ACL Injury Prevention

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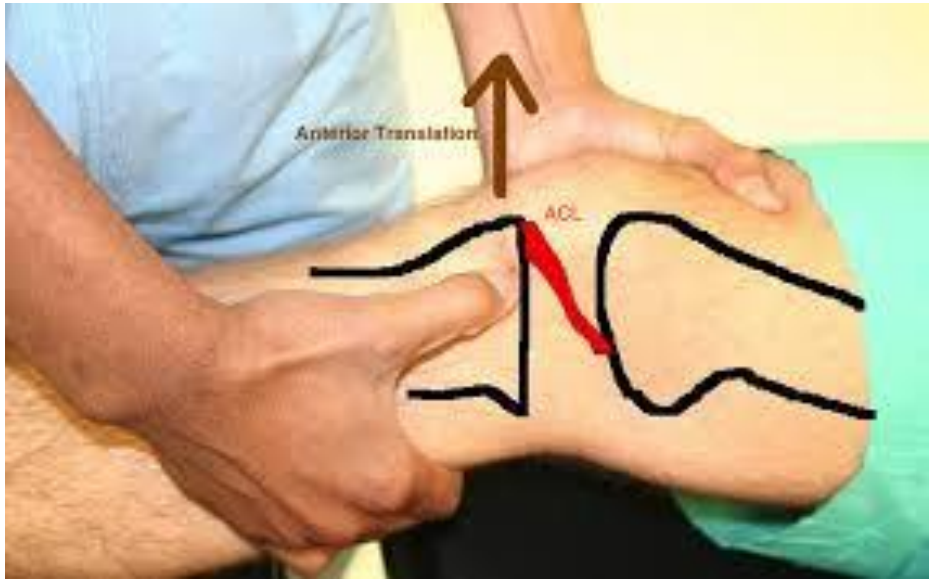
ACL Injuries

- What is the ACL
- Incidence
- Mechanism of Injury
- Prevention
- ACL update

What is the Anterior Cruciate Ligament



The ACL is one of 4 ligaments in the knee. It prevents the tibia from moving too far forward and provides approximately 90% of stability in the knee.

ACL Injury - Incidence

- The ACL provides approximately 90% of stability in the knee
- Over 100,000 ACL injuries annually
- Approximately 65% are sport injury
- 80,000 ACL Reconstruction injuries annually
- Young women are 3 times more likely to suffer an ACL injury compared to males

- UCSF Department of Orthopedic Surgery
- AJSM 2014

Mechanism of Injury

- Deceleration and sudden change in direction with a planted foot (cutting maneuver)
- Noncontact ACL injuries occur due to single high force event
- Contact ACL injuries most often occur with a direct blow to the outside of the knee (football)

Prevention program

- Preseason implementation
- Low cost and easy to implement
- Must include neuromuscular and proprioceptive training, plyometrics, agility drills, functional balance, and core strengthening
- Education
- Maintenance – improvements in movement quality do not appear to be retained once program ends.

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TABLE II PEP Program Overview*

Phase	Activity (Duration of Time To Complete Activity)	Time at Which Activity Occurs During Workout	Purpose
Warm-up (purpose: preparation)			
	Jog line-to-line (30 sec)	0 to 0.5 min	Prepare for training session
	Shuttle run (side-to-side) (30 sec)	0.5 to 1 min	Engage hip abductors and adductors; promote speed; avoid inward caving of knee joint
	Backward run (30 sec)	1 to 1.5 min	Engage hip extensors and hamstrings
Strengthening (purpose: leg strength)			
	Walking lunges (1 min)	1.5 to 2.5 min	Strengthen quadriceps
	Russian hamstring (1 min)	2.5 to 3.5 min	Strengthen hamstrings
	Single toe raises (1 min)	3.5 to 4.5 min	Strengthen calf; improve balance
Plyometrics (purpose: power, strength, speed)			
	Lateral hops over cone (30 sec)	4.5 to 5 min	Increase power and strength; emphasize neuromuscular control
	Forward and backward hops over cone (30 sec)	5 to 5.5 min	Increase power and strength; emphasize neuromuscular control
	Single leg hops over cone (30 sec)	5.5 to 6 min	Increase power and strength; emphasize neuromuscular control
	Vertical jumps with headers (30 sec)	6 to 6.5 min	Increase vertical jump
	Scissor jump (30 sec)	6.5 to 7 min	Increase vertical jump
Agilities			
	Forward run with 3-step deceleration	7 to 8 min	Increase dynamic stability of ankle-knee-hip complex
	Lateral diagonal runs	8 to 9 min	Encourage technique and stabilization of hip and knee; avoids "knock-knee" position
	Bounding run (44 yd)	9 to 10 min	Increase hip-flexion strength, power, and speed
Stretching (can be performed after warm-up)			
	Calf stretch (30 sec × 2 repetitions)	10 to 11 min	Stretch calf; focus on lengthening muscle
	Quadriceps stretch (30 sec × 2 repetitions)	11 to 12 min	Stretch quadriceps; focus on lengthening muscle
	Figure four hamstring stretch (30 sec × 2 repetitions)	12 to 13 min	Stretch hamstrings; focus on lengthening muscle
	Inner thigh stretch (20 sec × 3 repetitions)	13 to 14 min	Stretch adductors; focus on lengthening muscle
	Hip flexor stretch (30 sec × 2 repetitions)	14 to 15 min	Stretch hip flexors; focus on lengthening muscle

*PEP = Prevent injury and Enhance Performance. Website: http://smsmf.org/files/PEP_Program_04122011.pdf or http://pt.usc.edu/ACLprojectprevent/pep_tr.htm.

PEP program is designed to be implemented as warm up.

- Has been shown to reduce the incidence of injury
- Provide performance improvement (speed, jump height and strength)

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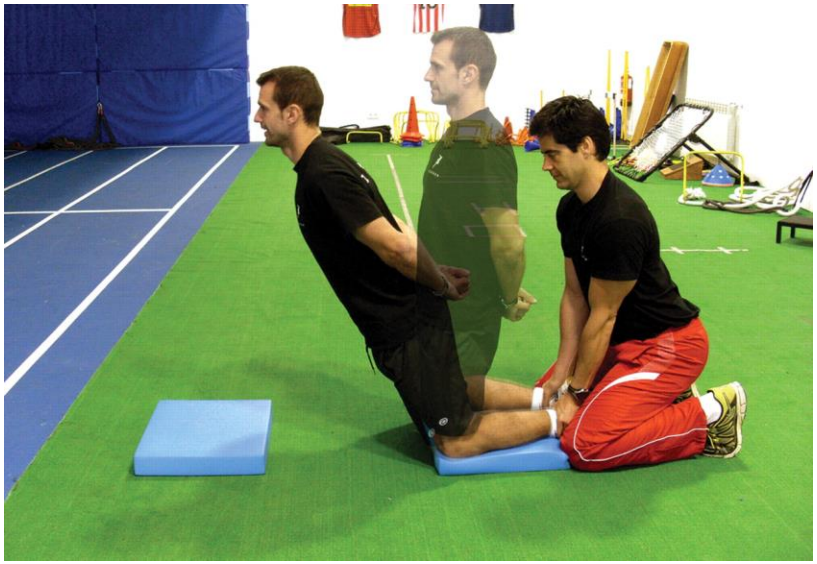
PEP Program - Strength

Walking lunges



Russian hamstring

PEP program – plyometrics and agility

Split jump

Bounding

ACL update – risk factors

- Knee joint geometry
- Knee joint laxity
  - Increased in females with both increased joint laxity and greater body mass index
    - Variants within genes have been associated with susceptibility to ACL rupture
- Genetic
  - Variants within genes have been associated with susceptibility to ACL rupture
- Hormonal
- Abnormal movement patterns
  - Tuck jump
  - Landing Error Scoring System
- Prevention

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Thank you