

The Causes of Early Hip Extension in the Golf Swing

Hypothesis:

Our hypothesis for this research is when a golfer fails any of Leg Lowering, Toe Touch, or Overhead Deep Squat tests early hip extension will be exhibited in the golf swing.

Procedure:

Subjects are greeted at reception in the Body Balance for Performance centers. Subjects will be required to complete a Client Registration form fully and sign a standard liability release. The subjects will be escorted to a clinical area to meet with the researcher. During that meeting the researcher will ask the following questions of the subject:

1. Tell me about your golf?
2. What is your handicap or average score?
3. What are the challenges you face in golf?
4. What have you done to improve your golf?
5. How often do you play golf?
6. How often do you practice golf?
7. How much time do you spend when you practice golf?
8. Do you exercise regularly?
9. If so, what do you do?
10. What are your physical issues or challenges?

Other conversation about the golf game is encouraged to get a better understanding of the golfer.

PLEASE DO NOT TELL THE SUBJECT WHAT WE ARE LOOKING FOR UNTIL AFTER THE TESTING as that could invalidate the results.

The researcher will explain the procedure to the subject. The researcher will tell that subject that the tests are done to determine if there is a correlation between the body and golf swing. Researcher will say "We will be performing 3 physical tests and capturing video of the golf swing." Tell the subjects that, "we cannot go into the details of the research until after we have collected the data." After the data collection, tell the subject exactly what the researcher is looking at and why. Tell the subject what we believe about how the findings of the testing are relevant to the golf swing.

Testing Procedure: Methods

Complete Overhead Deep Squat:

How to Perform the Overhead Deep Squat Test

To perform this test, begin by standing with feet shoulder width apart and toes pointing forward. Next grasp a club approximately shoulder width apart and extend the arms directly overhead, keeping the shaft in-line with the head and over the foot print. Next, simply squat down as far as possible, while keeping the club as high above your head as possible. The test will stop if any of the following conditions are seen or felt; 1) pain or discomfort, 2) heels coming off the ground, 3) club falling forward past the feet, 4) loss of balance.

To be considered a complete full deep squat one must see the following at the bottom of the squat:

- Upper torso is parallel with tibia or toward vertical
- Femur is below horizontal
- Knees are aligned over feet
- Feet are pointing forward (not flared out)
- Dowel is aligned over feet

This test is graded as a pass/fail.

Leg Lowering Test

Test Objective for the Leg Lowering Test

The Leg Lowering Test is used to assess how the golfer uses the abdominals and the overall stability of the core. Any weakness in the abdominal area can be disastrous for the golfer. The abdominals are the key muscles used to stabilize the spine and pelvis, rotate the torso, and maintain posture throughout the golf swing. In this test, any loss of lumbar curvature is a sign of abdominal weakness.

How to Perform the Leg Lowering Test

Start by having the golfer lay flat on back with the knees bent and feet flat on the ground. Have the subject lift the pelvis off the ground and slide a blood pressure cuff under the small of the back (make sure it is centered). Make sure the subject is relaxed and inflate the cuff to 40 lbs of pressure. Now, have the subject contract abdominals and hold

the brace. Record what happens to the needle of the blood pressure cuff when subject contracts the brace (up, down, no movement). Now, keeping the subject braced, instruct slowly sliding the left leg down to the ground, noting what happens to the needle on the cuff.

What to look for in the Leg Lowering Test

In this test the researcher wants to know three things:

Does the subject engage the abdominals?

The first part of the test determines what muscles are recruited when asked to brace abdominals, seeing minimal recruitment of anything but the abdominals. The blood pressure cuff needle should elevate between 40 and 50 lbs if perform a great abdominal brace without modifying the curvature of their lower back. If accessory recruitment occurs the researcher may see the following:

1. The blood pressure cuff needle drops below 40 lbs. This is the worst possible recruitment since it means the hip flexors and lower back engaged instead of the abdominals. Therefore, the lumbar spine increases its lordosis and the result is less pressure on the cuff.
2. The blood pressure needle increases over 50 lbs. This is due to the player performing a posterior tilt with the pelvis when engaging the abdominals. This is a better fault, but the player must be trained to isolate abdominals without modifying the spinal curvatures.

Can the abdominals work independent of hip extension?

The second part of the test determines if the player can maintain a good abdominal brace with movement of the lower extremities. When asking the player to slide leg all the way down, hip extension should occur. Normally, hip extension should not affect pelvic or lumbar spine motion, especially if the abdominals are actively bracing the pelvis and spine. If the musculature of the hip is shortened and pulls on the lumbar spine and pelvis, the abdominals must resist this tension. If the blood pressure cuff drops during hip extension, then either the lack of mobility in the hip musculature or lack of strength (or neurological control) of the abdominals is evident.

Is there an asymmetry between the left and right hip?

The last portion of the test determines if there is an asymmetry between the left and right hip and core. Indicating, if the blood pressure cuff needle drops during right hip extension, but does not move during left hip extension, an asymmetry exists.

Toe Touch Test

The Toe Touch Test is a great test for overall mobility in the lower back and hamstrings, plus it can help identify a hip problem versus a lower back/core limitation.

How to Perform a Toe Touch Test

To perform this test, begin by having the player stand with feet together and toes pointing forward. Next, have the subject bend from the hips forward and try to touch the ends of the fingers to the tips of the toes, without bending the knees.

If the client presents with a limitation in the toe touch, then it is imperative to go a step further to differentiate the cause. At this point simply ask the client to perform the same test however this time elevate one of the feet slightly with a lift of some sort (phone book, mat etc.). This will cause a slight bend in one knee while the other is straight. Ask the client to bend over and touch the toes. Repeat in the opposite direction.

If this test is tough on one side but easy on the other side, subject may have a unilateral hip limitation, not a lower back or hamstring flexibility issue. Make sure to only go as far as possible without pain and try to keep knees straight throughout the entire test.

Bilateral Toe Touch Test Unilateral Toe Touch Test

What to look for with the Toe Touch Test

In this test the researcher is looking for the ability of the client to demonstrate a good hip hinge or forward bend. This is important for the golfer since any restriction in hip hinge mechanics can lead to poor address and dynamic-Posture. Players will tend to get too rounded from the spine or excessive knee bend to make up for limited hip bend.

During the second portion of the test the researcher is looking for whether or not the client can get fully down into a toe touch with one

foot slightly elevated as compared to both feet being flat. Oftentimes a client presenting a hip joint issue will show a limitation in one of the sides while performing the unilateral toe touch test.

Bouncing!!! Do not allow the client to bounce in order to get down further. The use of momentum in this test is highly discouraged and is highly associated with injury.

Video Analysis:

Video analysis will be used to test for early hip extension. The capture will be of a down the line view of the subject. The test will be graded as pass or fail.

To ensure consistent camera set up on each and every testing. The angle of the camera to the subject needs to be identical for every subject. If the camera angle changes even a degree it will result in variance in the results and render the test data invalid.

Camera Setup:

- The camera must be on a tripod to limit movement.
- The camera lens must be set to the height of the top of the greater trochanter.
- The camera should be aligned parallel to the target and directly behind the hands of the subject.
- To do this project a piece of string on the floor and create a parallel target line. The string needs to run from in front of the hands, under the hands and straight back from the hands.
- Alternatively, if you wish to purchase an inexpensive laser level, attach the level to the camera and make sure the red line from the laser level bisects the hands of the subject.
- Video full swing of the subject with an 8 iron.

Analysis of video:

- Once the golfer is set up in address position, draw a vertical line on the posterior most aspect of the buttocks. Using software drawing program.
- Make sure to draw the line at the very outer edge of the pants at set-up. Make sure there is no daylight between the buttocks and the drawn line.

- Forward the video to the top of the backswing as evidenced by the stopping of upward motion of the golf club and pause the video.
- Verify if there is space between the buttocks and the line drawn. If so, there is early extension on the backswing.
- If not forward the video to impact.
- Verify that the buttock is still in contact with the initial line drawn.
- If the buttocks is not in contact with the line then, the player has early extended. This golfer has failed to maintain posture, and failed the test.
- If maintained, buttocks to line, the test is passed.

Results:

Toe Touch Test in correlation to early hip extension is no to Null-Hypothesis based on $p=0.1921 < r(1.303)df(0.05)$ no to null stated in an inverse relation.

Over Head Deep Squat in correlation to early hip extension is no to Null-hypothesis based on $p=0.1375 < r(1.303) df(0.05)$ no to null stated in an inverse relation.

Leg Lowering Test in correlation to early hip extension is positive to Null-Hypothesis based on $p=.0829 < r(1.303)df(0.05)$ no to null stated in a linear relation.

Conclusion:

There is a relationship between a golfer's ability to touch their toes, based on the TPI standard Toe Touch Test, and presence of early hip extension in the golf swing. The statistical correlation may lead us to the conclusion that the inability to hip hinge and bend properly is a major component in a golfer rising out of the swing.

Based on the inverse relation, failure of the Test and Exhibiting of early hip extension show a failed toe touch test early hip extension. Early hip extension is considered by many a major swing fault that leads to inconsistency. We believe that by clearing this issue through proper release and retraining techniques, stability and control of the pelvic region will reduce exhibiting early hip extension. Subjects who did pass Toe touch test were 54% less likely to exhibit early hip extension.

There is a relationship between a golfer doing a TPI standard Overhead Deep Squat Test incorrectly and exhibiting early hip extension in the golf swing. The inverse relation of the test and exhibiting early hip extension show the bodies inability to move ergonomically in a squat effects the golf stance at address and through the ballistic movement of the swing.

The overhead deep squat uses a sequence of muscles that are paramount in the stability of the entire body through ballistic movement. Weak glutes, abdominals and scapular muscles and tight calves and lats appear to be the main culprits of over head deep squat failure. Early hip extension is also a result of poor muscular control of these areas. Subjects who did not exhibit overhead deep squat failure were 25% less likely to exhibit early hip extension.

Clearly further study is needed on this topic. It would also be good to study how the fixing of overhead deep squat and toe touch in golfer who have these body faults is related to improve golf.