

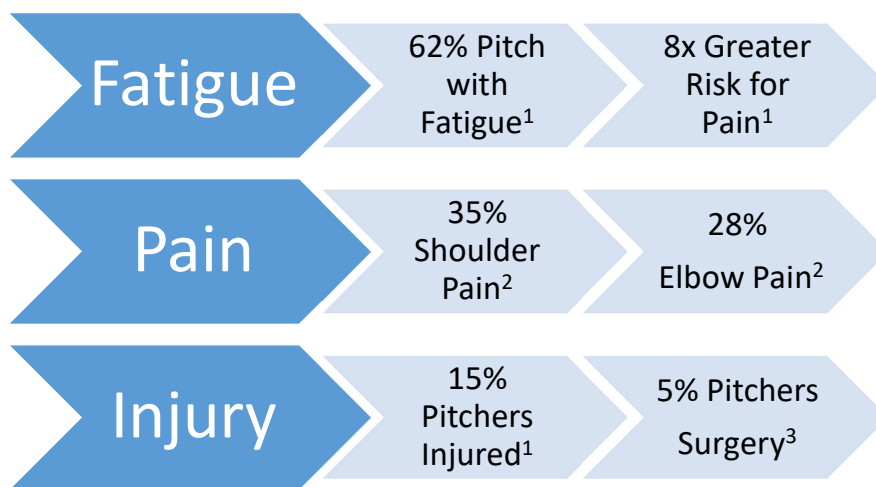
Youth Pitching Injuries: Keys to Reducing Risk



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Youth (Ages 9-14) Pitching Injuries



32% of Pitchers 13 to 16 years old admit to pitching through arm pain⁴

Little League Shoulder

- Irritation, inflammation, widening of growth plate
- Ages 11 to 16
- Caused by overuse
 - Fatigue precedes pain in upper arm
- Treatment
 - No throwing min. 1 month
 - Strengthening program
 - Interval throwing program before return to play



Little League Elbow

- Irritation, inflammation, widening of growth plate
- Ages 9 to 13
- Caused by overuse
 - Fatigue precedes pain inner elbow
- Treatment similar to Little League Shoulder
- 25% reoccur within 6 months



Coaches Can Be Part of the Problem or Solution?



- Who is at risk?
- Who is responsible?
- How can you reduce risk?



3 Factors Associated with Youth Pitching Injuries



Overuse



Mechanics



Velocity

Overuse is the #1 Problem

Variable	Increased Risk for Arm Pain
Pitching with arm fatigue ¹	8x
Specializing in Baseball ⁵	6.7x
Pitching ≥ 100 innings in 1 year ³	3.5x
Pitching > 600 pitches in 1 season ²	3x
Pitching > 75 pitches in 1 game ²	2.5x
Pitching back to back days ¹	2.5x
Pitching multiple leagues at once ²	2.4x
Pitching multiple games in 1 day ¹	1.9 x

Overuse is the #1 Problem

Other Variables Associated w/Arm Pain	Inconsistent or Conflicting Evidence
Pitching on a travel team ⁶	Curveballs before age 13 ^{2,3,6}
Pitching in showcases or tournaments ⁶	Playing catcher and pitcher ^{3, 6}
Private coaching or additional training ⁵	
Playing organized baseball > 8 months/year ⁵	
Pitching > 2 of every 4 Little League games ⁶	
Heavier pitchers (BMI) ²	
Older age ²	

Overuse is the #1 Problem

Recognizing Signs of Fatigue⁴

Decrease in velocity (more than accuracy)

Pitcher complains of feeling tired or visible signs (time between pitches, etc.)

Increased knee flexion (bend) at ball release (lower body fatigue)

Front shoulder "flying open" (trunk and core fatigue)

More upright upright (trunk and core fatigue)

Throwing elbow drops (arm fatigue)

*** Lower body and core fatigue before the arm**

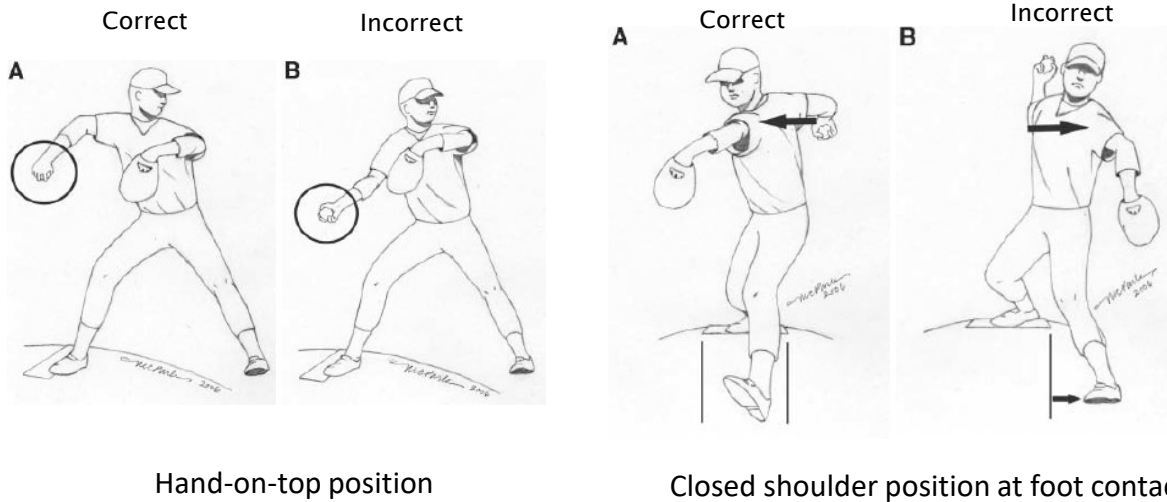
Pitching Mechanics: Arm Stress^{7,8}

Variables Associated with ↓ Arm Stress	Variables Associated with ↑ Arm Stress
Hand on top of ball in early arm cocking	Hand under ball in early arm cocking
"Closed shoulder" at front foot contact	"Flying open" at front foot contact



Pre-Peak Height Velocity (growth spurt) = best period to learn and acquire motor skills

Pitching Mechanics: Where to Start



Velocity⁹

- \uparrow Velocity = \uparrow Arm Stress = \uparrow Risk of Injury⁹
 - Every 10-mph \uparrow = 12% \uparrow risk of injury
- Age & Velocity¹⁰:
 - Each year = 1.5 mph \uparrow
- Height & Velocity¹⁰:
 - Each inch = 1.2 mph \uparrow
- Mechanics: \uparrow mph w/out \uparrow arm stress¹⁰
 - Hip-to-Shoulder Separation: 2.6 mph \uparrow
 - Stride length: 10% increase = 1.9 mph \uparrow



Youth Velocity Enhancement



- Arm Care Exercises
 - (4 weeks): 4% ↑ velocity¹¹
 - (In-Season) 9% ↑ velocity & Injury risk ↓ by 49%¹²
- Core training
 - (7 weeks): 4% ↑ velocity¹³
- Upper Body Plyometrics¹⁴
 - (6 weeks): 2% ↑ velocity
- Upper Body Resistance Training¹⁴
 - (6 weeks): 1.2% ↑ velocity
- Weighted Ball Training¹⁵
 - (6 weeks): 3.3 % ↑ velocity
 - 24% injured during subsequent season



Velocity: Danger Zones¹⁶



Table 2. Youth pitchers speed and distance: at-risk athletes.^a

Age (y)	Average		1 SD		2 SD		3 SD		4 SD		5 SD	
	mph	feet	mph	feet	mph	feet	mph	feet	mph	feet	mph	feet
8	40	95	43	109	47	123	50	137	54	151	57	165
9	43	105	47	124	51	142	55	159	59	167	63	185
10	46	123	50	140	54	157	58	174	62	174	66	191
11	48	135	52	157	56	175	60	195	64	215	68	235
12	50	141	55	166	60	191	65	216	70	241	75	266
13	54	164	59	188	64	212	69	236	74	261	79	286
14	60	196	66	225	72	254	78	283	84	312	90	341

^aReprinted with permission by Lippincott Williams and Wilkins.³ Three standard deviations (yellow), 26 athletes out of 10 000; 4 standard deviations (orange), 1 out of 100 000; 5 standard deviations (red), 1 out of 1 000 000.

Recommendations for Coaches

Recognize → Responsibility → Reduce Risk

1. Identify players at risk: multiple teams, year-round training, high velocity, bigger, older, previous injury, etc.
2. Initiate and keep open communication with player, parents, & other coaches about pitch counts, days rest, etc.
3. Watch for signs of fatigue in practice and games.
4. Emphasize basic throwing and pitching mechanics before players hit their growth spurt.
5. In general, most players benefit from throwing often (to a partner) and pitching (competitively) less.
6. Limit use of radar guns.
7. Warm-up before throwing. Never use throwing as a form of warm-up.
8. Gradually progress # pitches per game from early season to late season.
9. Don't rush velocity enhancement (slow cook vs. microwave).
10. Player is fatigued = rest and gradually return to pitching. Player reports pain = rest and medical evaluation.

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