Pursue PT ACL Rehabilitation eBook

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Pursue Greatness

Are you embarking on the journey of ACL rehabilitation?

Choose Pursue PT for a **transformative experience.**

Our cutting edge ACL rehab program stands at the forefront of sports rehabilitation, meticulously crafted to guide you through a comprehensive return to your sport. More than just recovery, we set the standard and rigor necessary to bring you back at a pre-injury level, significantly minimizing the risk of ACL retear. Trust in excellence, **trust in Pursue PT** to be the gold standard for rehabilitation and recovery following ACL reconstruction in North Jersey. Our team is committed to providing the most up-to-date treatment, creating a uniform approach to ensure you receive unparalleled care. We hope this eBook gives you guidance on what to expect during your rehab, whether it is with us, or not.

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Disclaimer

Before you dive into Pursue PT's ACL rehab eBook, here's a friendly heads up. While this eBook was written by a Fellowship trained Doctor of Physical Therapy, holding two board certifications, it is not meant to replace or skip in-person, professional, medical advice or treatment. Your body and situation are unique, and while we are here to provide helpful insights, nothing beats the expertise of your healthcare team. As you going through the eBook, keep in mind to consult with your healthcare team for personalized advice. Our ebook is here to support, not substitute the expert guidance of seeing a medical professional. If you do not have a medical provider, please reach out to us to set up a consultation, and we'll be able to help you specifically. Stay informed, state safe, and let's crush this recovery journey together!

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Goal of this E-Book

The goal of Pursue PT's ACL Rehabilitation Guide is to empower individuals recovering from ACL surgery by providing insights into the essential components of all the phases of rehabilitation post-ACL reconstruction. Through this guide, we aim to establish objective criteria for progression, especially in the crucial initial, and return to sport phases. By basing our approach on scientifically backed objective data, we are setting a standard for knowing when to progress a patient through each phase. Our ultimate aim is to create optimal outcomes, not just for performance but for long term health of the knee.

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Why is this important?

- Recent research suggests less than adequate statistics for return to sports
  - 55-70% return to pre-injury level
  - 6-25% retear rate
    - 15% retear rate prior to seven months
  - Risk increases in adolescent with allograft

- There is no standard for when an athlete should return to sport, other than time, which is typically the ~9 month mark. However, this does not take into account whether or not the athlete is physically ready.

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Phase 0:
Pre-Op (Prehab)

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Goals

Arguably just as important as any other phase

- Full ROM (especially knee extension)
- Quiet knee
- Absent or minimal effusion
- No knee extension lag with straight leg raise (SLR)
- Provide patient/family education to prepare for surgery
- Get baseline strength measurements

- Preoperative extension deficit (lack of full extension) is a major risk factor for an extension deficit after ACLR
- Preoperative deficit in quadriceps strength of >20% has a significant negative consequence for the self
- Reported outcome 2 years after ACLR
- Prehabilitation ensures better self-reported knee function up to 2 years after ACL

(Failla, 2016) (Mansson, 2013) (de Valk, 2013) (Shaarani, 2013) (Eitzen, 2009) (Grindem, 2015) (Lepley, 2016) (Quelard, 2010)

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Pre-Surgery Education

Get the KNEE straight!

Pre-operative **extension** deficit predicts postoperative extension deficit at 6 months. (McHugh 1998, Mauro 2008)

Get Strong!

Pre-operative **strength** deficit predicts postoperative strength deficit at 2 years. (Eitzen 2008, de John 2007)

Normalize the Knee Joint!

Pre-operative **synovitis** correlates to postoperative arthrofibrosis. (Mayr, 2004)

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Pre Surgery Education

It is our job at Pursue PT to prepare you, the patient, both mentally and physically for a long arduous journey ahead.

1. Ensure proper expectations for the entire ACL reconstruction process
    a. Especially the first 1-2 weeks when you may not be in rehab
2. Discuss graft choice that is most ideal for specific patient

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The Immediate Post Op “Must Do” Strategies

1. Swelling/Pain/Wound Management (Don’t Freak Out!)
2. “Wake Up” the quads!
3. Get Knee Extension!
4. Night 2 or 3 post surgery, the nerve block wears off… Be Prepared!

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Graft Choices: Types of Grafts

Bone-Tendon-Bone (BTB)

- Patellar Tendon (Gold Standard)
- Quadriceps Tendon (Newer)

Hamstring

- Single vs Double Bundle

BEAR (Bridge Enhanced ACL Reconstruction)

Allograft

Other

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Patellar Tendon Graft (BTB/PTG)

- Current Gold Standard Graft
- Middle ⅓ of Patellar Tendon
- May result in more anterior knee pain
- Must consider fat pads as cause of irritation due resection of the patellar tendon

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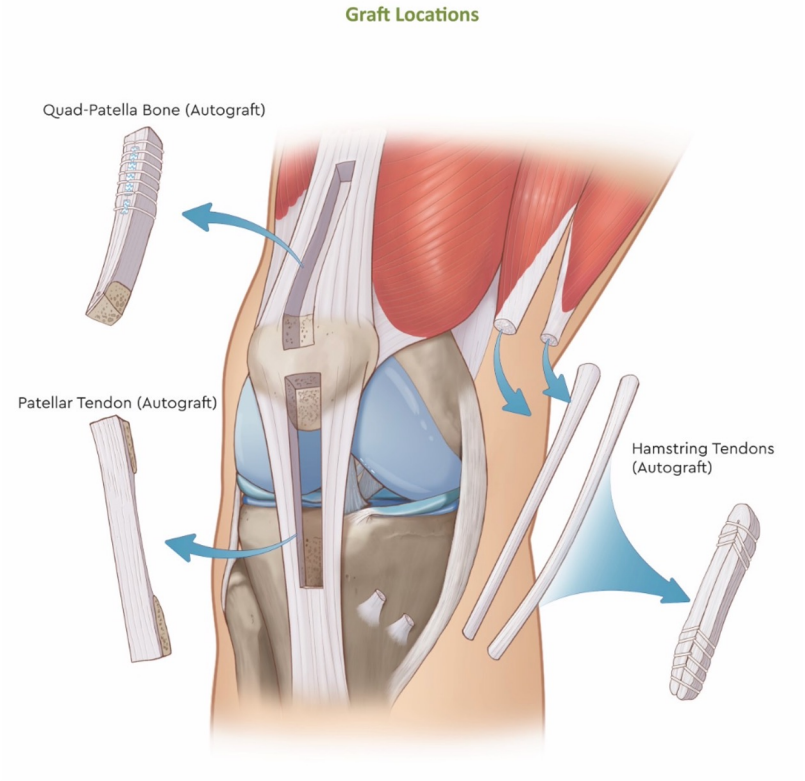

Quadriceps Graft

- Recently have become more popular
- May result in prolonged quad
- Weakness
- Less anterior knee pain reported
- Less likely for infection

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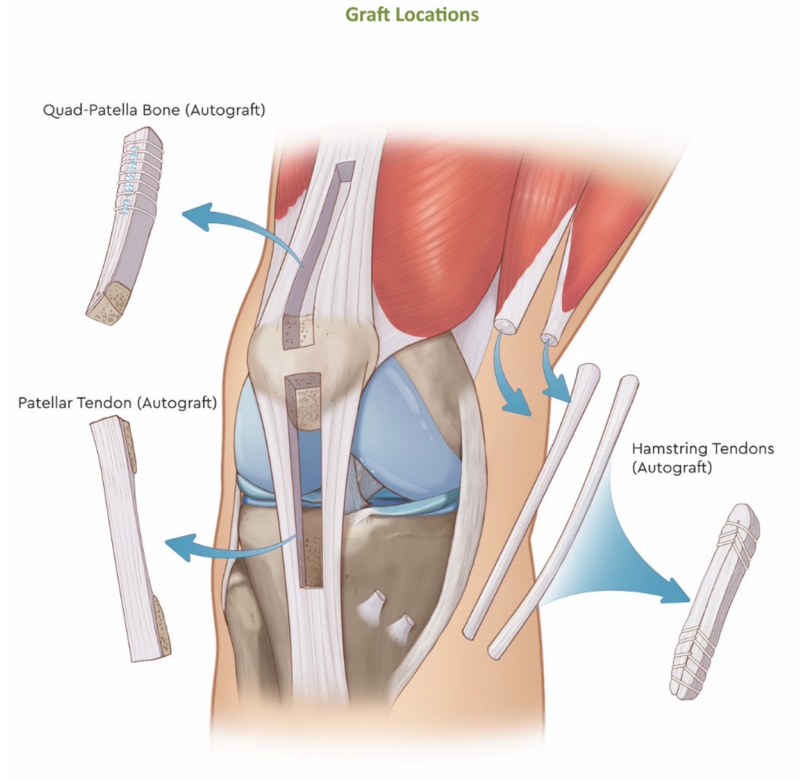

Hamstring Graft

- Typically a combination of Gracilis and Semitendinosus tendons
- Earlier reported RTS time compared to BTB
- Currently have higher re-rupture rate than BTB (17.5% vs 6.4% for BTB)
- Prolonged hamstring weakness is common
- Unable to do “heavy” strength training of HS until 6-8 weeks

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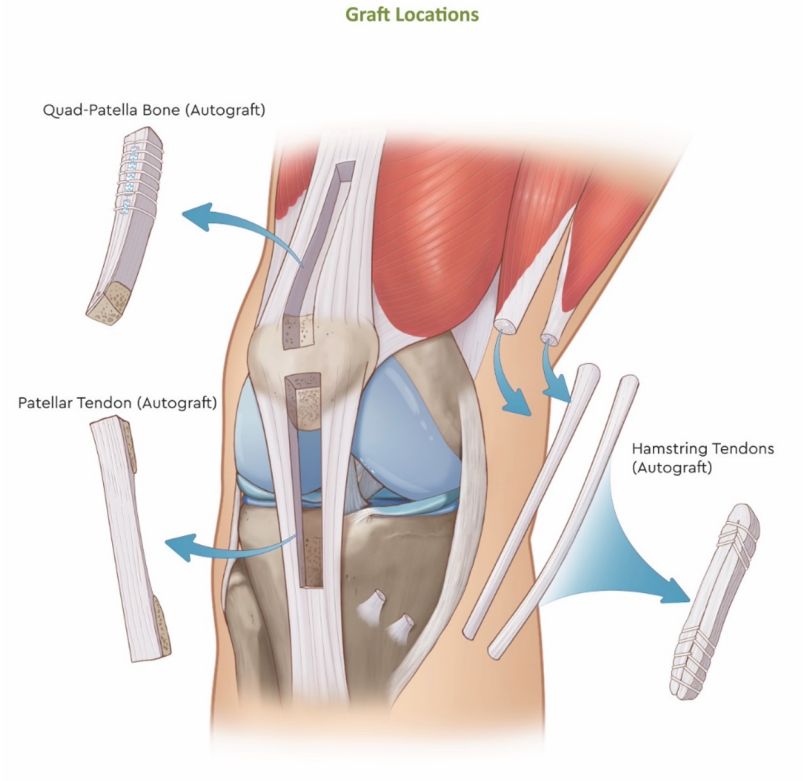

Allograft

- Allograft Options
  - Patellar Tendon
  - Tibialis Anterior/Posterior Tendons
    - HS Tendons
    - Peroneal Tendons
    - Iliotibial Band
    - Achilles Tendon

- Shorter surgical times, and no harvest site morbidity leading to an easier recovery in the immediate postoperative period
- Increase risk disease transmission, immune responses, weakening of graft tissues, and delayed incorporation and healing
- Not advised for young, female, or those involved in sports, secondary to higher retear rates in these populations.

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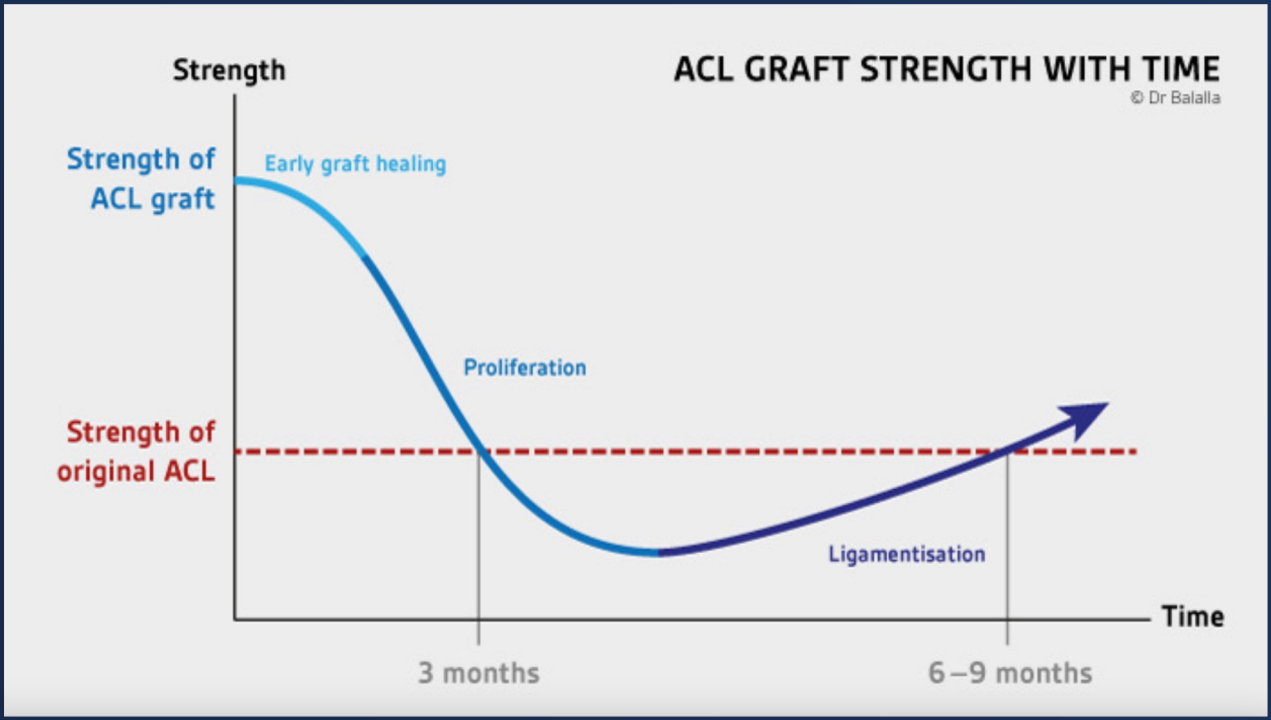
The Strength of A Graft Over Time



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Healing Graft Timeline

In the initial 0-3 months, think of it as the "early healing phase." Your graft is like a freshly planted seed, taking root and establishing a foundation, and is most vulnerable in this phase. Moving into the 3-month mark, we hit the "proliferation" phase – it's like your graft is “sprouting” and gaining strength. As we reach 6-9 months, welcome to "ligamentization." This is when your graft truly matures, becoming more like a fully grown tree with increased strength and stability. From the early days to a year or two later, your graft undergoes an incredible transformation, mirroring the natural process of growth and resilience. Keep up the good work on your rehab journey!

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BEAR Procedure

1. The BEAR technique has shown comparable mechanical properties with ACLR as well as a lower incidence of posttraumatic osteoarthritis in preclinical models.
2. In addition, the BEAR technique does not require the compromise of other healthy tissues around the knee, as is required with ACLR with an autograft.
3. The scaffold is composed of extracellular matrix proteins, including collagen, that were obtained from bovine tissue.
4. Must have at least 50% of length of ACL in order to reattach
5. Generally not performed >1 month from original ACL injury.
6. PWB to begin, braced 0-50° 2 weeks, then 0-90° for next 4 weeks

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Considerations for Concomitant Injuries

- Meniscal Repair: May be NWB for 2+ weeks
- MCL: May limit flexion
  - Avoid adduction exercises early (No-Op)
- LCL: Rare - May limit extension to 30 degrees postoperative
- OCD Lesion Repair (Microfracture, ACI, OATS, etc): May limit flexion pending on where defects were. Likely NWB at start.

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Post Surgery Phases

Phase 1: Graft Protection/Mobility
Phase 2: Early Post-Op (Weeks 2-4)
Phase 3: Late Post-Op/Controlled Ambulation and Strengthening (Weeks 4-10)
Phase 4: Strengthening Cont., Advanced Activities/Return to Running/Jumping (Weeks 10-16)
Phase 5: Return to Activity (Weeks 16-22)
Phase 6: Return to Sport (Weeks 22+)

"I want to emphasize that the timelines you'll find here are like road signs on your recovery journey – helpful, but not the whole story. They're general estimates, not strict rules. Remember, your progress is unique, and there are loads of factors influencing your rehab path. This info is a guide, not a substitute for seeking personalized medical advice. Everyone's situation is different, and variables like individual health, lifestyle, and other factors can influence how you progress. So, while our eBook is a great resource, always consult with your medical team for advice tailored to you. Your unique journey is our priority! If you don't have a Doctor of Physical Therapy you work with, please contact us to set up a consultation."

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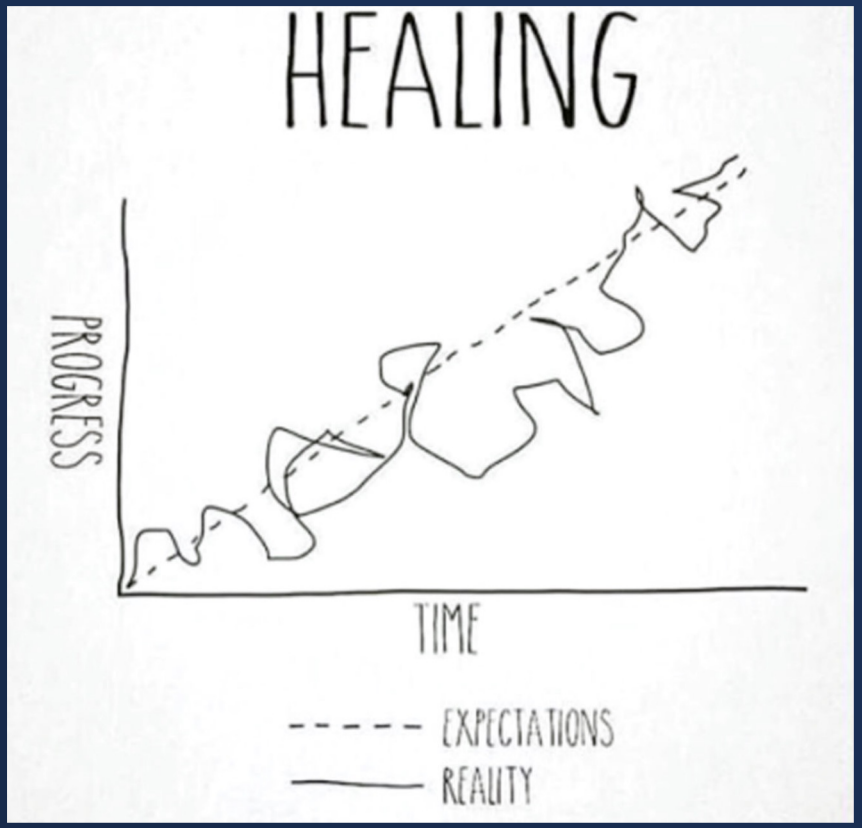
Speed Bumps On the Road to Recovery



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Phase One - Graft Protection/Mobility

1. Inflammation & Pain
    a. Numerous articles show quad inhibited with swelling
2. Patella Complex Mobility
3. Manual Therapy Decreases Pain & Increases ROM (Noel 2000, Deyle 2000)
4. ROM
5. Restore Quadricep Function
6. Adhere to Weight-Bearing Status

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ROM In Phase One

GET EXTENSION FAST!

- 25% had >5 degree loss at 4 weeks postoperative (Mauro 2008)
- 12% have >5 degrees loss at 2 year follow up (Kocher 2002)
- 10-14% have >3 degree deficit at 7 years postoperative (Roe 2005)

- Extension loss at 4 weeks postoperative predicts extension loss at 12 weeks postoperative. (Garrison unpublished 2011)
- Extension loss did not change between 2-year and 10-year follow up. (Shelbourne 2009)
- 48% of patients with extension loss at 4 weeks required arthroscopy to achieve normal extension. (Mauro 2008)

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Why Extension is Essential

- **Symmetrical** Knee Extension is **essential**!
- Achieving it does not affect graft laxity
- Extension loss did not change between 2-year and 10-year follow up
- 71% with extension loss >2 degrees or flexion loss >5 degrees showed abnormal findings on x-rays
- Quad strength decreased with extension lag
- “Performing an ACL reconstruction without also obtaining full knee range of motion might cause a worse result than doing no reconstruction at all.” (Shelbourne, 2009).

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Phase 2:
Early Post-Op
(Weeks 2-4)

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Goals

- Knee flexion ROM to within 10 degrees of uninvolved side
- Quadriceps strength greater than 60% of uninvolved side
- Walking without crutches and full extension
- SLR without extensor lag

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Obtain Knee Extension

- Our number one goal post surgery is to obtain knee extension or to get the knee completely straight as soon as possible. At Pursue PT we utilize and array of techniques to help our clients achieve this as fast as possible.

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Phase 0-3: Manual Therapy

At Pursue PT we specialize in a variety of manual therapy techniques designed to mitigate pain, restore range of motion, normalize joint kinematics, and muscle sequencing.

- Patellar Mobility
- Scary Mobilization & Soft Tissue
- Knee Extension Mobilizations
- Knee Flexion MObilizations
- PNF Stretching
- Nerve Mobilizations
- Neuromusculoskeletal Dry Needling

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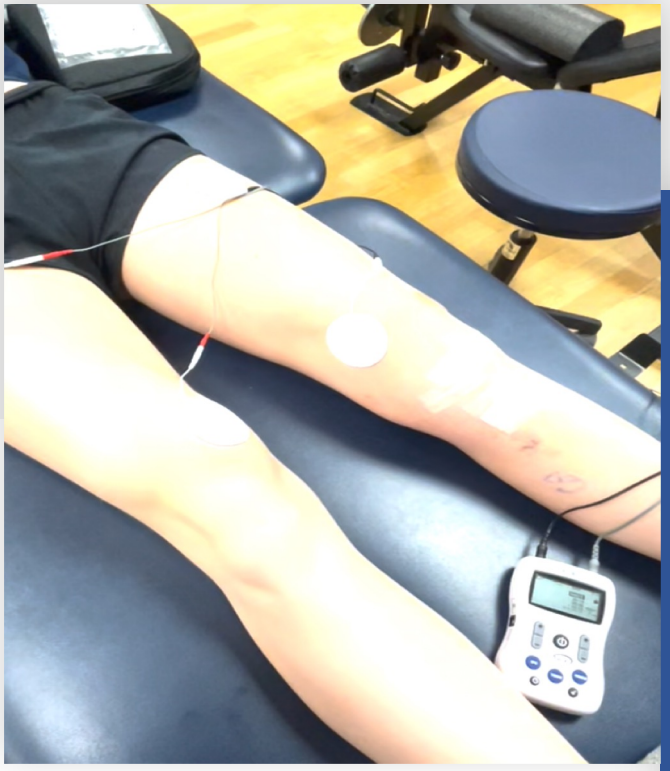
Importance of Manual Therapy

Joint Based Manual Therapy is crucial in the early stages of rehab as it has been shown to reduce pain, improve range of motion, and improve muscle activation and strength.

NMES/Russian Stimulation



NMES or Neuromuscular Electrical Stimulation is used early on in rehab to help recruit the quadriceps contraction. It is imperative that we get this muscle contracting properly in the 2-4 weeks post surgery to optimize patient outcomes.

EMG Biofeedback

- Enhanced real time feedback allowing conscious perception of muscle activation via auditory or visual electromyoprapgic (EMG) biofeedback improves voluntary muscle activation.
- Greater conscious control of descending motor pathways can override neutral/muscle inhibition and allow for restoration of quadriceps activation. (Gabler, 2013).

Blood Flow Restriction Therapy

- Blood Flow Restriction (BFR) therapy, also known as occlusion training, is a form of exercise therapy that involves restricting blood flow to the muscles during exercise. The goal of BFR therapy is to increase muscle strength and size without having to lift heavy weights or perform high-intensity exercises.
- During BFR therapy, a special cuff is placed around the affected limb, such as an arm or leg, and tightened to restrict blood flow. THis causes the muscles to work harder and stimulates the release of hormones that promote muscle growth and repair.

Blood Flow Restriction Therapy

BFR therapy is often used by athletes to help recover from sports injuries, particularly when they are unable to perform high intensity exercises due to pain or limited mobility. BFR therapy can help to improve muscle strength, endurance, and function without putting additional stress on the injured area.

Simple Quad Exercises

As soon as we are able to achieve a straight knee and a solid quadriceps contraction, we will progress to straight leg raises (SLR). This we help to improve quadriceps control, strength, and endurance throughout a range.

Phase 3:
Late Post-Op/Controlled Ambulation
(Weeks 4-10)

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Goals

- Quadriceps strengthen greater than 80% of uninvolved side
- Normal gait pattern
- Full knee ROM (compared to uninvolved side)
- Knee effusion of trace or less
- Enhance proprioception, balance, and neuromuscular control
- Improve muscular endurance
- Restore limb confidence and functions (Adams, 2012) (Wilk, 2012)

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Leg Extensions

Performing exercises like leg extensions, Terminal Knee Extensions (TKEs), and other initial quad activation moves is super important early in rehab, and here's why in simple terms. These exercises help you gain control over your quads, making them stronger. Think of it like training your leg muscles to handle different movements. It's like building a foundation for your legs to carry your body weight comfortably, allowing you to walk normally. Doing these exercises early on also fights against muscle wasting/atrophy and helps your knee bend and straighten better, reducing any swelling. So, in a nutshell, these moves set the stage for a strong, well-controlled recovery!

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Lunges

Doing exercises like lunges, squats, deadlifts, and step-ups are a big deal in ACL rehab, and let me break it down for you. These moves are like building blocks for your hip and knee strength – it's like giving your legs a solid foundation. They also help you find your balance and build endurance, which are super important. Think of it as preparing your body before you get back to running, jumping, and cutting. It's like making sure your muscles are strong and ready for action. So, these exercises are like the superheroes getting you set for the more dynamic moves down the road in your recovery journey!

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Nordic Hamstring Curls

Why Nordic Curls?

The hamstring muscle group is important in stabilizing the shin bone from the thigh bone and reduced the stress that is placed on the newly repaired ACL, as they worry synergistically with the ACL to reduce excessive motion.

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Sport Specific Proprioceptive Exercises

When an athlete undergoes ACL reconstruction surgery and starts the journey back to playing sports, it's crucial to include exercises that mimic the movements and challenges they'll face in their specific sport. These exercises, called sport-specific proprioceptive exercises, help the athlete regain their sense of balance, coordination, and control in movements that are important for their sport.

Think of it like practicing the exact skills you need for your sport but in a controlled environment. By doing these exercises, the athlete teaches their body how to move safely and effectively, reducing the risk of re-injury when they return to play. It's like training your muscles and brain to work together in a way that's tailored to your sport, so you can perform at your best without putting yourself at risk.

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Phase 4:
Advanced Activities:
Return to Running/Jumping
(Weeks 10-16)

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Goals

- Normalize lower extremity strength
- Enhance muscular power and endurance
- Improve neuromuscular control
- Perform selected sport-specific drills

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Plyometrics

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Explosive Exercises

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Return to Running Prerequisites

- Scoping review to determine what clinicians use for RTR:
  - Full knee range of motions or >95% of the non injured knee
  - No pain or pain <2 on visual analogue scale
  - Isometric extensor limb symmetry index LSI>70% plus extensor and flexor LSI>70%
  - Hop Test LSI>70%
- Delaware-Oslo Group
  - 80% QI
  - Full ROM
  - Trace or zero effusion

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Phase 5:
Return to Activity
(Weeks 16-22)

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Goals

- Gradual return to full, unrestricted sports
- Achieve maximal strength and endurance
- Normalize neuromuscular control
- Progress skill training

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Phase 6:
Return to Sport
(Weeks 22+)

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Return to Sport (Weeks 22+)

- Maintaining gains in strength (greater than or equal to 90% to 100%)
- Hop test 90% or greater
- KOS-sports 90% or greater
- 1 RM Quad/Hamstring >90%
- Return to sport criteria
  - Varies per patient
  - T Test, Depth Drop, Lateral Bounding, Tuck
- Route Running, Rebound with Perturbation

Goals

Eccentric control, explosive power

Develop confidence in knee

Knee flexion with loading/deceleration

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ACL Return to Sport Testing Implemented at Pursue PT

At Pursue PT, our ACL Return To Sport Testing goes beyond rehabilitation standards. Crafted to elevate your return to sport, our program is designed to not only bring you back to your pre-injury level but also significantly reduce the risk of ACL retear. Trust us for a comprehensive and cutting-edge approach to your recovery journey.

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Pursuing a Higher Standard

Let's break down why rehab professionals must do a series of tests to ensure a patient is truly ready to get back into sports after ACL surgery, especially considering the info from the study. There were 115 folks who had ACL surgery, got through rehab, and were cleared to return to sports. But here's the kicker – only 14% of them met the criteria for strength, knee function, and hopping ability combined.

Now, this study tells us that being a certain number of months post-surgery doesn't automatically mean you're fully ready to return to sports. The decision to go back should be based on solid, objective information from tests checking things like muscle strength, knee function, and how well you can hop around. It's not just about the time that has passed since surgery.

This is why rehab pros need to do a bunch of tests – it's like making sure all the pieces of the puzzle fit. The study found that even though people were given the green light to return, a lot of them didn't meet the necessary standards in these tests. So, the takeaway here is that we need to rely on hard data and not just a timeline to decide if someone is truly ready to jump back into the game after ACL surgery.

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Research that Supports Previous Claims

Of 115 subjects post ACLR that were **previously cleared** to RTS, **only 14%** of subjects met cutoff for combined strength (quadriceps & hamstring), IKDC and all 4 hop tests

Specific inclusion criteria included (1) primary, unilateral ACL reconstruction, **(2) completed rehabilitation program after an ACL reconstruction**, (3) cleared for unrestricted sports participation by a surgeon and treating rehabilitation specialist, and (4) planned to return to cutting and pivoting sports on a regular basis (50 hours or more per year).

The decision to allow return-to-sport clearance, the criteria used in return-to-sport decision making, and the rehabilitation program after ACL reconstruction, were not monitored or controlled by the current study.

Should we be comparing to the uninvolved or preinjury?

- Seventy athletes completed quadriceps strength and 4 single-leg hop tests before anterior cruciate ligament reconstruction (ACLR) and 6 months after ACLR.
- Forty (57.1%) patients achieved 90% LSIs for quadriceps strength and all hop tests.
- Only 20 (28.6%) patients met 90% Estimated Preinjury Capacity (EPIC) levels (comparing the involved limb at 6 months after ACLR to the uninvolved limb before ACLR) for quadriceps strength and all hop tests.
- Twenty-four (34.3%) patients who achieved 90% LSIs for all measures 6 months after ACLR did not achieve 90% EPIC levels for all measures.
- Estimated preinjury capacity levels were more sensitive than LSIs in predicting second ACL injuries (Wellsandt, 2017)

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Stop Rushing our Athletes Back

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In simple terms, let's talk about why it's crucial in rehab to aim for getting back to your original strength rather than just reaching a certain percentage of your uninjured leg. Imagine you're an athlete recovering from an ACL injury – the goal is to bring your injured leg back to the same strength and ability it had before the injury.

Now, the study tells us that some athletes achieved a certain percentage of strength compared to their uninjured leg, but not everyone reached the same level of performance they had before the injury. In fact, focusing solely on reaching a percentage of the uninjured leg didn't always ensure that the athletes could perform at their pre-injury capacity.

The decision to allow return-to-sport clearance, the criteria used in return-to-sport decision making, and the rehabilitation program after ACL reconstruction, were not monitored or controlled by the current study.

SL Hop Testing

- While the ACL hop tests display adequate reliability, the current evidence indicates a lack of consistency in their capacity to predict successful outcomes following rehabilitation, either in terms of returning to previous performance levels, or identifying those at a greater risk of re-injury.
- The current practice of using 4 hop tests to inform decision making appears to be unnecessary. Using fewer horizontal hop tests provides clinicians with an opportunity to examine a wider range of physical constructs that may offer broader insights into the athlete's readiness to return to sport.
- Hop distance/time should not be the sole measure of performance, and other factors relating to movement control should be assessed and form part of the RTS decision-making process. In addition, measuring the trajectory of progress over time may also give the clinician more useful information for decision making. (Davies, 2020)

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Return to Sport Tests That Should be Performed

- Single Leg Hop Test
- Single Leg Triple Hop Test
- Single Leg Crossover Hop Test
- 6 Meter Hop Test
- Neurocognitive Testing
- Dynamometry Testing

- Tuck Jump Test
- Vail Sport Cord Test
- LESS Test
- T-Test
- Vertical Jump Test
- Velocity Based Testing

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Handheld Dynamometry

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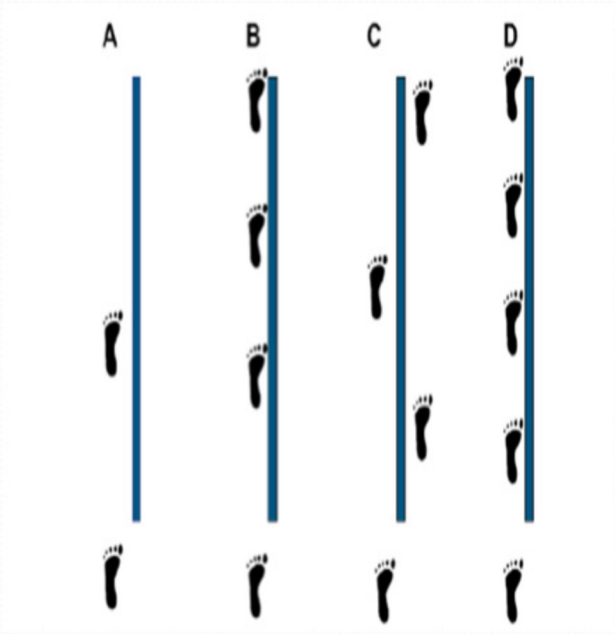
When we're helping athletes get back to playing sports after an injury, we use a special tool called hand-held Dynamometry to test their strength. This gives us really clear and accurate information to decide if it's safe for them to return to their sport.

For example, when we're checking the strength of their thigh muscles, we want the injured leg to be almost as strong as the uninjured one, ideally between 90-95%. Some studies say 85% is okay, but we aim for even better recovery.

We also look at the balance between different muscle groups in the same leg. The thigh muscles (quadriceps) should be about 1.5 times stronger than the muscles at the back of the thigh (hamstrings). This balance is really important for supporting the knee properly and avoiding further injury.

Hop Battery Tests



- Single Leg Hop
  - Single Leg Triple Hop
  - Single Leg Triple Crossover Hop
- 6 Meter Timed Hop
- 2 Practice Attempts
  - 2-3 Attempts
  - Goal: >90% LSI
  - Great opportunity to look for quality motion as well

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Hop Testing with Neurocognitive Reactive Component

- Comparison between standard hop testing vs. novel neurocognitive hop testing
- Crossover hop saw and average percent decrease of 10.37%
- Triple hop saw an average percent decrease of 7.13%
- 6 meter hop saw an average percent decrease of 81.67%
- The addition of neurocognitive reactive and anticipatory components to simulate more sport specific scenarios may improve functional testing for return to sport

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Tuck Jump Test

- 10 seconds of performing tuck jumps
- “Pull your knees as high as you can”
- The tuck jump assessment may provide clinician-friendly means to identify high-risk landing mechanics and may provide direction for a targeted intervention to reduce risk of ACL injury

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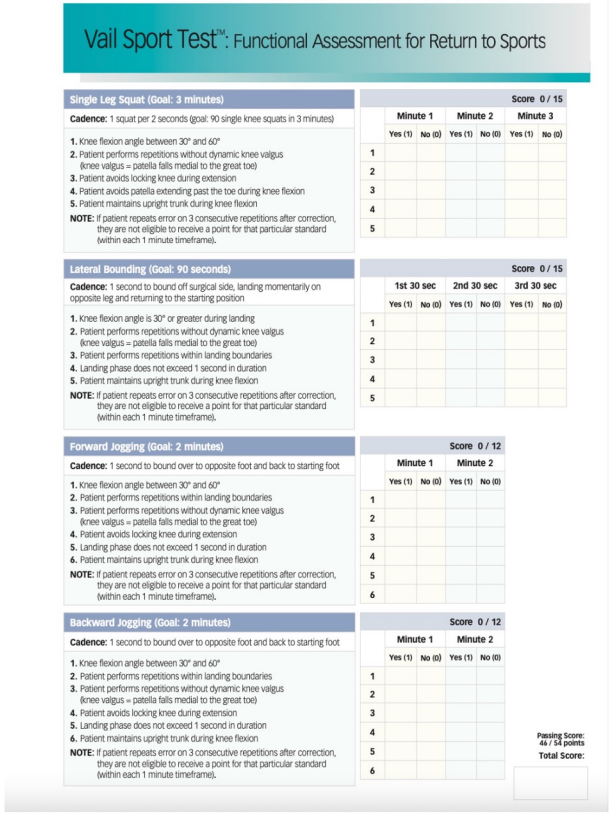
Tuck Jump Assessment	Pre	Mid	Post	Comments
Knee and Thigh Motion				
1 Lower extremity valgus at landing	❑	❑	❑	
2 Thighs do not reach parallel (peak of jump)	❑	❑	❑	
3 Thighs not equal side-to-side (during flight)	❑	❑	❑	
Foot Position During Landing				
4 Foot placement not shoulder width apart	❑	❑	❑	
5 Foot placement not parallel (front to back)	❑	❑	❑	
6 Foot contact timing not equal	❑	❑	❑	
7. Excessive landing contact noise	❑	❑	❑	
Plyometric Technique				
8. Pause between jumps	❑	❑	❑	
9. Technique declines prior to 10 seconds	❑	❑	❑	
10. Does not land in same footprint (excessive in-flight motion)	❑	❑	❑	
	Total _____	Total _____	Total _____	

ure 2 Tuck Jump Assessment: Six common mistakes that clinicians should aim to correct for their athletes while they perform the tuck ercise: (1) athletes display unwanted medial knee collapse, (2) athletes do not achieve the desired knees parallel position at top of flig letes do not displayed synchronized lower limb positions during flight, (4) athletes land with their feet too close together, (5) athletes undesirable staggered position, and (6) athletes do not land with both feet at the same time.

Vail Sport Cord Test



Vail Sport Test™: Functional Assessment for Return to Sports

Single Leg Squat (Goal: 3 minutes) — Score 0 / 15

Cadence: 1 squat per 2 seconds (goal: 90 single knee squats in 3 minutes)

1. Knee flexion angle between 30° and 60°
2. Patient performs repetitions without dynamic knee valgus (knee valgus = patella falls medial to the great toe)
3. Patient avoids locking knee during extension
4. Patient avoids patella extending past the toe during knee flexion
5. Patient maintains upright trunk during knee flexion

NOTE: If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1 minute timeframe).

	Minute 1		Minute 2		Minute 3	
	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)
1						
2						
3						
4						
5						

Lateral Bounding (Goal: 90 seconds) — Score 0 / 15

Cadence: 1 second to bound off surgical side, landing momentarily on opposite leg and returning to the starting position

1. Knee flexion angle is 30° or greater during landing
2. Patient performs repetitions without dynamic knee valgus (knee valgus = patella falls medial to the great toe)
3. Patient performs repetitions within landing boundaries
4. Landing phase does not exceed 1 second in duration
5. Patient maintains upright trunk during knee flexion

NOTE: If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1 minute timeframe).

	1st 30 sec		2nd 30 sec		3rd 30 sec	
	Yes (1)	No (0)	Yes (1)	No (0)	Yes (1)	No (0)
1						
2						
3						
4						
5						

Forward Jogging (Goal: 2 minutes) — Score 0 / 12

Cadence: 1 second to bound over to opposite foot and back to starting foot

1. Knee flexion angle between 30° and 60°
2. Patient performs repetitions within landing boundaries
3. Patient performs repetitions without dynamic knee valgus (knee valgus = patella falls medial to the great toe)
4. Patient avoids locking knee during extension
5. Landing phase does not exceed 1 second in duration
6. Patient maintains upright trunk during knee flexion

NOTE: If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1 minute timeframe).

	Minute 1		Minute 2	
	Yes (1)	No (0)	Yes (1)	No (0)
1				
2				
3				
4				
5				
6				

Backward Jogging (Goal: 2 minutes) — Score 0 / 12

Cadence: 1 second to bound over to opposite foot and back to starting foot

1. Knee flexion angle between 30° and 60°
2. Patient performs repetitions within landing boundaries
3. Patient performs repetitions without dynamic knee valgus (knee valgus = patella falls medial to the great toe)
4. Patient avoids locking knee during extension
5. Landing phase does not exceed 1 second in duration
6. Patient maintains upright trunk during knee flexion

NOTE: If patient repeats error on 3 consecutive repetitions after correction, they are not eligible to receive a point for that particular standard (within each 1 minute timeframe).

	Minute 1		Minute 2	
	Yes (1)	No (0)	Yes (1)	No (0)
1				
2				
3				
4				
5				
6				

Passing Score: 46 / 54 points

Total Score:

- Functional Test that evaluates muscle strength, endurance, power, and movement quality
- 4 components - Possible 54 Total Points - 46/54
  - Considered Passing Score (85%)
- Single Leg Squat: 3 Min
  - (Possible 15 Points)
- Lateral Bounding: 90 Sec
  - (Possible 15 Points)
- Forward Jogging: 2 Min
  - (Possible 12 Points)
- Backward Jogging: 2 Min
  - (Possible 12 Points)

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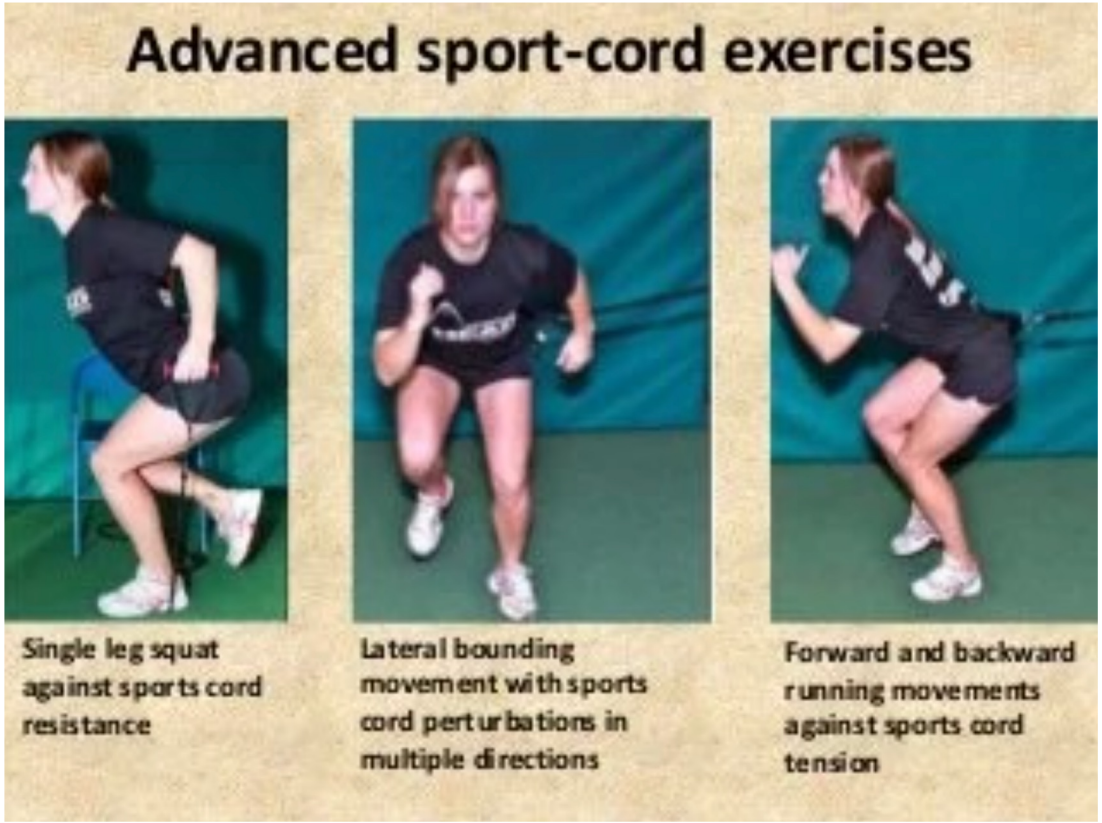
Advanced Sport Cord Testing/Exercises



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Y-Balance

- Used to assess dynamic strength/balance at limits of stability
- Measures Limb Symmetry as well as Composite Score:
- Anterior Reach + Posteromedial Reach + Posterolateral Reach
  - 2x Limb Length x 100
  - Goal: >90%% LSI
  - 4cm Difference L/R Difference Anterior Reach results in 2.5x increased risk for injury
    (Pilsky, 2006)

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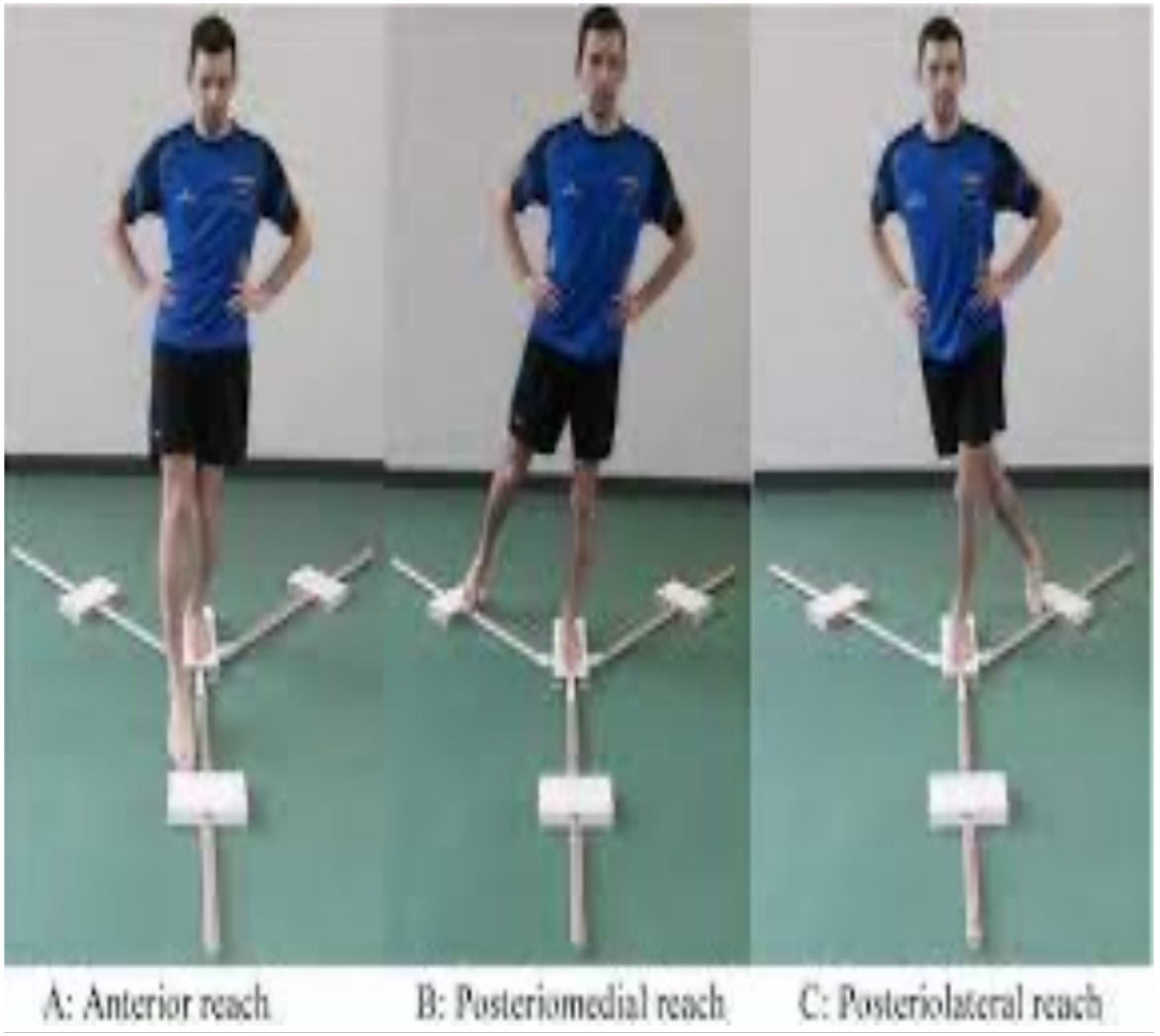

Landing Error Scoring System (LESS)

- Patient jumps from 30cm box, landing on both feet at a distance ½ of their height way from the box, then immediately performs a maximal vertical jump
- Scored out of 19 points
  - Higher score reflects poor technique and indicate higher risk for injury (Padau)
  - Scores <5 indicate low risk for ACL injury

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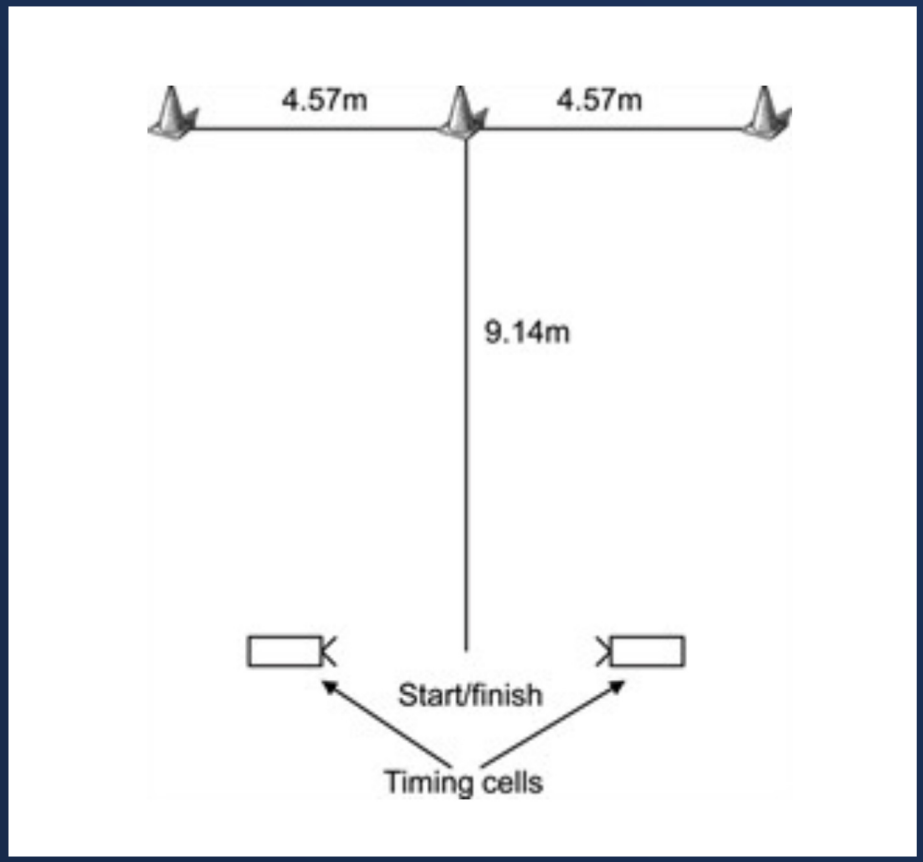
Frontal-Plane Motion	Sagittal-Plane Motion
1. Stance width	**6. Initial landing of feet**
☐ Normal (0)	☐ Toe to heel (0)
☐ Wide (1)	☐ Heel to toe (1)
☐ Narrow (1)	☐ Flat (1)
2. Maximum foot-rotation position	**7. Amount of knee-flexion displacement**
☐ Normal (0)	☐ Large (0)
☐ Externally rotated (1)	☐ Average (1)
☐ Internally rotated (1)	☐ Small (2)
3. Initial foot contact	**8. Amount of trunk-flexion displacement**
☐ Symmetric (0)	☐ Large (0)
☐ Not symmetric (1)	☐ Average (1)
	☐ Small (2)
	9. Total joint displacement in the sagittal plane
4. Maximum knee-valgus angle	☐ Soft (0)
☐ None (0)	☐ Average (1)
☐ Small (1)	☐ Stiff (2)
☐ Large (2)	
5. Amount of lateral trunk flexion	**10. Overall impression**
☐ None (0)	☐ Excellent (0)
☐ Small to moderate (1)	☐ Average (1)
	☐ Poor (2)

T-Test



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Vertical Jump

Used to assess lower extremity power

LSI goal of 89% was determined to be appropriate, with correlations to passing scores with SL Hop and Isokinetic Testing (peak extensor torque and extensor strength deficit) (Lee, 2018)

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ACL Injury Prevention

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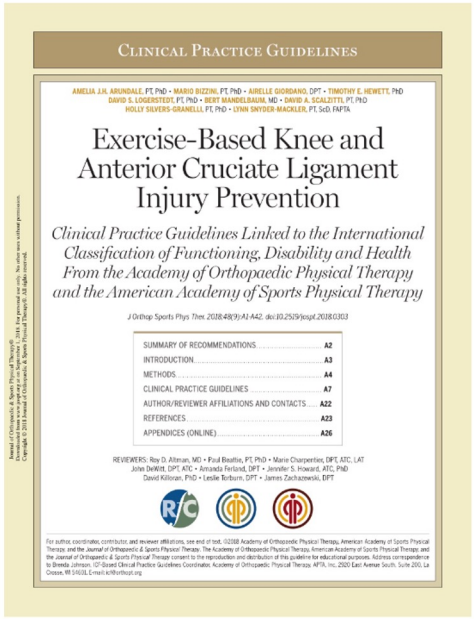
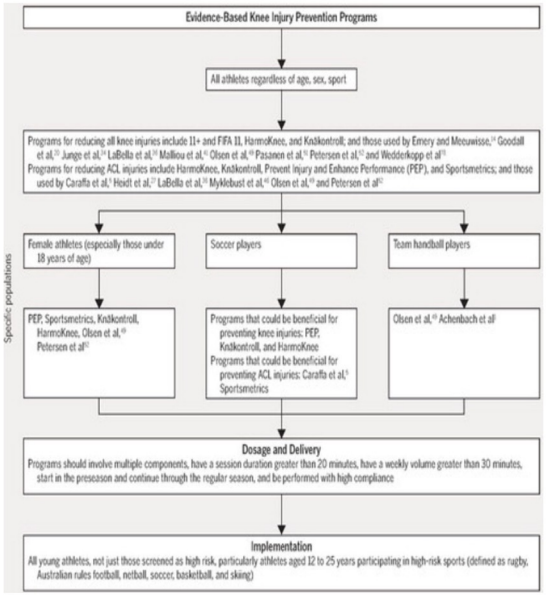
Review of Harmoknee, Fifa 11+, Sportsmetrics, ACL-SPORT Programs



CLINICAL PRACTICE GUIDELINES

Exercise-Based Knee and Anterior Cruciate Ligament Injury Prevention

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy and the American Academy of Sports Physical Therapy



	Flexibility	Running	Strength	Plyometrics	Core	Balance
Harmoknee	👍	👍	👍	👍	👍	
PEP	👍	👍	👍	👍		
Sportsmetric	👍	👍	👍	👍	👍	
Olsen et al		👍	👍	👍		👍
Achenbach et al			👍	👍	👍	👍
Knäkontroll			👍	👍	👍	
Caraffa et al			👍			👍

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Fifa 11+

- 32% decrease in all injuries
- 53% decrease in overuse
- 76% decrease in non-contact ACL injuries (Soligard, 2008)
- Efficacy of Fifa 11+ Injury Prevention in collegiate male soccer players
- 46% reduction in injury rate
- Less severe injuries and shorter timeout of sport AJSM Silvers
- The day they used it a 40% reduction of injury happens that day compared to days that athletes did not (Silvers, 2015)

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Sportsmetric Program

Originally a preseason program

60% reduction in ACL tears

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Harmoknee

Exercise	Duration
Part 1: Warm up	10 minutes
1. Jogging	4 minutes
2. Backward jogging on the toes	1 minute
3. High-knee skipping	30 s
4. Defensive pressure technique	30 s
5. One and one	2 minutes
Part 2: Muscle activation	2 minutes
6. Calf	4 s each leg/side
7. Quadriceps	
8. Hamstrings	
9. Hip flexor muscles	
10. Groin muscles	
11. Hip and lower back muscles	
Part 3: Balance	2 minutes
12. Forward and backward double leg jumps	30 s
13. Lateral single leg jumps	
14. Forward and backward single leg jumps	
15. Double leg jump with or without ball	
Part 4: Strength	4 minutes (1 min each exercise)
16. Walking lunges in place	15 repetitions each leg
17. Hamstring curl	12 repetitions
18. Single-knee squat with toe raises	12 repetitions
Part 5: Core stability	4 minutes (1 min each exercise)
19. Sit-ups	2 sets x 12 repetitions
20. Plank on elbows and toes	2 sets x 20 s
21. Bridging	2 sets x 12 repetitions

s: seconds;

*: for more details see http://www.harmoknee.com

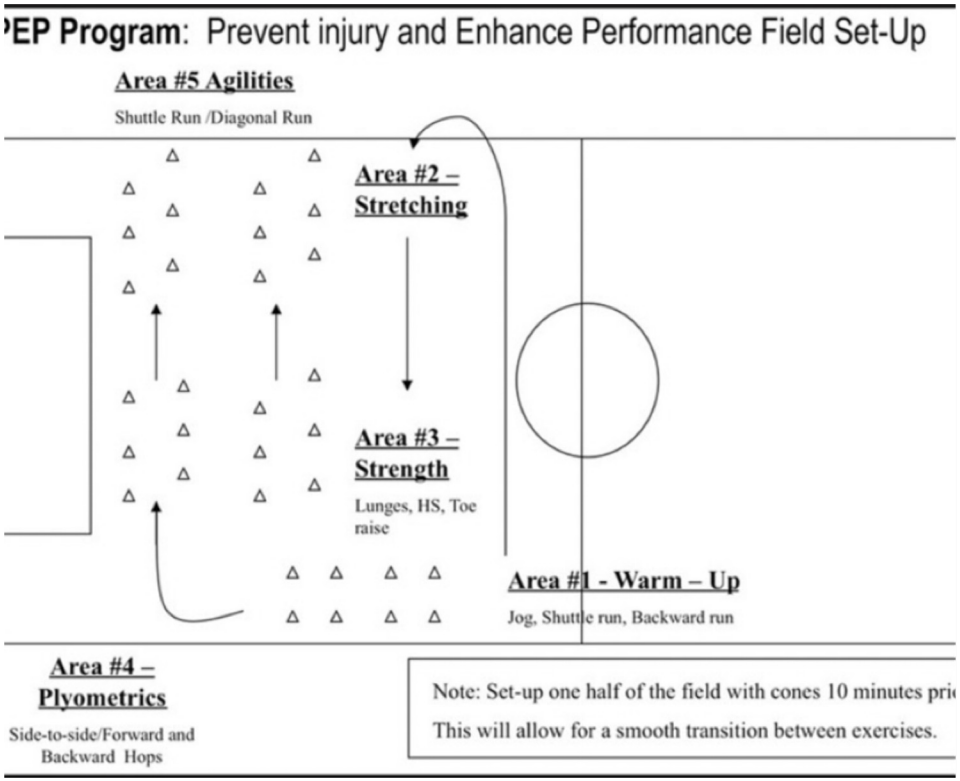
doi:10.1371/journal.pone.0169660.t002

PEP ACL Prevention Program Santa Monica

No equipment needed

Efficient designed to replace warm up all season long

- 74-88% reduction in ACL tears (Mandelbaum, 2005)
- 100% reduction in ACLS tears in “late season” (Gilchrist, 2008)



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Age Influences Biomechanical Change Participation in ACL Injury Prevention

Comparison of Fifa 11+ on pre adolescents vs adolescents

Pre adolescent athletes improved and creased their initial contact knee valgus angle as well as their peak knee valgus moment during the double-legged jump task, as compared with adolescent athletes in the intervention

After intervention training, pre adolescent athletes displayed an increase in precontact flexor-extensor muscle co-contraction during pre planned cutting as compared with adolescent intervention athletes

ACL prevention programs may be more effective if administered early in an athlete's career, as younger athletes may be more likely to adapt new biomechanical movement patterns

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Starting an ACL prevention program when you're an athlete is like giving your body superhero training to stay injury-free. The goal is simple – to keep your knees strong and protected. There are cool programs out there, like FIFA11+, Harmoknee, Sportsmetric, and PEP ACL, that teach you specific exercises and moves. These aren't just random workouts – they're like your personal armor against ACL injuries. So, why start early? Well, it's like building a shield before heading into battle; the earlier you start, the better protected you'll be when you hit the field. These programs are like your secret weapon for a strong, injury-resistant game. So, let's suit up and keep those knees in superhero shape from the get-go!

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If you're not sure how to get started with these programs or how to do the exercises correctly, you can reach out to Pursue PT at 201-340-4846 to schedule an appointment. Our sports-specific physical therapists can guide you through the process and help you implement these programs safely and effectively. It's like having expert support to ensure you're doing everything you can to protect your knees and stay active in your favorite sports.

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In wrapping up our ACL rehab eBook from Pursue PT, we've covered a wealth of information to guide you through a successful recovery journey. From understanding different types of grafts and importance of achieving early knee extensions to the importance of ensuring you have met the necessary criteria to return to sport without re injury. We've aimed to empower you with knowledge to reclaim your athletic prowess. Remember, every step you take in your rehab is crucial, and our eBook is here to support you. If you have any questions or need personalized guidance, don't hesitate to reach out. Your unique journey matters, and Pursue PT is here to help you stride confidently towards a full and active life. Thank you for downloading the eBook and let's make your ACL rehab a triumph!

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