

Specialization and Overuse Injury: what is the evidence?

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Over-activity - The other extreme

Participation in organized and recreational athletics has grown in past 2 decades

- ◆ 30-45 million youth (6-18 yrs) participate
- ◆ Sports are more accessible
- ◆ Year-round
- ◆ 10,000 hrs of practice necessary?

Overuse injury

- ◆ Micro-traumatic damage to bone, cartilage, muscle or tendon subjected to repetitive stress without sufficient time to heal
- ◆ Up to 50% of pediatric sports medicine injuries are overuse

Stages of overuse injuries

1. Pain in affected area after physical activity
2. Pain during activity, no restriction on performance
3. Pain during activity, restricts performance
4. Chronic, unremitting pain, even at rest

Increased risk and severity of overuse in young athlete

- ◆ Growing bones less resilient to stress
 - Traction apophysitis in baseball player with poor mechanics (poor kinetic chain)
 - Spondylolysis in gymnast (repetitive hyperextension)
- ◆ Under-recognition - less understanding of the different injury pattern in children
 - Tendonitis vs. apophysitis

Risk Factors for overuse injury

- High Weekly Exposure (>16 hrs/wk) – Rose, Jayanthi, Fleisig
- Prior Injury - Emery, Jayanthi
- **Specialized - Jayanthi**
- Rapid Growth - Caine, Blimkie
- High Competition - NCAA
- Year Round Training - Lyman
- Age (>13) - Emery
- Higher Skill Level – Mafulli, Baxter Jones

Specialization and Overuse Injury

- ◆ Inclusion: ≤ 18 years of age, compared athletes with high or single-sport specialization with athletes with low or multisport specialization, and focused on overuse injuries
- ◆ 5/12 articles that were identified for full-text review met the inclusion criteria
- ◆ 4 studies provided adequate data
- ◆ Quality scores on the modified Downs and Black scale ranged from 69% to 81%

Bell et al. Sport Specialization and Risk of Overuse Injuries: A Systematic Review With Meta-analysis. Pediatrics. 2018 Sep;142(3).

Specialization and Overuse Injury

- ◆ Athletes with high specialization were at an increased risk of sustaining an overuse injury compared with athletes with low (RR: 1.8; 95% CI: 1.3-2.6) and moderate (RR: 1.2; 95% CI: 1.1-1.3) specialization
- ◆ Athletes with moderate specialization were at a higher risk of injury compared with athletes with low specialization (RR: 1.4 [95% CI: 1.0-1.9])

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Sport Sampling Versus Sport Specialization

- ◆ 6/324 studies found met inclusion criteria
- ◆ Total participants 5736
 - 2451 (43%) were "sport samplers"
 - 1628 (28%) were "sport specialists"
 - 1657 (29%) were considered "others" (not classified as either)
- ◆ The average age was 14.6 years (range, 7-18 years)
- ◆ Sport specialists had a significantly higher injury risk than the sport samplers (RR, 1.4; 95% CI: 1.2-1.6; $P < .0001$)
- ◆ There was a higher risk of injury in the "others" when compared with the "sport samplers" (RR, 1.2; 95% CI, 1.1-1.3; $P < .0001$)
- ◆ There was a higher risk of injury in the "sport specialist" over the "others" (RR, 1.1; 95% CI, 1.0-1.1; $P < .005$)

Specialization and MSK Injury

- ◆ Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for studies evaluating sports specialization and injury rates in participants under age 18
- ◆ Inclusion criteria: (1) youth patient population (<18 years of age), (2) peer-reviewed investigation of association(s) between sports specialization and incidence of injury, and (3) original research article
- ◆ Exclusion criteria: (1) reliance on surrogate measure(s) of sports specialization (i.e. hours of participation), (2) language other than English, and (3) not a clinically-based study
- ◆ Rates of sport specialization, acute and overuse injuries, and frequency of organized training regimens were recorded

Fabricant et al. Youth sports specialization and musculoskeletal injury: a systematic review of the literature. *Phys Sportsmed*. 2016 Sep;44(3):257-62.

Specialization and MSK Injury

- ◆ 3 studies met inclusion and exclusion criteria
- ◆ 2 retrospective cohort studies and 1 case-control study
- ◆ All studies reported an increased risk of overuse injuries (OR range: 1.3-4.0; $P < 0.05$)
- ◆ 1 study noted an increased rate of withdrawal from tennis matches (OR = 1.6, $P < 0.05$) in athletes who only played tennis vs. multisport athletes who also played tennis
- ◆ Based on the consistency of the results from these studies, the strength of recommendation grade for the current evidence against early sports specialization is "B" (recommendation based on limited-quality patient-oriented evidence)

Fabricant et al. Youth sports specialization and musculoskeletal injury: a systematic review of the literature. *Phys Sportsmed*. 2016 Sep;44(3):257-62.

Sports-specialized intensive training and the risk of injury in young athletes

- ◆ 1214 athletes - 1190 (50/50 M/F) with satisfactory data
- ◆ 822 injured participants (50/50 M/F; unique injuries, n = 846) and 368 uninjured participants (55/45 M/F)
- ◆ Injured athletes were older than uninjured athletes (14 +/- 2 vs 13 +/- 2.5 years; $P < .001$) and reported more total hours of physical activity (20 +/- 9 vs 17.5 +/- 9 h/wk; $P < .001$) and organized sports activity (11 +/- 2.5 vs 9 +/- 6 h/wk; $P < .01$)
- ◆ After accounting for age & sports hours/ week, sports-specialized training was an independent risk for injury (OR 1.3; 95% CI, 1.1-1.5; $P < .01$) and serious overuse injury (OR 1.4; 95% CI, 1.1-1.7; $P < .01$)
- ◆ Young athletes participating in more hours of sports per week than number of age in years (OR, 2.1; 95% CI, 1.4-3.1; $P < .001$) or if organized sports: free play time was 2:1 hours/week had increased odds of having a serious overuse injury (OR, 1.9; 95% CI, 1.3-2.8; $P < .01$)
- ◆ Growth rates were similar between injured and uninjured athletes (5 cm/y for both groups; $P = .96$).

Jayanthi et al. Sports-specialized intensive training and the risk of injury in young athletes: a clinical case-control study. AJSM. 2015;43:794–801.

Sports Specialization EBM Recs

- ◆ Some degree of sports specialization is necessary to attain elite level skill
- ◆ For most sports, intense training in a single sport to the exclusion of others should be delayed until late adolescence to optimize success while minimizing risk for injury and psychological stress

◆ Sort level B

Jayanthi N, Pinkham C, Dugas L, et al. Sports specialization in young athletes: evidence-based recommendations. Sports Health. 2013;5:251–257.

Overtraining

◆ Detrimental
and harmful



◆ Healthy and
beneficial

- Scientific guidelines to keep the proper balance

ONE

Baseball Pitchers

- ◆ **Pitch counts should be monitored and limited in youth baseball:**
- ◆ **9-10 year old pitchers:**
 - 50 pitches per game
 - 75 pitches per week
 - 1000 pitches per season
 - 2000 pitches per year
- ◆ **11-12 year old pitchers:**
 - 75 pitches per game
 - 100 pitches per week
 - 1000 pitches per season
 - 3000 pitches per year
- ◆ **13-14 year old pitchers:**
 - 75 pitches per game
 - 125 pitches per week
 - 1000 pitches per season
 - 3000 pitches per year
- ◆ Pitches thrown in games only - not including throws from other positions, instructional pitching during practice, and throwing drills. Backyard practice after a game is strongly discouraged.



<http://www.asmi.org/asmiweb/usabaseball.htm>

Prevention Strategies

1. Be alert for signs/ symptoms of burnout
2. 1-2 days off/ week to recover physically and psychologically
3. Do not increase training frequency, duration or intensity $>10\%$ / week
4. 2 months/ year off from specific sport
5. Keep # sports hours/ week $<$ age
6. Emphasize fun, skill acquisition and safety
7. Participate on 1 team at a time
8. Develop medical advisory boards

Thanks

