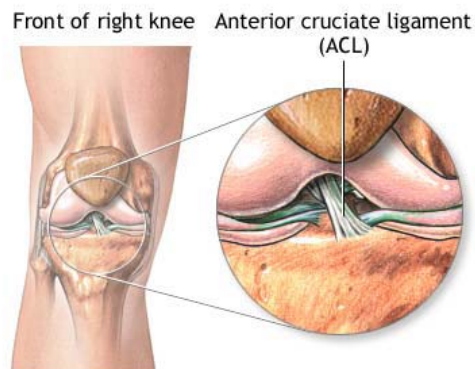


Functional Tests for ACLR Rehabilitation

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The purpose of this handout is to provide students with an outline of functional tests appropriate for patients/athletes following ACLR. These tests help to measure dynamic balance, postural control, and functional stability.

The Y-Balance Test

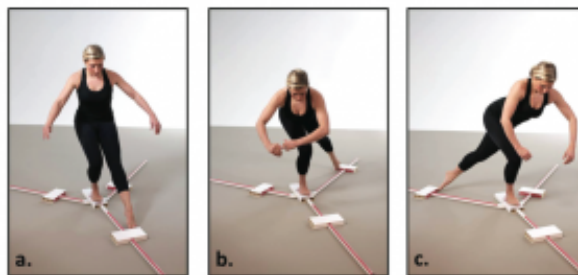


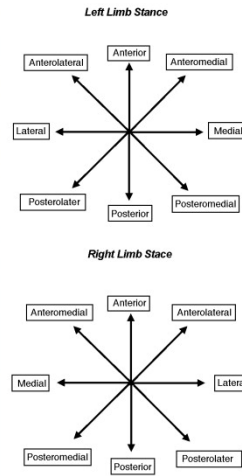
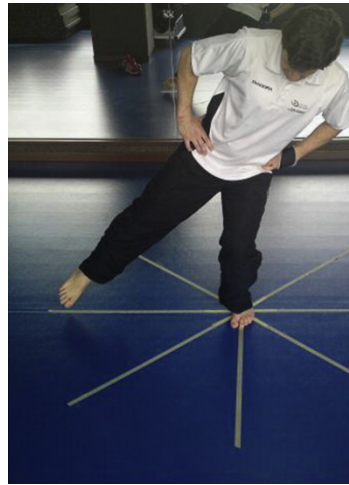
Figure 1. The three main directions of the Lower Quarter Y Balance Test (a. anterior; b. posteromedial; c. posterolateral).

*Description*¹: The patient stands with the right foot on the center box, with toes at the red start line. The patient starts with the anterior reach and pushes the box with the toes as far as they can without losing balance, failing to return to the starting position, kicking the measurement slider, or placing their foot on top of the measurement slider. The patient completes 3 trials anteriorly before switching to stand on the left limb. This process is repeated so that the anterior, posteromedial, and posterolateral directions are all

completed. Scoring is based on the best reach in each direction for each limb. The difference between limb reaches should be less than 4cm. Total composite score is calculated by adding all 3 directions for each limb and dividing by 3 times the limb length, and multiplying by 100.

Norms: See Star Excursion Balance Test.

*Psychometric Properties*²: Intrarater reliability: 0.85-0.89; Interrater Reliability: 0.97-1.00



The Star Excursion Balance Test

*Description*³: The patient stands in the center of the lines on one foot (right). The patient has 3 attempts in each direction, starting with anterior and continuing clockwise around the grid. The patient performs all reaches for the right stance limb before initiation of left stance limb measurements. Reach distances are normalized based on the patient's limb length. (distance/leg length) x 100

*Psychometric Properties*³: Intrarater Reliability: 0.67-0.87 and 0.81-0.96; Test-Retest Reliability: ICC: 0.84-0.92; Interrater Reliability: 0.81-0.93

93.9 ±10.5; PMED: 95.6 ±8.3; MED: 97.7 ±9.5; AMED: 85.2 ±7.5

*Norms*³: in % of limb length

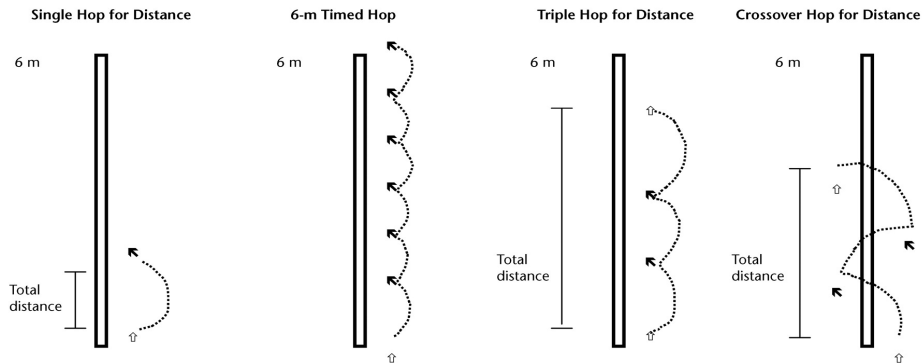
Male Recreational Athlete (23.2 ±3.8 years old): ANT: 79.2 ± 7.0; ALAT: 73.8 ±7.7; LAT: 80.0 ±17.5; PLAT: 90.4 ± 13.5; POST:

Female Recreational Athlete (22.4 ±1.4 years old): ANT: 76.9 ±6.2; ALAT: 74.7 ±7.0; LAT: 79.8 ±13.7; PLAT: 85.5 ±13.2; POST: 85.3 ±12.9; PMED: 89.1 ±11.5; MED: 90.7 ±10.7; AMED: 83.1 ±7.3

Shows differences between ACLR/ACL deficient and uninjured patients in anterior (P=.003), lateral (P=.005), posteromedial (P=.002), and medial (P=.001) directions. Performance decreased 5-28% in affected limb and 22.8% and 15.2% in the unaffected limb of ACLR/ACL deficient patients.¹

Hop Tests

Sensitivity⁷: .62 (when combining single hop and timed hop scores) Specificity⁷: .94-.97



Single Hop for Distance:

Description⁴: The patient stands with toes at the zero point on the line, on one foot. The patient hops forward one time, landing on the same foot. The distance is measured from the zero point to the back of the patient's heel.

Norms: 85-90% of contralateral limb distance.

Psychometric Properties⁵:
ICC: 0.76-0.96; Longitudinal Validity: 0.48 with Global Rating of Change, 0.37 with LEFS

6-meter Timed Hop:

Description⁴: The patient stands with toes at the zero point on the line, on one foot. The patient hops as fast as they can across the 6-meter line and time is stopped when the back of the heel crosses the line.

Norms: 85-90% of contralateral limb time.

Psychometric Properties^{5,6}:
ICC: 0.82-0.96; Longitudinal Validity: 0.46 with Global Rating of Change, 0.28 with LEFS

Triple Hop for Distance:

Description⁴: The patient stands with toes at the zero point on the line, on one foot. The patient hops forward 3 consecutive times, on the same foot. The distance is measured from the zero point to the back of the heel after 3 hops.

Norms: 85-90% of contralateral limb distance.

Psychometric Properties⁵:
ICC: 0.88; Longitudinal Validity: 0.44 with Global Rating of Change, 0.26 with LEFS

Crossover Hop for Distance: **Description⁴:** The patient stands with toes at the zero point on the line, on one foot. The patient hops forward 3 consecutive times, on the same foot, with each jump crossing over the line. The distance is measured from the zero point to the back of the heel after 3 hops.

Norms: 85-90% of contralateral limb distance.

Psychometric Properties⁵: ICC: 0.84; Longitudinal Validity: 0.45 with Global Rating of Change, 0.41 with LEFS

References

1. Y Balance Test Protocol. <http://www.move2perform.com/site/images/stories/pdfs/YBT%20Instructions.pdf>
2. Plisky PJ, Gorman P, Kiesel K, Butler R, Underwood F, Elkins B. The reliability of an instrumented device for measuring components of the Star Excursion Balance Test. *NAJSPT*. 2009;4(2):92-99.
3. Gribble PA, Hertel J. Considerations for normalizing measures of the Star Excursion Balance Test. *Measurement in Physical Education and Exercise Science*. 2003;7(2):89-100.
4. Bolgla LA, Keskula DR. Reliability of lower extremity functional performance tests. *J Orthop Sports Phys Ther*. 1997 Sep;26(3):138-42.
5. Reid A, Birmingham TB, Stratford PW, Alcock GK, Giffin JR. Hop testing provides a reliable and valid outcome measure during rehabilitation after anterior cruciate ligament reconstruction. *Phys Ther*. 2007 Mar;87(3):337-49.
6. Kramer JF, Nusca D, Fowler P, Webster-Bagaert S. Test-retest reliability of the one-leg hop test following ACL reconstruction. *Clinical J Sport Med*. 1992; 2: 240-243.
7. Noyes FR, Barber SD, Mangine RE. Abnormal lower limb symmetry determined by functional tests after anterior cruciate ligament rupture. *Am J Sports Med* 1991; 19: 513-518.