

Position Statement

The Risks of Shoulder and Elbow Injury from Participation in Youth Baseball

This Position Statement was developed as an educational tool based on the opinion of the authors. It is not a product of a systematic review. Readers are encouraged to consider the information presented and reach their own conclusions.

The American Academy of Orthopaedic Surgeons (AAOS) believes that parents should be informed about the risks and injuries that may occur in youth baseball as a result of excessive throwing and strongly urges compliance with the recommendations for throwing restriction in youth baseball to minimize such injuries.

Approximately 6.4 million children and adolescents in the United States play baseball under the supervision of adult coaches, administrators and parents.¹ Most of these athletes play in school and club leagues. In a study of 754 youth pitchers, 13.2% stated they pitched in competitive baseball games over 8 of the past 12 months, while 5.7% reported pitching over 12 months.²

The popularity and intensity of baseball has resulted in hundreds of thousands of injuries each year—238,552 baseball injuries in 2019. It is estimated that there were 93,388 baseball-related injuries that required an emergency department visit, according to the U.S. Consumer Product Safety Commission.³ These are primarily overuse injuries—commonly tears or damage to the muscles, tendons, and joints—that can cause pain, lost play time, and, if not treated quickly and appropriately, arthritis, deformity and disability. The shoulder has been reported as one of the joints most frequently injured in baseball followed by the elbow.^{4, 5} Baseball pitchers are known to sustain the most severe injuries, and thus may lose the greatest number of days from practice or competition. Catchers often sustain similar injuries.

Adolescent injuries are particularly challenging, especially when they occur during or just after periods of rapid growth. For pitchers, especially players who are still growing, the repetitive throwing motion places extreme stress on shoulder, elbow, and surrounding tissues. The risks for these children and adolescents include pain, loss of motion and strength, damage to the growth centers of the shoulder and elbow, and other, possibly permanent, changes to the bones and surrounding tissues.

High pitching volume and limited recovery times also will lead to arm fatigue, placing young pitchers at a greater risk for elbow and shoulder problems and arm injuries. About three of every four youth baseball players have experienced arm pain while throwing, and four of every five have had arm pain the day after. The majority of youth baseball players (~65%) report that their arm pain has caused them to have less fun while playing.¹ Forty-Six percent reported at least once being encouraged to keep playing despite arm pain⁶

Youth pitchers also exhibit many risky behaviors associated with a greater likelihood of pitching with

arm tiredness and pain:

- 45 percent pitched in a league without pitch counts or limits
- 43.5 percent pitched on consecutive days
- 30.4 percent pitched on multiple teams with overlapping seasons
- 19 percent pitched in multiple games on the same day.⁷

Safe pitching guidelines—which focus on proper warm up exercises, limited play time and pitch counts, recommended rest periods, appropriate ages for learning various types of pitches, and not playing on multiple teams year round or on consecutive days—are being integrated into many of the nation’s 200,000 youth baseball teams with commitment from coaches, parents, caregivers, and parents.⁸ A study published in 2021, however, found that 83 percent of the parents and caregivers of youth baseball pitchers were not aware of safe pitching practices designed to prevent shoulder, elbow, and other overuse injuries; 53 percent stated that they did not actively participate in monitoring their child’s pitch count; and 17 percent were unaware of how many pitches their child threw in a typical game.⁹

The AAOS recommends the following safety guidelines to decrease the risk of injury to the upper extremity in the growing athlete who participates in youth baseball:

Players should follow the Little League Baseball “Regular Season Pitching Rules” (littleleague.org) pertaining to maximum pitches per game and rest period requirements¹⁰

Maximum Pitch Counts

| Age | Pitches/Game |
|--------------|---------------------|
| 7-8 | 50 |
| 9-10 | 75 |
| 11-12 | 85 |
| 13-16 | 95 |
| 17-18 | 105 |

Required Number of Rest Days between Days of Pitching (based on number of innings played)

| Ages 14 & under | Ages 15-16 | Required # of Rest days |
|----------------------------|-------------------|--------------------------------|
| 66+ | 76+ | 4 calendar days |
| 51-65 | 61-75 | 3 calendar days |
| 36-50 | 46-60 | 2 calendar days |
| 21-35 | 31-45 | 1 calendar day |
| 1-34 | 1-30 | None |

In addition:

- Players should avoid pitching on consecutive days.
- League participants should avoid playing baseball or softball year-round.
- Any persistent pain, loss of motion (especially extension), or documented X-ray abnormalities should disqualify a child from playing until these symptoms subside, and/or the

patient is cleared for play by a physician.

- Coaches and players in youth baseball should be taught proper throwing and pitching techniques. Skeletally immature players should only throw “fast ball” and “change up” pitches, and work on control; “breaking ball” or “curve ball” should not be initiated until after puberty.
- Coaches should educate players on the importance of and techniques for stretching and strengthening the upper extremity. Adequate time to warm up and stretch after play can help young players avoid throwing-arm pain. Pitchers and catchers younger than age 15 often experience tightness of a shoulder ligament known as the posterior-inferior glenohumeral ligament. If this ligament is not stretched, it will lead to pain or injury of the rotator cuff (the muscles around the shoulder) and/or the labrum (the lining of the shoulder joint) as a player ages and continues to play baseball.

References:

1. State of Play 2020. The Aspen Institute Project Play. Accessed November 12, 2021. <https://www.aspenprojectplay.org/state-of-play-2020/introduction><https://www.aspenprojectplay.org/state-of-play-2020/introduction>
2. Arm Pain in Youth Baseball Players: A Survey of Healthy Players. American Academy of Orthopaedic Surgeons 2015 Annual Meeting website: <http://www.abstractsonline.com/Plan/ViewAbstract.aspx?mID=3595&sKey=1497450c-3983-4b35-9033-e56166a401fa&cKey=f04b5c5f-9da3-4daf-9d64-49f6a62ef82d&mKey=31eb97e9-7ed4-4166-acfc-dbe541be7d75>. Accessed June 4, 2015.
3. U.S. Consumer Product Safety Commission, NEISS 2019 Data.
4. Trofa DP, Obana KK, Swindell HW, et al. Increasing Burden of Youth Baseball Elbow Injuries in US Emergency Departments. *Orthopaedic Journal of Sports Medicine*. 2019;7(5):2325967119845636. doi:10.1177/2325967119845636
5. Melugin HP, Leafblad ND, Camp CL, Conte S. Injury Prevention in Baseball: from Youth to the Pros. *Curr Rev Musculoskelet Med*. 2018;11(1):26-34. doi:10.1007/s12178-018-9456-5
6. Makhni EC, Morrow ZS, Luchetti TJ, et al. Arm Pain in Youth Baseball Players: A Survey of Healthy Players. *Am J Sports Med*. 2015;43(1):41-46. doi:10.1177/0363546514555506
7. Yang G, Dugas J, Mann B, Irrgan J, Guettler J, Fleisig G: Risk-Prone Pitching Activities and Injuries in Youth Baseball. *Am J Sports Med*. 2014; 42 (6): 1456-1463.
8. History of Little League. Little League. Accessed November 16, 2021. <https://www.littleleague.org/who-we-are/history/>
9. Reintgen C, Zeppieri Jr G, Bruner M, et al. Youth Baseball Caregiver Understanding of Safe Pitching Guidelines and Player Injury. *Int J Sports Phys Ther*. 2021;16(3):807-815. doi:10.26603/001c.22532
10. Little League. Regular Season Pitching Rules. Accessed November 16, 2021. <https://www.littleleague.org/playing-rules/pitch-count/>
11. Makhni EC, Morrow ZS, Luchetti TJ, et al. Arm Pain in Youth Baseball Players: A Survey of Healthy Players. *Am J Sports Med*. 2015;43(1):41-46. doi: EC, Morrow ZS, Luchetti HYPERLINK "https://doi.org/10.1177/0363546514555506" TJ, et al. Arm Pain in Youth Baseball Players: A Survey of Healthy Players. *Am J Sports Med*. 2015;43(1):41-46. doi:10.1177/0363546514555506
12. Sports Tips: Baseball Injuries. STOP (Sports Trauma and Overuse Prevention) Sports Injuries: Keeping Kids in the Game for Life website: <http://www.stopsportsinjuries.org/baseball-injury-prevention.aspx> Accessed June 3, 2015.
13. History of Little League. Little League. Accessed November 16, 2021. <https://www.littleleague.org/who-we-are/history/>
14. Reintgen C, Zeppieri Jr G, Bruner M, et al. Youth Baseball Caregiver Understanding of Safe Pitching Guidelines and Player Injury. *Int J Sports Phys Ther*. 2021;16(3):807-815.

doi:10.26603/001c.22532

15. Little League. Regular Season Pitching Rules. Accessed November 16, 2021.
<https://www.littleleague.org/playing-rules/pitch-count/>

©May 1997 American Academy of Orthopaedic Surgeons®. Revised June 2005, September 2010, September 2015 and January 2022

This material may not be modified without the express written permission of the American Academy of Orthopaedic Surgeons.

Position Statement 1145

For additional information, contact the Marketing, Communications and Membership Team at 847-384-4036.