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$_{LH}$)

- 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
Case 2: Hamstring Injuries

- **NHE** with up to 65% reduction on hamstring injury rates in soccer

- 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 3rd surgery
  - At 6.5 years after the revision ACL, only 21% (males) and 18% (females) were playing
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


- 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