Functional Testing for Return to Sports

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When are athletes ready for return to sports???

- Post ACL reconstruction, average time to return to sport is 7 mos, but some as early as 2 mos? and as long as 24 months
- Graft healing progresses from remodeling to maturation phase by 6 mos.
- Different injuries and different surgeries will require different RTS times.

Important Factors Involved in Return to Sport

- Subjective questionnaires
- Clinical exam: full ROM, no effusion, stability
- Isokinetic/Strength Testing
- Functional Testing

Goals and Skill Acquisition for RTS

- The ability to equalize ground reaction forces between extremities.
- Improved confidence and stability with high intensity activities involving change of direction.
- Improved and equalizing power and endurance between extremities.
- Demonstrate safe biomechanics (increased knee and hip flexion and decreased knee abduction angles) when performing high intensity plyometric activities.

Functional Testing Following Injury/Surgery

- Developed with the goal to incorporate kinetic chain activities that mimic functional activities and correlates to sports to include: strength, agility, power, balance and neuromuscular control.
- It is recommended and can be used in conjunction with other tests to test for dynamic function and determine athlete readiness for RTS.
- Provides objective measures to determine athletes readiness RTS.
- Can lead to decreased re-injury risk for athletes.

So how do we know they are ready??

- There has been a shift from a time based return to play criteria to guidelines that are based on function. The hope is to decrease the likelihood of failure due to insufficient rehabilitation.
- Data shows significant failure rate in young athletes in the 4-9 mos period following most commonly ACL repairs.

Univ of Pittsburg Medical Center Guidelines for RTS

- Achieves >90% on strength assessments
- Displays normal running pattern that does not increase pain
- Has practiced and displays no hesitation or compensation strategies during agility drills, especially decelerating when performed at 100%
- Has practiced and displays normal loading and soft athletic landings
- Has practiced and displays no hesitation or compensation strategies during cutting drills, especially deceleration when performed at 100%

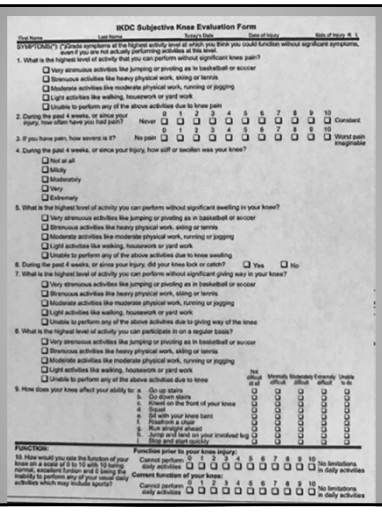
UPMC RTS Test (Involved/Uninvolved)

- Single leg broad jump landing 1 foot
- Triple broad jump, landing last jump on 1 foot
- Single leg forward hop
- Single leg triple hop
- Single leg triple crossover hop
- Timed 6m single leg hop
- Single leg lateral hop
- Single leg medial hop
- Single leg medial rotating hop
- Single leg lateral rotating hop
- Single leg vertical hop
- 10 yard lower extremity functional test (sprint, back peddle, shuffle, carioca, sprint)
- 10 yard pro-agility run

International Knee Documentation Committee (IKDC) – Subjective Knee Form

- IKDC subjective knee form is a reliable and valid tool for the athlete to subjectively rate their knee symptoms, function, and ability to return to sport following knee injury.
- IKDC score= sum of items/87 (max poss score) X 100
- Higher scores represent higher levels of function.
- IDKC score > 70 indicates higher functional abilities and readiness to enter RTS phase of rehab or RTS.
- IDKC score < 70 may indicate that an athlete in in need of extra rehab and recovery time prior to RTS.
- www.sportsmed.org

Documentation and Testing for RTS



IKDC Subjective Knee Evaluation Form

First Name | Last Name | Today's Date | Date of Injury | Side of Injury: R L

SYMPTOMS: (Grade symptoms at the highest activity level at which you think you could function without significant symptoms, even if you are not actually performing activities at this level.

1. What is the highest level of activity that you can perform without significant knee pain?
- ☐ Very strenuous activities like jumping or pivoting as in basketball or soccer
- ☐ Strenuous activities like heavy physical work, skiing or tennis
- ☐ Moderate activities like moderate physical work, running or jogging
- ☐ Light activities like walking, housework or yard work
- ☐ Unable to perform any of the above activities due to knee pain

2. During the past 4 weeks, or since your injury, how often have you had pain? Never 0 1 2 3 4 5 6 7 8 9 10 Constant

3. If you have pain, how severe is it? No pain 0 1 2 3 4 5 6 7 8 9 10 Worst pain imaginable

4. During the past 4 weeks, or since your injury, how stiff or swollen was your knee?
- ☐ Not at all
- ☐ Mildly
- ☐ Moderately
- ☐ Very
- ☐ Extremely

5. What is the highest level of activity you can perform without significant swelling in your knee?
- ☐ Very strenuous activities like jumping or pivoting as in basketball or soccer
- ☐ Strenuous activities like heavy physical work, skiing or tennis
- ☐ Moderate activities like moderate physical work, running or jogging
- ☐ Light activities like walking, housework or yard work
- ☐ Unable to perform any of the above activities due to knee swelling

6. During the past 4 weeks, or since your injury, did your knee lock or catch? ☐ Yes ☐ No

7. What is the highest level of activity you can perform without significant giving way in your knee?
- ☐ Very strenuous activities like jumping or pivoting as in basketball or soccer
- ☐ Strenuous activities like heavy physical work, skiing or tennis
- ☐ Moderate activities like moderate physical work, running or jogging
- ☐ Light activities like walking, housework or yard work
- ☐ Unable to perform any of the above activities due to giving way of the knee

8. What is the highest level of activity you can participate in on a regular basis?
- ☐ Very strenuous activities like jumping or pivoting as in basketball or soccer
- ☐ Strenuous activities like heavy physical work, skiing or tennis
- ☐ Moderate activities like moderate physical work, running or jogging
- ☐ Light activities like walking, housework or yard work
- ☐ Unable to perform any of the above activities due to knee

9. How does your knee affect your ability to:

	Not difficult at all	Minimally difficult	Moderately difficult	Extremely difficult	Unable to do
a. Go up stairs	☐	☐	☐	☐	☐
b. Go down stairs	☐	☐	☐	☐	☐
c. Kneel on the front of your knee	☐	☐	☐	☐	☐
d. Squat	☐	☐	☐	☐	☐
e. Sit with your knee bent	☐	☐	☐	☐	☐
f. Rise from a chair	☐	☐	☐	☐	☐
g. Run straight ahead	☐	☐	☐	☐	☐
h. Jump and land on your involved leg	☐	☐	☐	☐	☐
i. Stop and start quickly	☐	☐	☐	☐	☐

FUNCTION:

Function prior to your knee injury:

10. How would you rate the function of your knee on a scale of 0 to 10 with 10 being normal, excellent function and 0 being the inability to perform any of your usual daily activities which may include sports?

Cannot perform daily activities 0 1 2 3 4 5 6 7 8 9 10 No limitations in daily activities

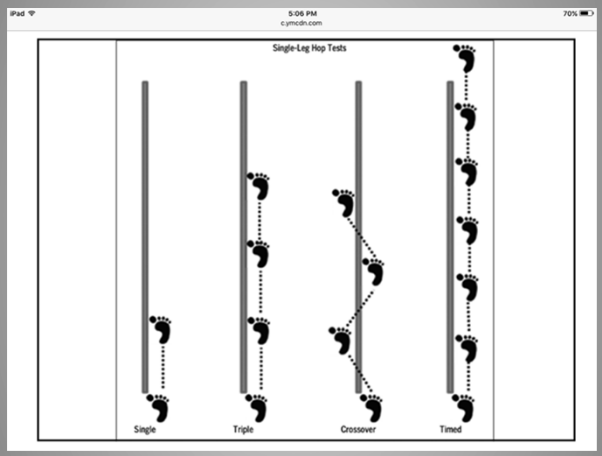
Current function of your knee:

Cannot perform daily activities 0 1 2 3 4 5 6 7 8 9 10 No limitations in daily activities

Hop Testing

- Most commonly reported functional test following ACL surgery that provides a reliable and valid outcome measure.
- Side to side imbalances in strength, flexibility and coordination may be a predictor of risk of injury.
- Side to side imbalances may increase risk to both limbs.

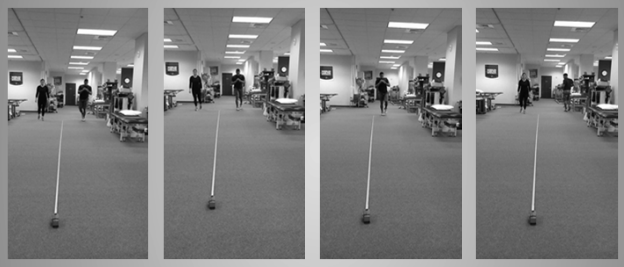
Single Leg Hop for Distance



6M Timed Hop

Triple Hop for Distance

(nearest .01sec)



Unsuccessful Hop

- Touching down of contralateral leg
- Touching down of either upper extremity
- Loss of balance
- An additional hop on landing

Crossover Hop for Distance

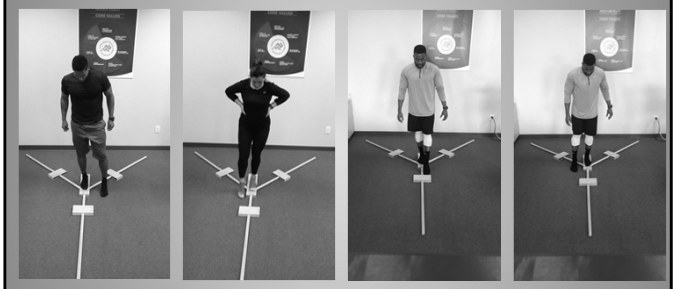
Testing

- 3 trials each
- Limb Symmetry Index: mean of involved/mean of univolved X 100
- Previous desired results: involved 85% of uninvolved.
- New desired results: involved 90% of uninvolved.

Y Balance Test

- Reliable test for measuring single leg stance excursion distances while performing dynamic balance testing.
- Easy way to test motor control and demonstrate functional limb symmetry
- Highly accurate and high ability to predict future extremity injury.

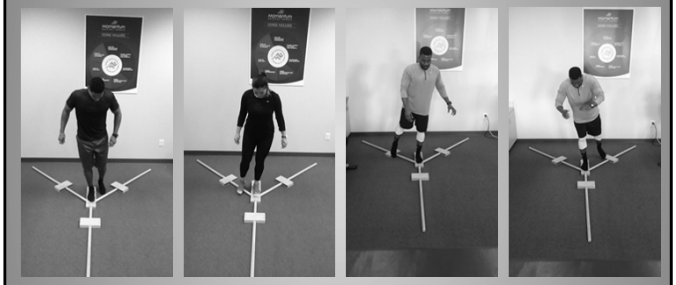
Performance Y Balance Test Anterior Excursion



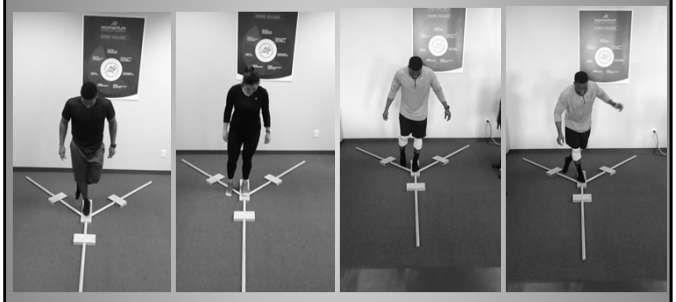
Performance Y Balance Test

- Performed no shoes
- 3 trials all directions
  - anterior uninvolved then involved
  - posterior medial uninvolved then involved
  - posterior lateral uninvolved then involved

Performance Y Balance Test Posterior Medial Excursion



Performance Y Balance Test Posterior Lateral Excursion



Y Balance Test Scoring

- Mean of each direction for each limb
- Statistically the difference from side to side should be less than 4cm for return to sport or a participating screen.
- Can figure a percentage of involved/uninvolved X 100

Y Balance Test Failures

- Unable to maintain stance on platform
- Failure to maintain reach foot contact (no kicking)
- Placing foot on top of pushing block or using it for stance support.
- Failure to return reach foot back

Single Limb Vertical Power Hop

- Vertical jump correlates with max isometric peak force, 1rep max squat, ground reaction forces in eccentric and concentric phases, knee extensor muscle strength and relative quad strength.
- Performance:
  - Athlete jumps as high as they can with one leg, height is recorded. Can be done from standing or taking a counterstep.
- Controversy: It has been proposed that the more important factor is the ability to absorb forces than to produce it in knee function.

Drop-Jump Test
(Sportsmetrics)

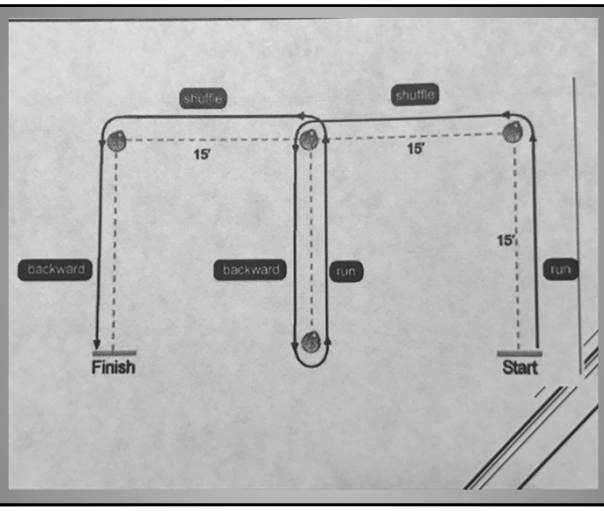
- General assessment of lower limb position, poor control on landing and acceleration into a vertical jump.
- Studies show that valgus lower limb alignment commonly occurs during non contact ACL injuries, either with landing a jump or accelerating into a jump.
- Performance:
  - Athlete stands on a 30cm box, athlete jumps down and immediately jumps vertical into the air upon landing.
  - Knee separation and landing mechanics are observed.

Modified Agility T-Test

- Tests symmetry during agility performance
- More accurate than the standard T-Test
- Isolates involved side deficits during a multi directional agility test with four 90 degree cuts.
- Goal: 10% symmetry in time.

Tuck Jump

- Useful in identifying extremity valgus and side to side differences.
- Valgus torques on the knee can significantly increase tibial subluxation and load on the ACL.
- Performance:
  - Athlete performs repeated tuck jumps for 10 sec.
  - Evaluating 8 different items, grading from never (0) to always (10).
    - Knees neutrally aligned at landing
    - Thighs reach parallel
    - Thighs equal side to side
    - Foot placement shoulder width apart
    - Foot placement not staggered
    - Toe to mid foot rocker utilized (no heel strike)
    - Rapid rebound between jumps
    - Lands in same footprint



Return to Sports

- Ultimately we need MD clearance.
- We also need to make sure our athletes are fully prepared for RTS before their full release back to sport.
- Progression back to sport should involve: functional testing with progression to non-contact practice, to contact practice at 100% effort without any increased pain, edema, warmth or episodes of giving way, with progression to competition.
- Something to think about: is it more important to get athletes back quickly with high risk of re-injury or to get our athletes to reach their fullest rehab potential prior to RTS decreasing the chances for re-injury.

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Thank You