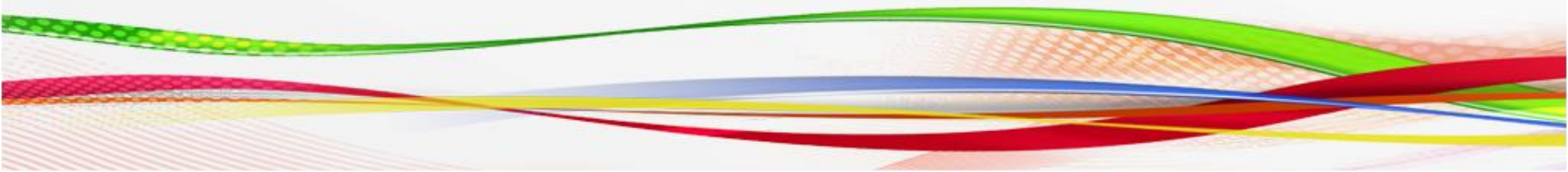


A Major Educational Event for all Professionals involved in
the Training, Performance and Rehabilitation of Runners



Running2015

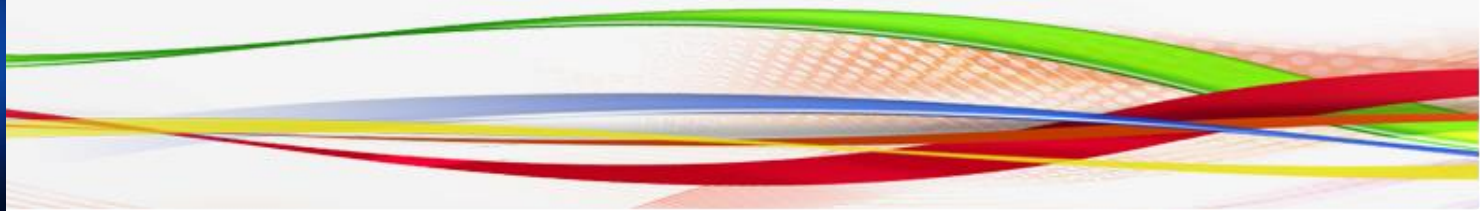
Prevention & Management of Traumatic Sports Knee Injury



Prevention & Management of ACL Injury

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ACL injury



- **ACL injury**
- **30/100,000, 40% sports injuries (NHS)**
- **Limited statistics in UK related to sport**
- **Rugby Union 2002-2004 (Fuller et al 2005)**
 - 14 injuries (0.48 injuries per 1000 player hours)
- **Football figures 2009-10 season 14 ACL injuries (Physioroom.com)**
 - 1 club since 2009 9 ACLi
- **Women's sport far worse**
 - X3 greater risk, full time athletes 5% (Prodromos et al 2007)
 - England Netball 5 of squad
 - GB women's basketball 4 out 12
 - England woman's FA (U19 – senior) 15ACLi



ACL Injury

- Research shows there will be an estimated 100,000 ACL tears this year
- Several research studies indicate that this injury is more common in female athletes
- Several risks factors have been pinpointed for the **increase in frequency in female athletes**





Why Women?



- 38,000 estimated female ACL injuries each year
- Estimated 2,200 at the collegiate level
- May be 4 times as high at HS level (8000-9000!!)





Theories To Explain Gender Differences



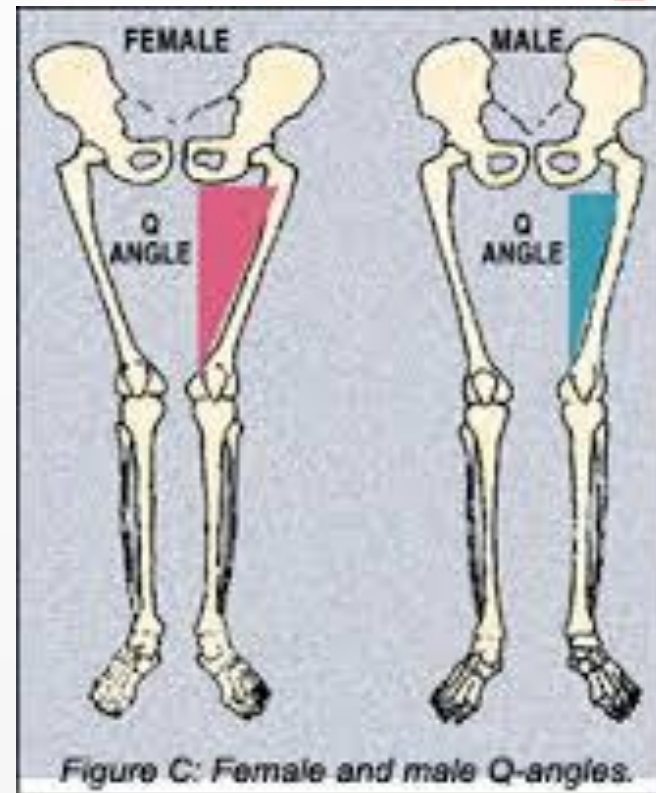
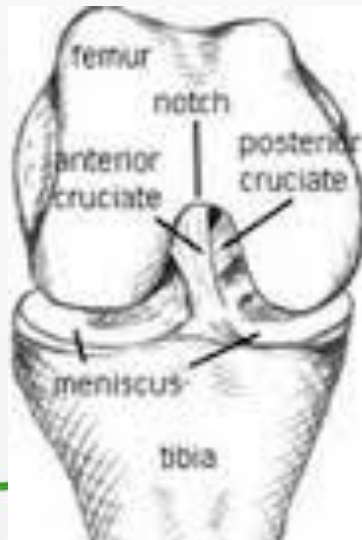
- Anatomical Differences
- Biomechanical Factors
- Hormonal Influences
- Neuromuscular Differences





Anatomic Differences

- Women tend to have a more “knock-kneed” leg alignment
- The femoral notch, in women tends to be narrower



Biomechanical Differences



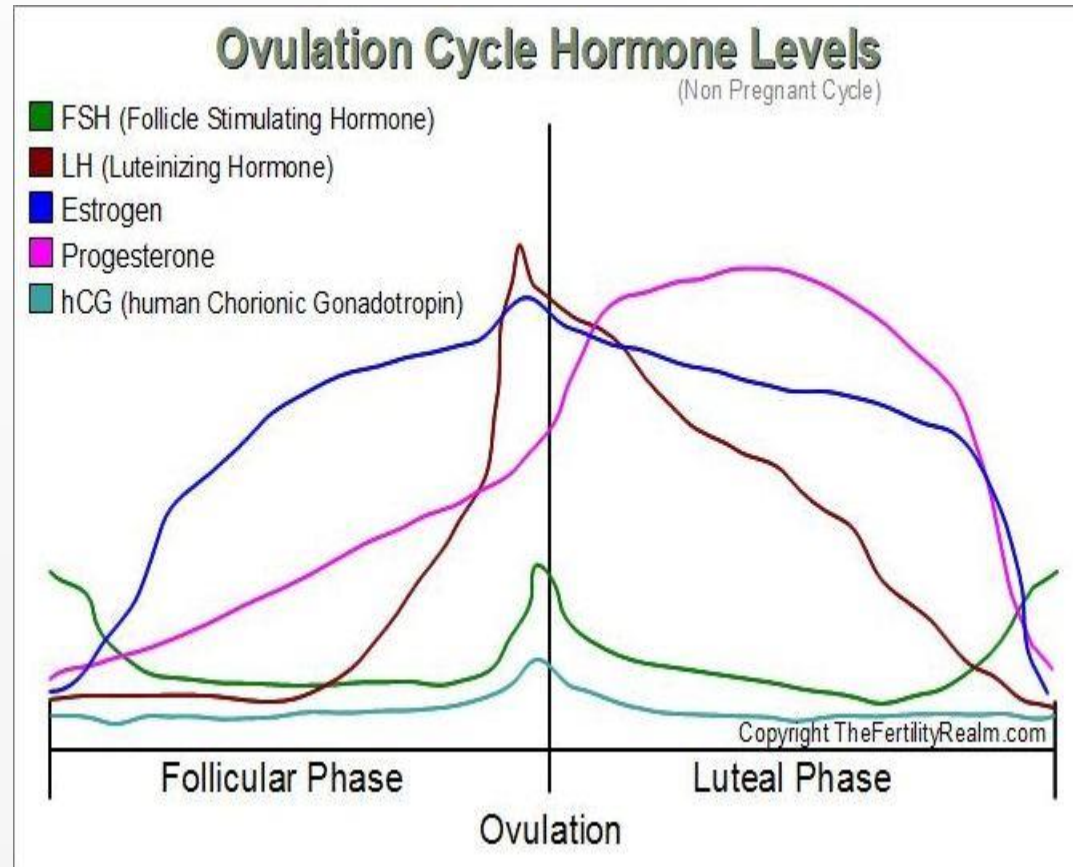
- Compared with men, women:
 - Have less muscle mass
 - Are slower at the rate of muscle force development
 - Have a **stronger, quicker** reacting quadriceps relative to hamstrings
 - Tend to be more upright when landing
 - Tend to be “quad dominant”





Hormonal Influences?

- Increased risk of ACL tears during ovulatory phase of menstrual cycle
- Decreased risk of ACL tear during follicular phase of menstrual cycle
- Recent studies are **conflicting**, these results are not widely supported...





Neuromuscular Differences



- Ligament Dominance
 - Knee ***ligaments*** rather than knee muscles absorb the landing forces during sports maneuvers
- Quadriceps Dominance
 - Quads react more quickly to forces than the hamstrings
- Leg Dominance
 - The non-dominant knee greater risk because



Risk Factors and Technique Flaws that Can Lead to Noncontact ACL Injuries



Risk Factors	Technique Flaws
Weak hamstrings	Cutting, pivoting in erect position
Muscle fatigue	Decreased knee flexion with landing
Decreased core strength	Increased knee valgus with landing
Decreased proprioception	Foot flat landing
High dorsiflexion of ankle	
Low trunk, hip, knee flexion angles	

Major Factors for ACL Injury

- Instantaneous loss of motor control while in combination with landing with knees and hips straight
- **Good news** : research is showing that a dedicated program with the right components can reduce this risk of injury



ACL injury

- **ACLR & return to sport**
- 32-76% (Jennings et al 2003; Holm et al 2010; Smith et al 2004) **ACLR return pre-injury sports**
- Average return across 48 studies 44% (Arden et al 2012)
- 4% at same level 4 years post op (Jennings et al 2003)
- Younger (<25yrs) likely to return to high risk sport older (>25yrs) 26% returned to same level (Shelbourne et al 2008)
- NFL 37% (Shah et al 2010) NBA 22% (Busfield et al 2009) **did not return to same level**
- Average time to return in NFL 10.8mths (Shah et al 2010)

- ACLR & return to sport
- Secondary injury rate in young about 24% (Paterno et al 2010)
- 10x increased likelihood tearing graft or contralateral ACL following surgery (Marshall et al 2010)

Screening

TUCK JUMP

Knee & Thigh Motion

1. Knee valgus on landing
 - Hip, knee and foot aligned, no collapse of the knee inwards
2. Thighs not reaching parallel (peak of jump)
3. Thighs not equal side to side (during flight)



Foot position during landing

4. Foot placement not shoulder width apart
 - -Inside of tape marks
5. Foot placement not parallel (front to back)
6. Foot contact timing not equal
 - Asymmetrical landing
7. Does not land in same foot print
 - Consistent point of landing
8. Excessive landing contact noise



Plyometric technique

- 9. Pause between jumps
- 10. Technique declines
prior to 10seconds

Name:	Score
Knee & thigh motion	
Knee valgus on landing	
Thighs not reaching parallel (peak of jump)	
Thighs not equal side to side (during flight)	
Foot position during landing	
Foot placement not shoulder width apart	
Foot placement not parallel (front to back)	
Foot contact timing not equal	
Does not land in same foot print	
Excessive landing contact noise	
Plyometric technique	
Pause between jumps	
Technique declines prior to 10 seconds	
Total Score	

Research



- The evidence shows that neuromuscular training including plyometrics, balance, and technique training reduces the risk of serious knee injuries in female athletes
- All current preventative programs are different but center on alteration of neuromuscular risk factors
- Training may facilitate NM adaptations to increase joint stabilization and muscular preactivation and reactivation patterns which help protect the ACL

Strategies to Avoid Injury

- Avoid vulnerable positions
- Increase flexibility
- Increase strength
- Increase balance through agility training
- Include sports specific exercises into the training program



Injury Prevention Protocol



- A 3 phase program done three days / week beginning six to eight weeks prior to the season
 - **Technique phase:** teach proper jump technique - Learn to “stick and hold” landings
 - **Fundamental phase:** continue to build strength, power and agility
 - **Performance phase:** focus on increasing maximum vertical jump height and sports specific training

Components of Program



- Warm up
- Stretching
- Agility drills
- Practice
- Strength exercises
- Cool Down



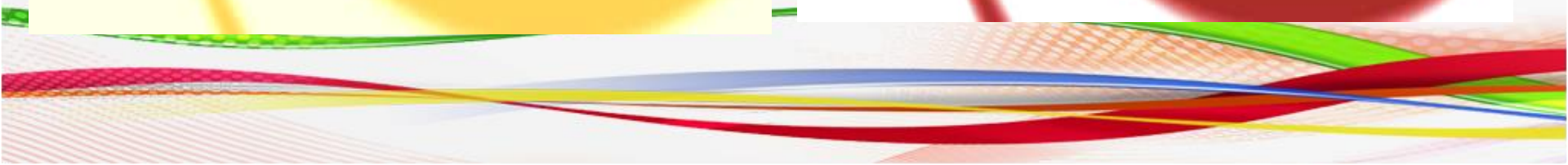
Warm Up



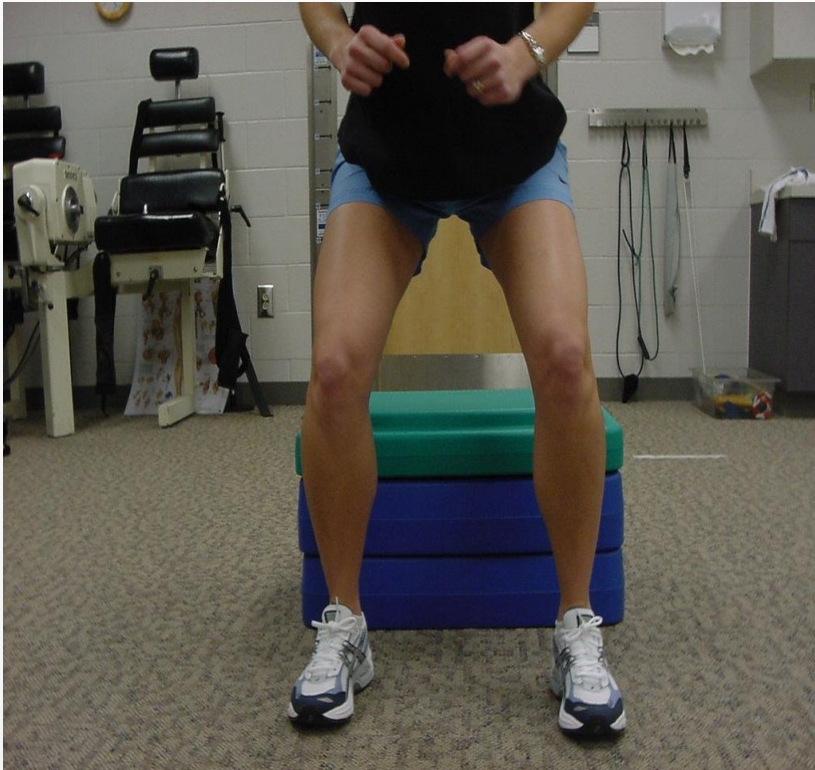
Agility Drills



Strengthening



Technique Phase



- At the start – proper landing form must be reinforced
- The athletes should be taught to land on the balls of the feet with the knees flexed and the chest over the knees
- Verbal cues:
 - Sit back
 - Land soft – toes-> heels
 - Legs are shock absorbers (instant recoil for next jump)

Technique Phase

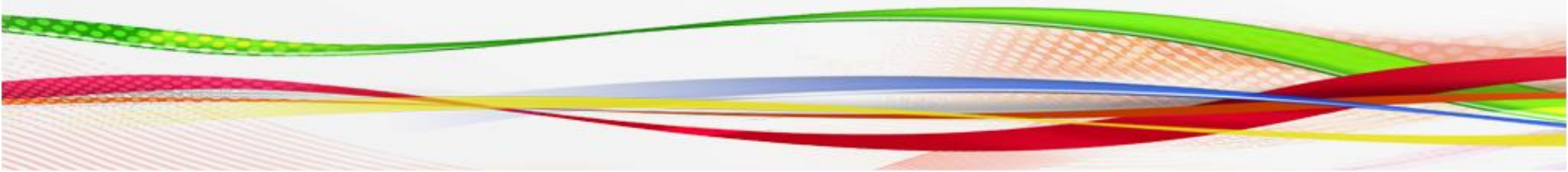
- Focus in this phase must be on perfecting the technique of each exercise
- Athletes need immediate feedback
 - Wall jumps
 - Squat jumps
 - Broad jump and hold



Fundamental Phase



- Training should focus on strength and balance
- Exercises should include dynamic, multi-planar, sport-specific movements that are a challenge to the proprioceptive system



Fundamental Phase

- Strength exercises must also include the core
 - Critical for body control
- Progression must be slow and methodical with enough recovery time
- Balance activities should be progressively more challenging
 - Single leg passing (bounce -> chest -> OH)
 - Single leg woodchops
 - Multidirectional lunges
 - Single leg jump and hold
 - Power skipping



Performance Phase

- Practical application:
 - Training skills should expose the athlete to movement patterns that generate greater dynamic knee control
 - Agility drills should be progressed when the athletes can maintain good static body control



Performance Phase

- Exercises should progress from previous phases and should now focus on agility
- Power drills include advanced p and explosive movements
 - 180 Deg jumps
 - Barrier hops
 - Scissor jumps
 - Power skipping → maximize height
 - Box drop jumps → plant and turn
 - Medicine ball vertical throws



Injury Prevention Protocol



- Optimally, after the training program, the program should be performed at least 2-3 times per week during the season
 - Program consists of a warm-up, stretching, strengthening, plyometrics, and sport specific agilities
 - The coaches and athletic trainers need to emphasize correct posture, straight up and down jumps without excessive side-to-side movement, and reinforce soft landings



Conclusion

- The evidence shows that neuromuscular training including plyometrics, balance, and technique training reduces the risk of serious knee injuries
- All current preventative programs are different but centre on alteration of neuromuscular risk factors
- Training may facilitate NM adaptations to increase joint stabilization and muscular pre-activation and reactivation patterns which help protect the ACL

Thank you

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@Back_in_Action 

Physio matters Podcast

