs can be progressed to (see Figure 6). In depth jumping, it is upon landing, not after, that the jumping phase is initiated. Jumping, for as much height as possible, is accomplished by thrusting the arms upward and extending the body.

Bounds

Bounding involves movements that alternate from one leg to the other. This may not be executed in early progressions. The emphasis in bounding is to gain maximum horizontal distance with height being a factor in the success of that distance. Early progressions of horizontal hip projection encourage the need for double leg take-offs and landings (e.g. prancing, galloping and skipping) for the purposes of teaching and learning progressively.

Prance

This is the beginning progression for bounding. The hips are projected horizontally off of a two-foot landing and take-off. It is important that this drill is performed with take-offs and landings on both feet simultaneously.

Upon take-off the hips are pushed outward and upward with the knee of one leg recovering forward. Upon landing the take-off repeats itself with the opposite knee recovering forward. The upper body action is the same as in running. In order for both feet to land simultaneously the ankles must remain locked in a “toes up” position.

Gallop

This is a rhythmic exercise that helps to foster good hip projection and back leg push-off. Lead leg mechanics and proper “pawing” or leg cycle mechanics are also emphasized.

Begin by pushing off with the back leg and foot, keeping the ankle locked to emphasize a spring loaded landing and take-off. Continue to keep the same leg behind the hips and projecting them forward, while maintaining the opposite leg in a forward position for initial landing and balance within each stride.

Ankle Flips

Ankle flips emphasize forward hip projection through extension at the ankle joint.

Begin by pushing the hips forward and outward from the lead foot and leg. With minimal knee flexion and the ankle locked, land with the opposite foot and quickly extend from that position so that the hips remain in a forward thrusting sequence with the ankle always projecting from slightly behind.

Lateral Bound

This exercise emphasizes lateral distance and horizontal trajectory sideways, allow the lead leg to countermove to shift the weight over to the outside leg for an immediate push-off and extension of the outside leg while the lead shoulder and knee drive for distance. The lead foot will land first with the trail foot following to balance out the landing.



Figure 6: Depth jump—immediate take-off

Alternate Leg Bounds

This is the prime exercise in specific development of explosive leg and hip power.

Push off with the back leg, driving the knee forward and upward in an attempt to gain as much height and distance as possible before landing. Repeat the sequence, keeping the ankle locked in dorsi-flexion, the heel up under the hips, while reducing ground contact time with efficient hip projection. Either block with the arms in a contra-lateral motion, as with normal running, or execute a double arm swing.

Alternate Leg Diagonal Bounds

Perform this drill in exactly the same manner as the Alternate Leg Bounds but increase the distance from side to side as well as forward upon landings.

Skips

Skipping is performed in an alternating step-hop of right to right step then left to left step manner that emphasizes both height and/or horizontal distance. This step-hop method can be applied in all directions (forward, lateral, and backward).

Fast Skipping

This drill is performed by maintaining close contact with the ground, and eliminating “air” time. Actions consist of driving the lead leg toe up, propelling the knee forward and upward, and keeping the heel up under the hips. This sequence is performed as fast as possible. Stride distances are not emphasized, maximum thigh extension, recovery, and frequency are.

Power Skipping

Power skipping involves driving off of the back leg, initiate a short skipping step, and then with the opposite leg, thrust the toe and knee up. Obtain as much height and explosive power as possible after each short step. Block with the arms, while concentrating on lift, “hang-time,” and minimizing ground contact time.

Hops

Hops are take off and landing movements from one leg onto the same leg. The primary emphasis in hopping is to achieve height and/or distance, with a maximum rate of cyclic leg movement. With the complexity of hops, early progressions require the balance and postural stability of using both legs for acquiring good hip projection, and cyclic leg action regardless of the direction (forward, lateral, or backward).

Double Leg Hop Progression

The use of cones or small hurdles help foster the technique in the beginning stages.

Using a quick counter-move, extend the hips for vertical height and upon full extension tuck the toes, knees, and heels upward in a cycling motion in order to clear the hurdle. Maintain posture and upright position by blocking with the arms. The execution progression is as follows:

- Single Response Hops: Upon completion of clearing the first hurdle, land with full foot contact, bending at the knees and hips to absorb the landing forces. After “sticking” this landing, pause and then reset the body position, stance, relationship to the next hurdle, etc, before executing the next hop. This reset allows for a reeducation of landing and take-off technique.
- Multiple Response Hops with Pause: These hops are executed by pausing for a brief moment, in as proper a landing position as possible, then performing the next take-off without having to reset the lower or upper body in order to be successful. Once the take-offs from pause are successful, progress to multiple responses.

Side Hop

This involves the use of 2 cones approximately 18 to 26 inches in height. Jump sideways over the first cone and then the second one. Without hesitating, change direction by jumping back over the second cone and then the first one; continue this back-and-forth sequence. Block with the arms in an upward thrusting motion to aid in lift and posture.

Single Leg Butt Kick

Using a quick counter-movement, extend the hips for vertical height and upon full extension tuck the toe and heel of the take-off leg upward and slightly backward into the buttocks. Maintain posture and upright position by blocking with the arms. In the same single response, to multiple response with pause, to multiple response progression, perform all of the repetitions with one leg then switch to the other.

Single Leg Hop Progression

The same progression that applied for the double leg hopping applies to the advancement of hopping in its most common terminology, with single leg. Using the counter moving effects of the “swing” leg for lift and drive, execute the hops in the same manner as progressed through with the double leg hopping.

Single Leg Hops of single responses

Single Leg Hops of multiple response with pause

Single Leg Hops of multiple response

About the Author

Jimmy Radcliffe, MS, earned a BA in Physical Education and Health from Pacific University and an MS in Exercise and Movement Science from the University of Oregon. He stayed at the University of Oregon as the Head Strength and Conditioning Coach and also contributes as an instructor in the Physical Activities and Recreation Department. Jimmy is the author of several books on plyometrics and has been a presenter at both NSCA and ACSM conferences.