Sports Medicine in the Pediatric Office

Ensuring the Healthiest Sports Experience for Young Athletes

Jordan D. Metzl, MD
Sports Medicine Service
Hospital for Special Surgery
MetzlJ@hss.edu
www.DrJordanMetzl.com
Objectives

• What makes sports healthy for young athletes?
• Mental health for young athletes
• Recognize the role of preventive conditioning in the pediatric and adolescent athlete
• Choosing the right sport
• Encourage safety in an ever evolving youth sports climate
Make Good Decisions

- Role of health provider
- What is reasonable to expect?
- What “patterns” are we seeing?
Graphic Representation of the Numbers of High School Athletes in the United States as Reported by the National Federation of State High School Associations, 1970-2010
Sports medicine training during pediatric residency

- 73% of chief residents reported less than 6 hours of SM lecture training in residency
- 43% of chief residents reported less than 5 hours of clinical training.
Pediatric residency education: is sports medicine getting its fair share?


• Sports related injury are leading cause of ED and pediatric office MS visit

• Is residency training in pediatrics taking these issues into account?

• **Objective:** To assess US pediatric residency sports medicine curricula and teaching methods
Sports Medicine Training in Pediatric Residency

• **Methods:** Chief residents and third year residents surveyed from 100 randomly selected medical schools
• Response rates 63% CR, 39% PL-3
• **Results:** Lecture 77%, Hands on 37%, 29% none, 34% none in charge SM education
• CR report that only 36% have discussed more SM education into curriculum
• **Conclusion:** SM training is deficient, standard education needed
Epidemiology of Childhood Sport Injury

- Damore JT, Metzl, JD, et al
  - 4 emergency departments, 1421 patient visits, sports-related MS 41%

- Epidemiology of pediatric injury-related pediatric office visits, *Pediatrics*, 109(4);559-65
  - Sports-related injury is the most common cause of MS visit to the pediatric office
General Changes in the Youth Sports World

• Increasing competition
• “Travel”, select teams
• Increasing numbers of participants
  – estimated 30 million under age 18
• Injury frequency
When Sports Becomes too Serious
Does Sports Medicine Logic That Has Been Applied to Adult Athletes Make Sense for Young Athletes?

- Children are not little adults
- Very little research done in this age group
- Focus of sport participation is different than in adults
  - Concussion, performance enhancing drug use, orthopedic issues, etc.
How To Ensure the Healthiest Sports Experience?

• Mind
  – Competition
  – Psychological Makeup
  – Fun?

• Body
  – Body Build/Sport Selection/Training Error?
  – Injury Profile?
  – Injury History
The Adolescent Athlete: Multiple Issues Happening Simultaneously

- Adolescent Development
  - Sexual Development
  - Skeletal Development
  - Physiologic Development
  - Psychological Development
Why Do Children Play Sports?

• “Have fun”
• Teamsmanship
• Leadership
• On and off the field lessons
• Health profiles ?
Healthy Sports: Mind

- Adolescent Development
  - Sexual Development
  - Skeletal Development
  - Physiologic Development
  - Psychological Development
Basal ganglia volume is associated with aerobic fitness in preadolescent children

- 9-10 year old children
- Treadmill runs, into highest-, lowest- and median-fit categories, only highest and lowest in study
- Cognitive challenges involving watching directional arrows on a computer screen
- Brain MRI
- Fit children had significantly larger basal ganglia, part of brain that aids in maintaining “executive control” and improved cognitive performance
Cardiovascular fitness is associated with cognition in young adulthood

- Aberg MA et al, *PNAS*, 10.73, Nov 2009
- 1,221,727 Swedish males age 18 enlisted in army
- 268,496 siblings, 3,147 twins
- Physical fitness (cycling erg) and intelligence data collected
- Cardiovascular fitness, not muscle strength, correlated with intelligence
- Cardiovascular fitness changes between age 15 and 18 predicted cognitive performance at 18
- In twins, fitness was a greater predictor than genetics
Sport Selection, Psychology

- 11 year old ballet dancer
- “Ill” before going on stage
- “I’m fine once I start dancing”

- 15 year old soccer player
- Playing on school team and 2 travel teams
- “No joy”
Psychology – Is the Athlete in the Right Sport?

- Fun?
- Successful?
- Does the level of competition meet the athlete expectation?
- Is there “balance”? 

![Ballerina in a pose]
Sports Specialization

• Is there a “Too Much”?
• At What Age, Competition?
• Equation is not the same for everyone
• AAP Policy Statement, June 2001
  – Balance of organized sports and “free play”
  – Suitability of organized sport and child
  – Health providers should take an active role
Healthy Sports - Body

• What keeps athletes healthy?
• Are we recognizing injury patterns?
• Are we emphasizing prevention?
Charles Darwin
Are We Doing A Good Job Discouraging Young Athletes When Appropriate? (Athletic Darwinism)
Sports Injuries in the Athletic Patient

- Acute Traumatic
  - Fractures
  - Ligament Injury
  - Concussion

- Overuse
  - Stress Fracture
  - Osteochondritis Dessicans
Sports Grading

• **High Contact**
  - 1) Football
  - 2) Soccer
  - 3) Lacrosse
  - 4) Ice Hockey
  - 5) Field Hockey
  - 6) Wrestling
  - 7) Rugby
  - 8) Basketball
Sports Grading

• **Medium Contact**
  – Baseball
  – Cheerleading
  – Fencing
  – Figure Skating
  – Skiing
  – Softball
  – Gymnastics
Sports Grading

• Noncontact Sports
  – Dancing
  – Running
  – Strength Training
  – Tennis
  – Swimming
Case #1

- 15 year old football player
- 3 concussions over 2 years
- Normal anatomy
- ? Contact sports
Effect of Growth and Maturation

- High school aged children (14-18) may have prolonged cognitive recovery when compared with young adults (18-25 years), although symptom recovery is equivalent
  - Field 2003
- No information available for younger children
Each Athlete With A Concussion is Different

- Age of athlete
- ? Gender
- Sport
- Return to activity is an individual decision
Post-concussive Symptoms

- Headache
- Irritability
- Sleeplessness
- Dizziness
- Anxiety
Rational for Neuropsych Testing

• More accurate predictor of individual recovery rate and safe return to activity
• On-field relationship between headache and neuropsychological testing deficit
• 78 high school and collegiate athletes
• What correlated with prolonged recovery time?
Rational for Neuropsych Testing

- Amnesia, not LOC, was the most predictive factor for delayed recovery
- 3 days post injury, athletes with post concussive symptoms were 10x more likely to display retrograde amnesia
- **Point:** Recovery time is difficult to measure
ImPact Demo
Case #2

• 14 year old ballet dancer
• Spondylolysis
• Documented osteopenia
• Wants to dance
• How to encourage/counsel?
Pediatric Bone Health

- Children attain 90% of peak bone mass by 18 years of age
- Bone density increases by 6-8% per year in teens
- Multiple factors determine adult bone health
Issues to Consider When Counseling for Healthy Bones

• Body Habitus
  – Disordered eating, anorexia athletica, anorexia nervosa

• Lifestyle
  – smoking, drinking, caffeine ingestion

• Diet
  – calcium, calories (calcium counting sheet)

• Heredity

• Sex Hormone Levels

• Previous Bone Injury (Dexa?)
Bone Injury in the Female Athlete
Correlations between injury, training intensity, and physical and mental exhaustion among college athletes

- Vetter RE, J Strength Cond Res. 2010 Mar;24(3)
- 411 NCAA division 1 athletes
- 50% reported “chronic injury”
- Physical exhaustion correlated with both acute and chronic injury in roughly 30% of athletes
- Mental exhaustion correlated with roughly 20% of injury
- **Prevention**: periodization, tapering, relative rest
How Do We Optimally Prepare the Young Athlete for Sport?

- Skills
- Rules
- Practice (practice time)
- Body Preparation (Strength Training and Conditioning)
History of Pediatric Strength Training

- Medical community slow to accept
- General concern over growth related issues
- Perceived injury risk
Is Pediatric Strength Training a Good Idea?

• Sports preparation
  – Intensity of pediatric sports

• Body preparation
  – Bone density
  – Strength development

• Injury risk?
Medical Organizations Recommending Strength Training in Children

• American Academy of Pediatrics (AAP) (2001)
• American College of Sports Medicine (ACSM)
• American Orthopedic Society for Sports Medicine (AOSSM)
National Trend Towards Sports Training
What Are We Are After?

 Acquisition of strength, improvement in bone mass, reduction in injury frequency
Adolescent Bone Health

- Activity
- Diet
  - Calcium
    - 1500 mg/day
  - Soda, caffeine
- Hormone levels
  - Primary amenorrhea
- Genetic
Is there a long-term correlation between activity and bone health?

- Neville CE, Murray LJ, et al
- *Bone* 30(5):792-80, 2002
- Physical activity questionnaire to 242 men, 212 women, ages 20-25, based on childhood physical activity
- 10.4% increase in DEXA values with sports activity greater than 3 months/year
How Effective Are Strength Programs for Adolescents?

• Preliminary evaluation of an after-school resistance training program for improving physical fitness in middle school-age boys


• 22 middle school boys, 9 week program, 2x/week

• Improvements in squat (19%), bench press (15%), flexibility (10%), vertical jump (5%), medicine ball toss (12%)
Does Plyometric Strength Training Type Make A Difference?

- 12 teens, average age 17.1, assigned to two groups, with 3 times weekly plyometric strength programs
- Depth Jump (DJ) – limit ground time
- Countermovement Jump (CMJ) – maximum jump height
- 6 week program
- Vertical jump, sprint time, and agility all increased and were roughly similar between groups
  - Thomas K et al, J Strength Cond Res. 2009 Jan;23(1):332-5
Sport Specific Conditioning and Prevention Programs

- Baseball
- Football
- Soccer
- Ballet
- Gymnastics
- Basketball
- Others
Case #3

- 13 year old pitcher
- 4 weeks of worsening shoulder/elbow pain
- Initially only with throwing hard
- Now pain with throwing softly
Longitudinal study of elbow and shoulder pain in youth baseball pitchers


- The purpose of this study was to evaluate the frequency of elbow and shoulder complaints in young pitchers.

- Prospective cohort study of 298 youth pitchers was conducted over two seasons.

- The frequency of elbow pain was 26%; that of shoulder pain, 32%. Risk factors for elbow pain were increased age, increased weight, decreased height, lifting weights during the season, playing baseball outside the league, decreased self-satisfaction, arm fatigue during the game pitched, and throwing fewer than 300 or more than 600 pitches during the season.

- Risk factors for shoulder pain included decreased satisfaction, arm fatigue during the game pitched, throwing more than 75 pitches in a game, and throwing fewer than 300 pitches during the season.
Little League Shoulder: Mild
Little League Shoulder: Moderate
Little League Shoulder: Severe
Proximal Humeral Physis

• Appears at 1 year of age
• Fuses between 15-19 years of age
• Accounts for 80% of humeral growth
• Adaptive remodeling increases external rotation, decreases internal rotation
Treatment: LLS

• No throwing until pain free
• Xray for initial evaluation, possibly if concern for growth arrest
• Asses risk factors
• Modify throwing mechanic?
Treatment - LLE

- History
- Diagnosis
- Rest
- Mechanics
- Return to activity?
Prevention Program for Throwers

- Warm-up 5-10 minutes
- Strength
  - forearm
  - upper arm
  - shoulder
  - core
  - hips
Pitch Counts

*Guidelines for maximum effort pitches*

10 pitches per years of age per 7 day period.
Guidelines for Appropriate Pitch Types
Biomechanics

- Stance
- Windup
- Cocking/acceleration
- Landing
- Follow through
HSS Thrower’s Program
Take Home Points – Throwing Injury

- “Play through the pain”
- Recognition of previous injury patterns
- Prevention programs
  - Strength
  - Biomechanics
Conclusions

• Continue to support sports for kids
• Encourage participation on all levels
• Consider strategies for prevention on every level