

Prevention of Anterior Cruciate Ligament Injuries

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History of Injury



80% non-contact

Pivoting / side stepping

Landing on single leg

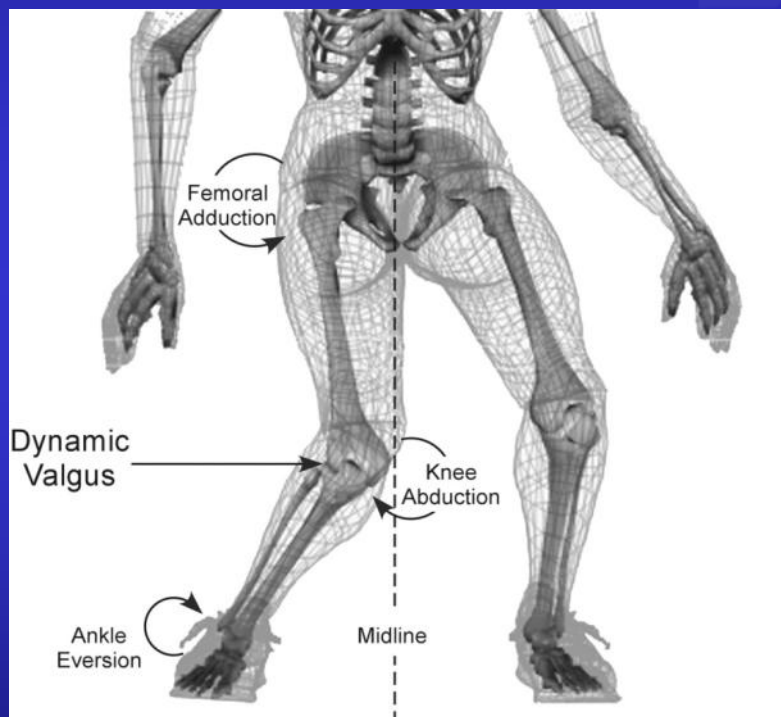


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Mechanism of Injury



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Prevention of ACL Injuries

- Not a random event
 - Preventable
- Extrinsic and Intrinsic Factors



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Extrinsic Factors

- Competition vs. Practice
- Footwear and Playing Surface
 - Protective equipment
- Meteorological conditions



Intrinsic Factors

- Anatomical – Small femoral notch
Posterior tibial slope
- Neuromuscular
- Strength, proprioception
- Coordination, Technique, Fatigue
- Sex – Female 4 – 6x risk c.f. Males



ACL Injuries in Females

- Small Notch
- Small Ligament
- Hormonal factors

ACL oestrogen receptors

Increased risk preovulatory phase of menstrual cycle

Ligamentous laxity



ACL Injuries in Females

- Ligaments different mechanically – less stiff, lower elongation to failure, lower load to failure
- Lack of neuromuscular /proprioceptive “growth spurt”



Biomechanical Factors

- Complex interaction between knee, hip, foot/ankle and trunk



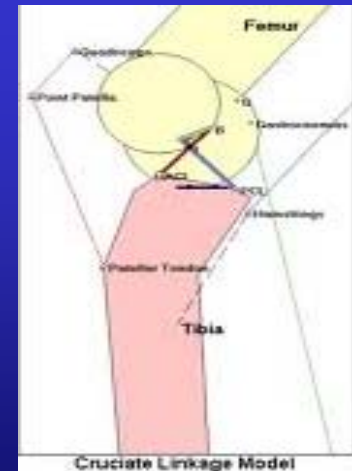
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Knee

- Dynamic Valgus
- Low flexion Angle – Increased ACL elevation angle, defxns hamstrings, Increased PT – tibial shaft angle, decreased force absorption
- Tibial Internal rotation
- Quads >> Hamstrings



Hip

- Adduction / internal rotation – dynamic valgus at the knee
 - Low flexion angle – decreased ability to absorb force
 - Weak abductors



Foot / Ankle

- Pronation / eversion
- Internal tibial rotation
- heel landing posture, dorsiflexion



Trunk

- Center of mass passes laterally over the foot



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Other Factors

- Perturbance / unplanned movement
 - Fatigue



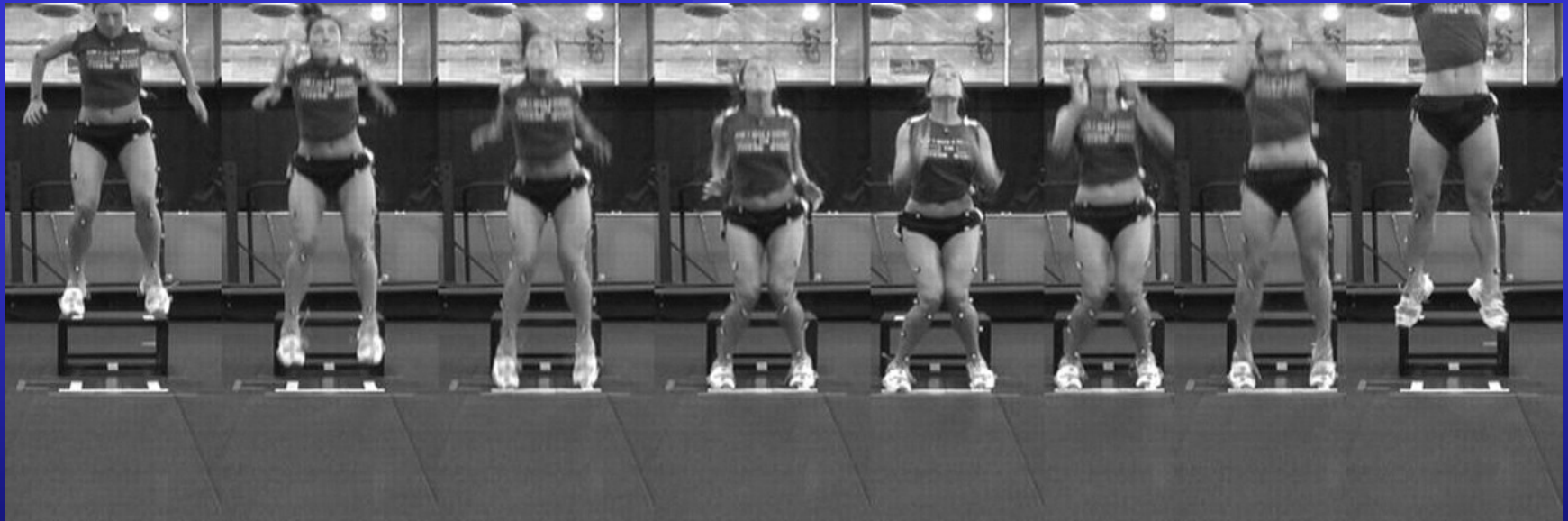
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Identification of Athletes at risk

- Double Jump Test



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Identification of Athletes at Risk

Single leg Squat



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Prevention ACL Injuries

- Education – Downhill skiers 62% decrease
- Proprioception training – Soccer 10 ACL c.f. 70 in control group n 600 (Caraffa et al 1996)
- Neuromuscular training – Basketball 89% reduction in ACL tears over 8 years (Henning 1990) knee flexion, multiple step deceleration, rounded cutting
- 4- 6 weeks to gain benefit



PEP Program

- Prevent Injury and Enhance Performance
- Santa Monica Ortho & Sports Med
(Mandelbaum et al)
- No specialised equipment, 20min 3x /week
- Warm up
- Focus on avoiding movement patterns of risk
- 6 – 8 weeks to gain benefit



PEP Program

- 14 -18 yo female soccer players

1041 PEP program

1902 control

First year 2 ACL c.f. 32 in control (88%)

Second year 4 ACL c.f. 35 in control (74%)

Age and skilled matched , not randomised

(Mandelbaum, Silvers, Watanabe Am J Spts
Med 2005)



PEP Programme

- NCAA womens soccer 1 season
- Randomised

575 PEP programme

854 control

7 ACL in PEP group c.f. 18 in control

With increasing difference in second half of season

(Gilcrest, Mandelbaum , Silvers 2004)



Avoid ACL Injury

- Avoid hip adduction/ IR
- Increase hip flexion angles
- Avoid dynamic valgus at the knee
 - Increase knee flexion angles
- Balance Quads and Hamstrings
 - Forefoot landing
 - Hip, knee, ankle in line
- Multiple step deceleration
 - Rounded cutting



Avoiding ACL injury

- Do something else



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Thank You



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