

Throwing in Children and Adolescents Youth Baseball Injury Prevention

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Financial Disclosure



- Fellowship support
 - Smith and Nephew Endoscopy

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Youth Throwing Injuries



- Recent media attention - heightened awareness
- Dr. James Andrews / STOP sports injuries
- PitchSmart – MLB and USA baseball
- Still considered “epidemic”



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Public Perceptions of Tommy John Surgery

Ahmad, et al, Phys Sportsmed, 2012



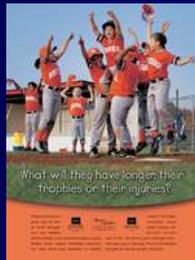
- Believe that Tommy John surgery should be performed on players without elbow injury to enhance performance:
 - Coaches 30%
 - Parents 37%
 - High school athletes 51%
 - College athletes 26%

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Year Round Baseball



- #1 reason for explosion of youth baseball injuries



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UK youth baseball study Objectives



- Determine frequency of x-ray changes in young throwing shoulder
- Correlate x-ray changes with shoulder symptoms
- Help develop recommendations for injury prevention



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Study population

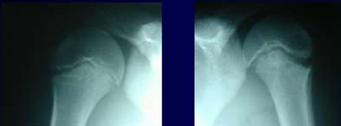
- 79 male volunteers age 8-15
- All during peak of season
- Followed for 6 years (32 made it)



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Summary of our study findings

- X-ray differences common in young throwing shoulder (45/79)
- Some correlation to symptoms
- Common in asymptomatic athletes
- When symptomatic, responds well to rest



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New York Times article

- Summarizes recommendations for youth baseball players



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Andrews Study, AJSM

- Increased risk of injury needing surgery
 - Pitching > 8 months / year 500%
 - Pitching > 80 pitches / game 400%
 - Fastball > 85 mph 250%
 - Pitching despite arm fatigue 3600%

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Curveball?

- Greatest mechanical torque stress shoulder and elbow –
 - Fleisig, Andrews
 - 1. Fastball
 - 2. Curveball
 - 3. Change-up




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Curveball

- Less stress when properly thrown
- Higher risk of poor mechanics?




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Curveball

- Systematic Review – Sports Health 2015, Grantham, et al.
- 5 epidemiologic studies
 - 3 showed no correlation between age of / number of curveballs and shoulder and elbow injuries
 - 1 showed 52% increased risk of shoulder pain in youth that throw curveballs (may be confounders)
 - 1 showed 67% of UCL reconstruction patients reported throwing curveball before age 14 (no control)



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USA Baseball Recommendations

- No curveballs until age 14 (approximate age growth plates close)
- Remains controversial



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Pitch Counts

- Restrictions on pitch counts and mandated rest period proven to lower risk of injury



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Little League Regulations

7-8 years	50 pitches / day
9-10 years	75 pitches / day
11-12 years	85 pitches / day
13-16 years	95 pitches / day
17-18 years	105 pitches / day



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Little League Regulations

14 years and younger

66 or more pitches	4 days rest
51-65 pitches	3 days rest
36-50 pitches	2 days rest
21-35 pitches	1 day rest
1-20 pitches	0 days rest

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USA Baseball Medical and Safety

Advisory Committee

Table 2. USA Baseball Medical & Safety Advisory Committee recommendations for limits with youth pitchers (modified with permission).^{20, 21}

Age in years	Pitches/ Game	Pitches/ Week	Pitches/ Season	Pitches/ Year
9-10	50	75	1000	2000
11-12	75	100	1000	3000
13-14	75	125	1000	3000
15-16	90	2 games/ week		
17-18	105	2 games/ week		

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USA Baseball Injury Prevention Recommendations



1. Pitch count guidelines
2. Pitcher should not return to the mound once removed
3. Develop proper pitching mechanics as early as possible
4. Do not throw breaking pitches until puberty

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USA Baseball Injury Prevention Recommendations



5. Pitchers should not play for more than one team / season
6. A pitcher should not play baseball (or other overhead sport) at least 3 months / year



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Additional ASMI Position Statement



- No competitive pitching 4 months/year
- No > 100 innings pitched in calendar year
- Avoid radar guns
- Avoid showcases
- Pitchers should not also be catchers



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Impact of Fatigue on Baseball Pitching Mechanics in Adolescent Male Pitchers- Arthroscopy May 2016, Erickson, et al.



- Simulated game, high def video analysis
- Began to show signs of fatigue by pitch 30, all had fatigue by pitch 90
- As pitch count increased
 - More reported fatigue, more arm pain, lower velocity
- Upper extremity kinematics unchanged
- Lower extremity:
 - Increased knee flexion at ball release
 - Hip to shoulder separation decreased
- Conclusion: emphasize core and lower extremity strength and endurance



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Avoiding Injury



AVOID FATIGUE / OVERUSE

- Pitch counts
- Coaches and parents should know the signs
- Proper conditioning and rest

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Coaches / Parents



- Be alert for signs of fatigue
 - Loss of velocity
 - Loss of control / command
 - Change in mechanics
 - Upright trunk
 - Dropped elbow
 - Increased knee flexion
 - Increased time between pitches



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Proper Mechanics



- Subjective – difficult to prove
- Andrews – “proven that similar mechanics are used by successful pitchers, no matter the age or skill level.”



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Great Mechanics – Nolan Ryan



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Poor Mechanics – Subtle Difference



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