



# SOCCER INJURY PREVENTION

KEY FACTS

SOLUTIONS

CASE PRESENTATIONS

MICHAEL BILLER, PT & KYLE HAMMOND, MD

**EMORY**  
SPORTS MEDICINE  
CENTER



# Rationale for injury prevention programs

- Rate of injuries is increasing in many sports and injury types despite better understanding of how injuries occur
- Increasing mental, physical and monetary costs
- Several research studies have shown significant reduction in injuries when prevention programs employed
  - PEP and FIFA 11+ specific to soccer
  - FIFA 11+ Kids (ages 7-12)



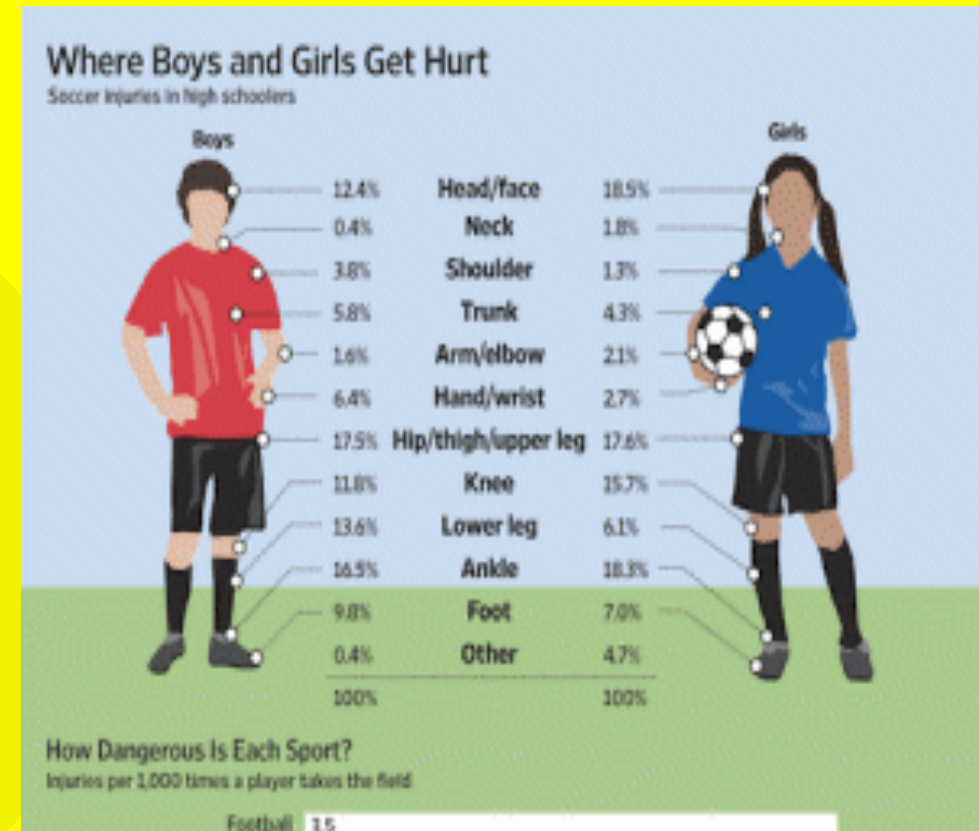
# Re-injuries and recurrence

- **When do they occur?**

- 50% in first 25 days after return to sport
- 25% in first week
- Suggest slow return to sport- limit minutes
- Avoid playing athlete when fatigued

- **Recurrence rates**

- Severe injuries (>28 days missed) with lowest recurrence rates
- Mild injuries with highest recurrence rate- tendinopathies , sprains and strains
- Hamstring strain recurrence rate 13-18% in first 2 months of return to play





# Load and training volumes

- Increased rates of loading and sudden changes associated with increased risk of injury
- Loads increase:
  - Pre-season
  - Increase to next level of competition
  - Return from injury
- High tech and low tech monitoring
  - GPS
  - Heart Rate monitors
  - Acute vs. chronic loads
    - Looking for that “happy medium”



# Screening for potential injury

- Many types of screening tests available
- Research has not shown tests to be reliable
- Tests identify some at risk but not others
- Less test- landing error scoring system
- Drop vertical jump
- Star excursion balance test
- Strength tests
- Flexibility / range of motion



# Case Presentations

- Case 1- Growth Plate Injuries
  - Why they occur and what are they
  - What you can do for prevention
  - Specific techniques you can do
- Case 2- Hamstring Injuries
  - What can you do to prevent initial or recurrent injuries
  - What does the Research show us?
  - Specific Techniques you can do
- Case 3- ACL Injury
  - Prevention and Recurrence
  - Determining return to play
  - Injury Prevention programs
- Case 4- Ankle Sprain
  - Preventable or Inevitable ?
  - Avoiding chronic ankle instability
  - Specific Techniques you can do



# Case 1: Growth Plate Injuries

**Epiphysis/Physis** is the “growth plate” where the bone is near a joint  
**Apophysis** is the “growth plate” where a ligament/tendon attaches

- Apophyseal injuries can occur between ages **9-22**
- Strongest - Tendons/Ligaments/Muscle
- **Weakest – Physes and Apophysis**
- During most rapid growth period – growth plates are **thicker and more fragile**
- Imbalance between flexibility and strength during puberty
- Stress injuries (apophysitis), Avulsion injuries (tendon/ligament pulls away from the bone), Fractures (bone breaks)
- **Quality over quantity** with training, especially during rapid growth periods
- Loads, training variation, rest periods are important factors to consider when it comes to injury prevention

**Change it up:**

- yoga/pilates
- Strength training
- Proprioception training
- Film study
- Physician involvement

*Mafulli and Denaro BJSM 2016*





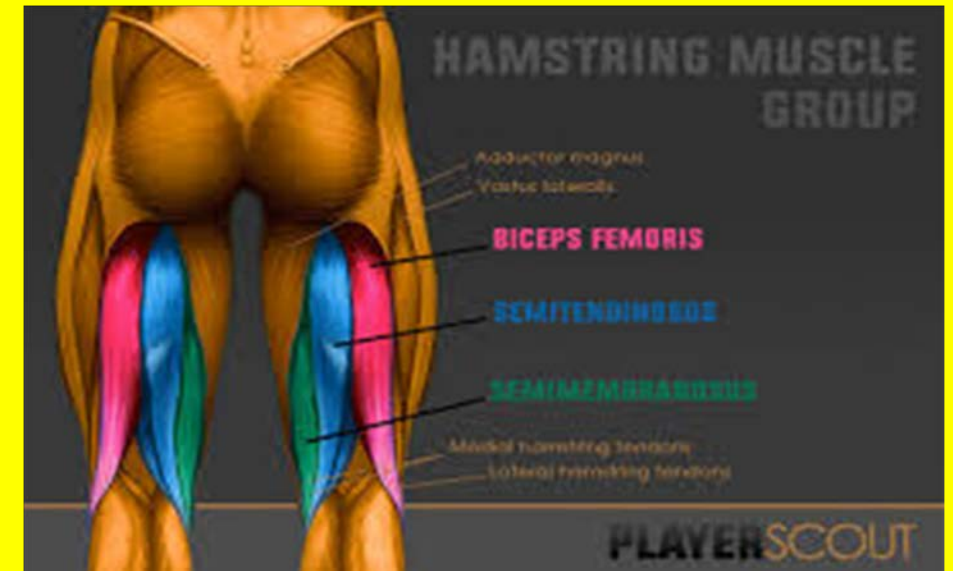
# Wearable Analytics; Catapult etc.





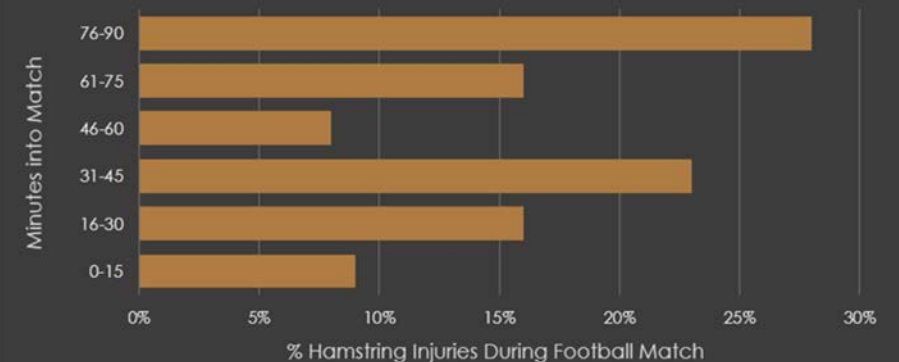
# Case 2: Hamstring Injuries

- 16-60% recurrence rate with 30% rate within 12 months
  - Brooks et al, BJSM 2005; Ekstrand et al, BJSM 2011
  - Bruckner et al, BJSM 2014; Hagglund et al, AJSM 2005
- 80% of HSI involve Biceps Femoris-long head ( BF<sub>LH</sub> )
- **50% of reinjuries occurred within 25 days after RTS from index injury; 50% of reinjuries occurred within 50 days of index injury. 79% at same location. (Wangensteen, AJSM 2016)**
- HSI frequently occur during late swing phase of running



## HAMSTRING INJURY FOOTBALL MATCH OCCURANCE TIMES

The percentage of hamstring injuries that occurred during a 90 minute football match:



# Case 2: Hamstring Injuries

- **NHE** with up to 65% reduction on hamstring injury rates in soccer
  - Peterson et al, AJSM 2011; van der Horst et al, AJSM 2015; Arnason et al, Scan J Med Sci Sports 2008.
- Teams using injury prevention programs that include **NHE** had reduction in hamstring injury rates up to 51% vs. teams that did not use an injury prevention program (Al Attar et al, Sports Med 2016).
- **NHE program** reduces acute hamstring injuries by 50% (Bahr et al, BJSM 2016).
- Bahr study looked at 50 professional soccer teams (32 UCL, 18 Norwegian Pro League) and **11% were compliant with NHE program and 83% non-compliant**

- *Can clinical evaluation predict return to play after acute hamstring injury.* Schut et al, Sports Med 2016.
  - No strong evidence that any clinical test at baseline predicts RTS
  - Moderate evidence for VAS at time of injury for prediction of RTS
- Time from injury important
- Clinical tests: Askling H test and eccentric prone leg curl tests (Cut off time of 4 minutes : 30 seconds had predictive properties for reinjury).



# Case 3: ACL Injury Prevention

## Why do we care?? Famous Surgeon!!

- 200,000 + ACL injuries per year in the U.S. – **costly**
- NCAA ISS – **1.45 (female) and .6 (male)** per 10,000 athletic exposures
- Female soccer athletes have between **1.5-2x** the chance of tearing their ACL
- Gilchrist et al AJSM 2008 – **31% have a knee injury and 14% an ACL injury - Division 1 soccer athlete medical histories**
- Myer et al AJSM 2017
  - **20-25%** reinjury rate with the same or opposite knee in the youth athlete who returns to high-level sports
- MARS study group – Revision ACL soccer athletes return to soccer at a rate of 70% (males) and 56% (females) – at an average of 10 months post-surgery.
  - **20% females had a 3<sup>rd</sup> surgery**
  - At 6.5 years after the revision ACL, only 21% (males) and 18% (females) were playing

### Impact of an ACL Injury

- **Physical**
  - Surgery and/or 6-9 months of rehabilitation
- **Social/academic**
  - Athletes miss whole seasons of play
  - Often limits future sports participation
  - Negative impact on academic performance
- **Financial**
  - Treatment is \$17,000 - \$25,000 per injury
- **Long-term health**
  - Despite treatment, 10-fold greater rate of early-onset knee osteoarthritis (15-20 years post injury)





# ACL Injuries

## Prevention

70% non-contact – landing, cutting, deceleration, pivot-type injuries

73% occur while defending, Mandelbaum et al 2015 Sports Health

- Hewett and others – risk factors with valgus landing, trunk mal-alignment and hip rotation/strength deficiencies
- Powers et al AJSM 2015, Preseason Hip abduction and external rotation strength predicts non-contact ACL injuries
- Shea et al AJSM 2015; level 1 meta-analysis showed decrease in knee injuries with prevention program, but not specific to ACL
- Neuromuscular programs shown most promise in injury prevention
- Playing surface exposure
- Cleat modifications
- Variation in training and practice methods, rest

## Sportsmetrics

### Prevent Injury and Enhance Performance Program (PEP)

Noyes et al AAOS 2018 – 2 programs shown to decrease ACL risk

### FIFA 11+

- Designed to address all soccer-related injuries, not just the ACL
- Dynamic, on-field warmup that requires no equipment
- Multiple studies now showing its efficacy, especially in the female athlete
- Snyder-Mackler et al 2017 CORR
  - FIFA 11+ decreased ACL incidence rate by 77% in male collegiate players



# ACL Injuries

- ***Return to Play “CHECKLIST”***
- Freedman et al AAOS 2018
- **7 objective tests:** physical exam, functional tests (hop, agility, movement, jump, landing), questionnaire
- 15-35 year old ACL surgical patients
- **1 group** followed for re-injury with “old-fashioned” clearance
- **1 group** followed for re-injury with new “checklist”
- Same knee re-injury was 3.3% v **9.8%**
- Same knee ACL was 3% v **6.6%**
- Opposite knee re-injury was .8% v **5.6%**
- Opposite knee ACL was .8% v **5.1%**
- **40%** athletes that the doctor or therapist cleared without performing checklist then failed the actual checklist!!

# Case 4: Ankle Sprains

- NCAA data from 1988-2004 revealed ankle injury rate of 14.9% of all reported injuries in 15 sports with highest rate in men's basketball at 26.6% (Hootman et al, J Athl Train, 2007)
- Chronic Ankle Instability (CAI) often leads to repeated ankle sprains
- Incidence of CAI has been estimated by many authors to range between 10-30% (Peters et al, Foot and Ankle 1991 and Sobrohoff et al, Clin Orthop Relat Res, 1984)





# Case 4: Ankle Sprains



- Several authors have demonstrated improvements in proprioception and neuromuscular control after a rehab program ( Bernier et al, JOSPT 1998, Rozzi et al, JOSPT 1999, Docherty et al, J Athl Train 1998, Eils et al, Med Sci Sports Exerc 2001, Freeman, JBJS 1965, and Gauffin et al, Int J Sports Med 1988)
- McKeon et al , Journal Athletic Training 2008 systematic review concluded a reduction in recurrence of ankle injury with a balance training program.
- Tropp et al , AJSM 1985 reported a decrease in lateral ankle sprains in soccer players following ankle disk training
- Verhagen et al, AJSM 2004 found a reduction in ankle sprain risk in volleyball players with a prior history of ankle sprain utilizing a balance training program
- Valovich et al, Journal of Sport Rehabilitation 2008, reported a reduction in the incidence of ankle sprain in adolescents with a balance training program

Train for Stability and Control



THANK YOU!

