The Young Athlete: An Overuse Injury Epidemic?

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Objectives

• Definitions and Epidemiology
• Sports Specialization and Competition
• Training Errors that lead to overuse injuries
• Proposed mechanism for overuse injuries
• Specific group at risk
• Examples of overuse injuries

Epidemic

• An epidemic occurs when new cases of a certain disease, in a given population, and during a given period, substantially exceed what is expected based on recent experience.
Overuse Injury

- Definition: Overuse injuries occur due to repetitive submaximal loading of the musculoskeletal system when rest is not adequate to allow for structural adaptation to take place.

Are Overuse Injuries an Epidemic?

- The National Council of Youth Sports (NCYS) survey 2008 found that 60 million children age 6-18 years participate in some form of organized athletics
- In 1987 the NCYS survey found 17 million participants in organized youth sports

According to the CDC overuse injuries are responsible for nearly half of all sports injuries to middle and high school students
- Estimates of the proportion of all sports injuries that are due to overuse range from 46-54%
Are Overuse Injuries an Epidemic?

- Although data is limited on overuse injuries when we extrapolate the data increasing numbers of athletes equals an increasing number of injuries.

Obesity

- Definition: Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems.

Is Obesity an Epidemic

- National Health and Nutrition Examination Survey (NHANES) collects data monitoring the national prevalence of obesity.
- Results from 2009-2010 NHANES indicate that 17% of children and adolescents aged 2-19 are obese.
- Results from 1976-1980 indicated 5% were obese.
Active Generation

Comparison Definitions

<table>
<thead>
<tr>
<th>Overuse Injuries</th>
<th>Obesity</th>
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<tbody>
<tr>
<td>Overuse injuries are due to</td>
<td>Obesity is due to repetitive</td>
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<td>repetitive sub maximal loading</td>
<td>caloric intake overloading the</td>
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<td>of the musculoskeletal system</td>
<td>digestive system when physical</td>
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<td>when rest is not adequate to</td>
<td>activity is not adequate to</td>
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<td>allow for structural adaptation</td>
<td>allow for appropriate caloric</td>
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<td>expenditure to take place</td>
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Overuse Injuries:
How did we get here?

* There is an emphasis on competitive success, resulting in increased pressure to begin high-intensity training at young ages.
* This may be driven by parental goals, originate within the child, or fostered by coaches or peers.
* Coaches, personal trainers, club team organizations, sporting goods manufacturers, tournament directors, nutrition supplement resellers and others have a financial stake in your sports participation.
Sports Specialization

- Intensive, year round training in a single sport at the exclusion of other sports.
- Early sports specialization may increase rates of overuse injury and sport burnout.
- Diversified sports training during early and middle adolescence may be more effective in developing elite-level skills in primary sports due to skill transfer.

IMG Academy

- Reports 60% of IMG Academy grads go on to play sports at the Division I level as compared to the national average of 2%.
- 38% go on to play sports at Division II & III levels.
- The college preparatory school of IMG Academy has established itself as the nation's premier prep school for preparing student-athletes for their next step in life.
Given this trend toward early and multifaceted training, frequent competition, and single sport specialization, it is no surprise that overuse injuries and burnout are common.

ERA sports Inc.

"Unlike other travel teams, our teams practice in between their weekend tournaments. We place our players on a professional hitting, throwing, fielding, and conditioning routine as if they were in a Major league system."

Local Organizations competing for youth participants
- Soccer AYSO and club teams
- Football pee-wee through junior high
- Baseball travel teams
- Gymnastics
- Swimming clubs
- Running clubs
Acute vs. Overuse Injury

• Acute injuries are those injuries that occur at a specific defining moment in sports participation or practice

• Examples of Acute Injury
  ▫ ACL tear
  ▫ Concussion
  ▫ Ankle sprain
  ▫ UCL tear
  ▫ Fracture

Acute vs. Overuse Injury

• Overuse Injuries are associated with gradual increase in symptoms

• They often go undiagnosed and untreated for long periods of time

• Examples of Overuse Injury
  ▫ Stress fractures
  ▫ Osteochondral defects
  ▫ apophysitis

How to Diagnose Overuse Injury

• Persistent pain with activity
• Timing - often with increased workouts
• Decreased desire to practice
• Change in technique
• Night time pain
Warning Signs of Impending Overuse Injury

• Pain that persists until next day's workout
• Lack of performance
• Technique suffers, loss of accuracy or form

Risk Factors for overuse injuries

• Intrinsic
  ▫ PHV
  ▫ Maturation
  ▫ Strength imbalance
  ▫ Flexibility

• Extrinsic
  ▫ Training schedule
  ▫ Volume
  ▫ Rest
  ▫ Frequency
  ▫ Nutrition

How to avoid overuse Injury

• The #1 cause of overuse injury is training error
  ▫ Volume
  ▫ Frequency (recovery time)
  ▫ Repetition of skill
  ▫ Lack of adequate sleep
  ▫ Improper nutrition
  ▫ Lack of cross training
Training Errors

• Clinical Journal of Sports Medicine in 2011 found that inadequate sleep <6 hours at night, number of practices in a 48 hour period and perceived excessive training without adequate rest to be important considerations to optimize safety.

Training Errors

• British Journal of Sports Medicine 2004, found lack of adequate rest days correlated with increased overuse injuries in adventure racing endurance athletes.

Proposed mechanisms for rise in overuse injuries

• CJSM 2013 Boston MA studied child and adolescent injury patterns
• Children age 5-12 sustained more traumatic injuries resulting in mostly fractures
• Adolescents age 13-17 were treated for higher percentage of overuse injuries
• Surgery was required in 40% of the injuries in the full sample of over 2100
Proposed mechanisms for rise in overuse injuries

- Peak Height Velocity (Adolescent Growth Spurt)
- The number of overuse injuries steadily increases from pre-PHV → PHV → post-PHV
- Trunk length and leg length have already increased, but muscles still have to reach their full size and strength
- Imbalances between strength and flexibility exist post-PHV
  - 2013 study of age 12 soccer players, Netherlands

Proposed mechanisms for rise in overuse injuries

- Scandinavian J of Medicine and Science in Sports looked at tendon mechanics and morphology in two groups of volleyball athletes, adolescents and middle age former elite athletes
- They found evidence of an imbalanced development of muscle strength and tendon mechanical and morphological properties

Proposed mechanisms for rise in overuse injuries

- Muscle strength was similar between the groups
- Tendon hypertrophy was not similarly developed and resulted in greater tendon stress
- Strong muscle action on a tendon characterized by a low cross-sectional area induces high levels of tendon stress
How to Prevent Overuse Injuries?

• Proper warm up and cool down
• Stretch
• Improve core strength
• Maintain hydration
• Adequate sleep
• Proper rest

Female Athlete Triad

• Low Energy Available
  ▫ Inadequate calories and nutrition to support increased energy demands
• Menstrual function
• Low bone mineral density
Female Athlete Triad

• The #1 fastest growing sport and gender is female HS lacrosse
• Female HS Lacrosse has grown >200% in the past decade
• There has also been a rise in stress fractures among females with amenorrhea

Overuse Injuries

• Stress fractures
• Apophysitis
• Osteochondritis dissecans

Overuse Injuries of shoulder

• Little League shoulder (proximal humeral SHI physeal injury)
• GIRD
• Scapular Dyskinesia
Overuse Injuries of Elbow

- Epicondylitis (Little League Elbow – medial)
- Triceps and biceps tendinosis
- Posterior impingement syndrome
- Pronator syndrome
- Radial tunnel syndrome

Overuse Injuries of spine

- Spondylolysis and Spondylolthesis
- Somatic dysfunction

Overuse Injuries of Hip

- Femoral Acetabular Impingement*
- Apophysitis of Hip
  - ASIS → sartorius, TFL
  - Greater trochanter → Hip rotators
  - Lesser trochanter → iliopsoas
  - Ischial tuberosity → hamstring
  - Inferior pubic ramus → adductors
Overuse injuries of Knee

- Runner’s knee
- Jumper’s knee
- Patella Apophysitis

Overuse injuries of ankle/foot

- Achilles tendinopathy
- Stress fractures
- OCD talus
- Sesamoiditis

STOPsportsinjuries.org
Thank You!
• Eric Kephart DO CAQSM MS
• blairortho.com