

# The Movement Screen

The ability to control your body and perform basic movements is essential for every sport. Weakness and muscle imbalances can lead to chronic injuries that can cost you a season and detract from the enjoyment of the sport. Prior to starting your plyometric program everyone should go through a basic movement screen that will help them choose their starting level and appropriate exercises to help them maximize their progress.

## Step up

The step up is a test of hip strength, particularly the glutes, and hip abductors, muscles that are extremely important for explosive jumping and landing. Subjects who are unable to pass this test have a strength deficiency which causes the knee to be unstable when jumping or landing, increasing their risk of ACL injuries during jumping or cutting activities. The box or bench used for this exercise needs to be high enough to create a 120 degree angle at the knee when the foot is placed on the box. Stand 12-18 inches behind the box or bench. Place the entire foot of one leg on the top of the box, shifting body weight to the leg on the box. Powerfully extend the knee, hip, and ankle of the foot on the box, and bring the body to a standing position on top of the box. Step off the box, keeping all body weight on the working leg and lightly touch the ground with the non-working leg, do not put any weight on the non working leg, it is only being used as a guide for depth. Immediately stand back up. Keep the trunk upright throughout the movement; avoid bending over from the waist. Perform five reps on each leg.

## Scoring System

When doing this exercise your weight is always on the foot that is on the bench. Even when in the bottom position the back foot should not be under load. If the subject pushes off the back foot or the whole foot touches down give them 2 points.

Your knee should stay aligned with your foot. If the knee tracks to the inside of the foot so that the center of the knee is inside the big toe this is an indicator of weakness in the glutes and abductors and earns the subject 3 points.

The subject must maintain an upright body position at all times. If the subject bends at the waist this removes the glutes from the exercise, making it more of a quadriceps exercise. If the subject bends at the waist give them 3 points.

The points for this exercise are additive meaning that pushing off the back leg and the knee pulling to the inside of the toe would give the subject 5 points. If there is a visible performance difference between right and left legs the subject receives 7 points.

If no errors occur the subject gets zero points.



**Bending forward from the waist is worth 3 points**



**The knee tracking inside the toe is 3 points**



**If the subject pushes off the back foot 2 points are awarded**

## Box landing

In order to safely and effectively perform jumps and agility drills an athlete must have proper landing mechanics; land on the balls of the feet, knees bent aligned with 2nd and 3rd toes, trunk upright, head up.

The box landing test will require a 12-18 inch (30-45 cm ) box and an appropriate landing area like a sprung wood floor or a rubber matted surface. The subject will stand upright on the box and hop off landing with both feet simultaneously. Repeat the test five times.

If the subject lands with toes aligned over the middle toes, trunk upright and on the balls of the feet without stepping forward they receive 0 points.

If the subject lands and the knees pull inward or they must take a step to balance themselves they receive 3 points.

If the subject lands and they bend forward with their trunk they will receive 3 points

If the subject lands and the knees move inward and their trunk comes forward they receive 5 points.



**Proper landing position**

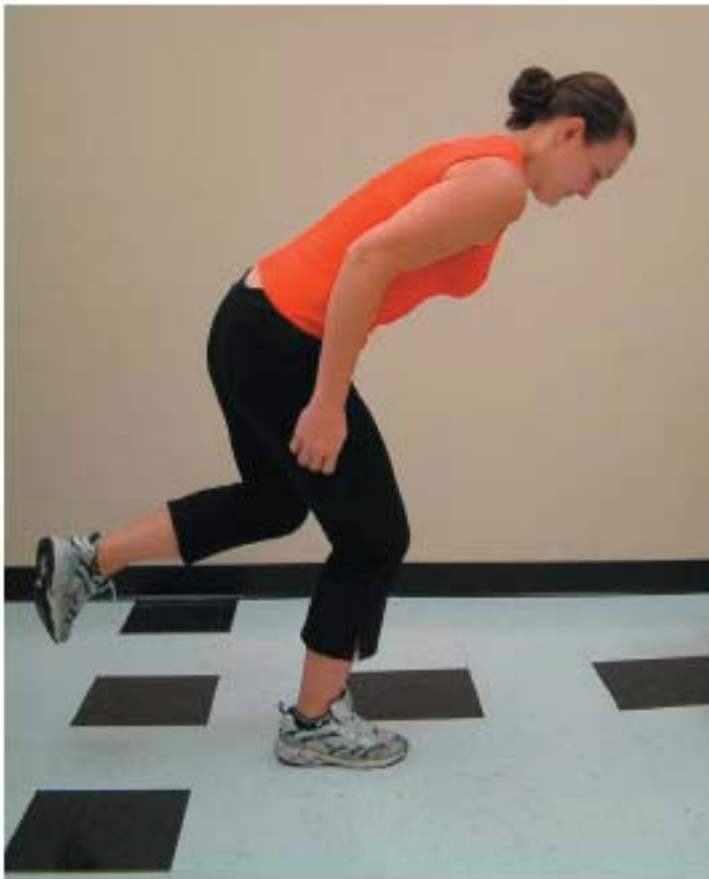


**Knees pulling together on the landing**

## Lateral Hop Landing

You will need masking or duct tape and a tape measure for this test. Place a piece of tape on the floor. The subject stands on one foot with hands behind their back, foot on the tape. Bend the leg to about 90o, swing the other leg and jump sideways as far as possible. Repeat for four jumps in each direction. The subject should be able to land the jump with the knee of the landing foot over the middle two toes, trunk upright and head up.

The subject is given two points if they don't stick the landing on three of the four jumps and move their foot or take a second hop upon landing. They receive three points if their trunk comes forward during the landing and their back rounds. Five points are given if the subjects knee tracks to the big toe or inside the toes and seven points are given for any combination of the above or if there is a noticeable difference between right and left sides.



**Trunk collapsing forward on the landing**



**Knee tracks to the inside of the big toe**

## Lateral Hop Distance

Bilateral muscle imbalances, an imbalance between the right and left side of the body, have been implicated in the development of injury. A muscle imbalance of greater than 10% can increase the risk of injury by 20 times. The lateral hop test can be used to assess differences in strength and power in the power body muscles. Using the distances jumped in the previous test plug the numbers in to the formula below and calculate the percent difference in distance jumped between the right and left sides of the body.

$$((\text{Right/ Left}) - 1) \times 100 = \text{percent difference}$$

Difference	Score
< 3%	0 points
3%-5%	2 points
5%-10%	3 points
10%-15%	5 points
> 15%	7 points

## Single Leg Lying Hamstring Raise

The subject lies flat on their back with legs straight and hands just out from their sides. With one leg flat against the ground the other leg is kept straight and lifted as high as possible. Using a goniometer the raised leg angle is measured with the head of the trochanter as the axis of rotation. Perform three trials on each leg and record the best score. Scoring is as follows:

>90o	0 points
75o-90o	2 points
60o-75o	3 points
45o-60o	5 points
<45o	7 points



Single leg lying hamstring raise

# One Legged Balance T-Test

Have the subject raise their arms to their sides so that they are parallel to the floor. Stand on one leg and rotate from the hip so that the upper body and non support leg are parallel to the floor. There should be a straight line from the top of the head through to the toes of the non support leg, the supporting leg is slightly bent at the knee. Shoulders are squared to the floor, not rotated. This position must be held for 10 seconds to fully pass the test. Repeat on the other leg.

If the subject cannot hold the position for the full 10 seconds they are given 1 point. If the subject cannot get their back leg or trunk to parallel they receive two points. If neither reaches parallel three points are awarded. This test is a measure of balance and stability not kinesthetic sense so the tester can provide verbal feedback and correction to a subject who is having difficulty getting their body in the right position but they cannot actively move the subject into the appropriate position. The time starts when proper position is achieved. If there is a difference between the right and left sides of the body the subject is given five points.



**Back leg does not achieve parallel**

**Neither back leg or trunk reach parallel**



## Push Up Hold

This test measures upper body and trunk strength. The subject starts lying face down with hands by the shoulders in a push up position, the thumbs are just under the shoulders. Keeping the body straight so that only the toes are on the ground push half way up until there is a 90 degree angle at the elbows. When the subject gets into position the timer is started and this position is held as long as possible. The body must be kept straight during the whole movement, the test is stopped when the subject cannot hold a straight body or 90 degrees at the elbows. Scoring is as follows:

0-10s	7 points
10-20s	5 points
20-30s	3 points
30-40s	2 points
40s+	0 points



**Body Position for the push up hold**

## Supine Pull Up

This test measures strength of the back and arm muscles. Set a bar in a power cage so that when the subject is lying on their back directly below the bar it is 6-8 cm beyond their reach. Tie a piece of string or dynaband around the power cage uprights 15 cm below the bar. The subject reaches up and grasps the bar with an over-hand grip. The hands are positioned so that there is 60cm between the index fingers. The body is straight throughout the movement with only the heels touching the floor. A pull up is counted when the subject's chin passes the string or elastic band. The subject performs as many pull ups as possible. If they cannot hold the proper body position for two consecutive pull ups or three out of every four the test is stopped.

Score as follows:

0- 10	5 points
11- 15	3 points
16-20	2 points
21-25	1 point
26+	0 points



**Positioning for the supine pull up**

## Lying leg raise

The lying leg raise is a test of rectus abdominus and external oblique strength. As the legs are lowered towards the floor the force developed by the hip flexors tends to tilt the pelvis anteriorly creating resistance against the rectus abdominus and external obliques which are holding the pelvis in posterior tilt.

The subject lies flat on their back with legs straight and hands across their chest. Help the subject raise their leg until they are perpendicular to the ground. Holding the pelvis in a posterior tilt contract the trunk muscles and pull the lower back tight against the floor. Keeping the legs straight and lower back against the floor slowly lower legs towards the floor. When the lower back first lifts off the floor the angle between the legs and table is measured with a goniometer using the head of the trochanter as the axis of rotation. The following scoring system is used.

< 15°	0 points
15°- 45°	2 points
45°-60°	3 points
60°-90°	5 points
Cannot keep back flat	7 points

Excessively tight hamstrings may prevent the subject from achieving a proper starting position. A poor score on the lying hamstring raise will indicate if this is the case. If the subject cannot lower their legs slowly this may be caused by very weak hip flexors. To determine if this have the subject lie in the starting position and try to raise their legs off the floor. If the legs cannot be lifted the hip flexors are too weak to perform the test and need to become a training priority.



**The back must stay tight against the floor during the lying leg raise**

# Interpreting the data

Once all test have been completed total the subjects score. Three ranges of scores are used to determine the type and level of program that is most appropriate for the client.

## Level 1

Score: 40+

Those athletes who fall in this group exhibit marked weakness throughout their body that contributes to poor movement control and execution. They are not capable of working against their body weight while keeping their body properly aligned. These athletes are at the greatest risk for developing injuries during high speed and power activities. A traditional program of plyometric drills is far too advanced for these athletes. Training programs should focus on basic movement and body control drills.

- Ground based balance activities both single and double legged.
- Emphasizing the mastery of basic body positions and movements like squatting, running forwards and backwards, shuffling, crawling and climbing.
- Abdominal strengthening
- Light weight medicine balls and other light implements like rubber tubing should be used in place of push ups and other body weight exercises.
- The mechanics of body position change should be emphasized during low speed turns, cuts and corners
- Landing mechanics from low level boxes or steps
- Obstacle courses built around climbing over, crawling under and stepping over or around various objects.
- Adolescent and post adolescent subjects should begin a weight training program that emphasizes hip and trunk strength using large multi joint exercises.
- Flexibility training

Movements to avoid include:

- Rapid changes of direction drills
- Single leg jumps
- Multiple response jumps
- Olympic style lifts
- Jumps off boxes or objects more than 12 inches high
- Single limb isolation strength exercises
- Equipment based balance training

## Level 2

Score: 22-39

Clients scoring in this range have moderate weakness or strength imbalances that affect their body control and predispose them to injury during high speed and power activities. They still require a significant amount of work on basic movement skills but are capable of handling higher intensity drills and exercises. A strength program featuring large multijoint movements should be the emphasis of a balanced program that includes:

- Ground based and equipment based balance drills
- Free weight and body weight exercises
- Basics change of direction drills
- Low level two legged jumps and hops over hurdles
- Two legged ladder drills
- Single response jumps onto boxes with landing
- Flexibility
- Abdominal strengthening
- Rotational drills

Movements to avoid include:

- Multiple response jumps
- Single leg jumps and hops
- Depth jumping
- Olympic style lifts

### Level 3

Score: 0-21

Those clients that fall into level three have good body control and no major strength deficits that increase their risk of injury. These clients are able to perform most types of training safely and effectively as long as proper exercise progressions are followed. Technical errors in cutting, running, jumping, cornering and landing are most likely due to true technique and learning errors and not strength or flexibility imbalances. Time still needs to be spent on reinforcing basic movement skills but there are not restrictions on the type of exercises performed as long as the following progression is respected:

**Table 1. Level 3 Movement Screen Exercise Progression**

<b>Drill Type</b>	<b>Intensity</b>	<b>Example</b>
Hops	Low	Rope hops, Calf hops, Octagon hops, Pattern hops, Lunges
Cuts, Corners and Turns	Low	90o cut, 180o turn, M drill, T-drill, Up and Back, Reaction drills.
Two Foot Ladder drills	Low	Icky shuffle, chain saws, Ladder runs forward backward and lateral, two foot ladder hops forward backward and lateral
Double Limb Single Response jump and throws	Low-Moderate	Vertical jump, Standing long jump, Box jump, Pike Jump, Tuck jump, Overhead toss, Med ball chest pass
Full body Single Response throws	Moderate	Med ball vertical jump and toss, Med ball backwards toss, Med ball long jump and toss, Shot put, Rotational throws
Double Limb Multiple Response jumps and throws	Moderate-High	Multiple long jumps, Repeat vertical jumps, Box jump and leap, Speed box jumps, Rope jumps
Single Limb Single Response Jumps and Throws	High	Single leg vertical jump, Single leg long jump, One arm chest pass
Single limb ladder drills	High	Single leg slaloms, Single leg hops (forward, backward and lateral)
Single Limb Multiple Response Jumps and Throws	Very High	Repeat Single leg long jumps, Single leg pattern hops