

Pitching Safety in Palo Alto Little League

Introduction

The Palo Alto Little League Board, in conjunction with Little League® International, is continually looking at means of making youth baseball safer and more enjoyable for the children. One area worthy of special attention is pitching, which applies to players in PCL (Little League Minors), Little League (Majors), Juniors and Seniors Divisions.

Little League International has always taken pitch limitations seriously. That is why players may only pitch so many innings per week, with prescribed rest periods. Little League International and Palo Alto Little League are currently evaluating methods of feasibly controlling pitch counts.

This document is intended to help managers, coaches, and parents of pitchers become more informed about pitching safety, particularly regarding arm injuries. Palo Alto Little League Board has collected information on pitch limits; particularly limiting the number of pitches thrown in a game, rest between games and pitches thrown during a season. Additional information on this topic can be found <http://www.pabaseball.org/info/safety.html>

What are the Main Concerns?

In general, serious injuries in Little League are relatively rare. Experts have expressed two main concerns having to do with a child's physical development, particularly arm strength. Specifically:

- Over-pitching (i.e., pitching too much or too often) may cause injury. Based on epidemiological studies and research on stresses caused by pitching mechanics, USA Baseball recommends, among other things, that 9-10 year old players throw no more than 50 pitches per game and 75 per week.
- Throwing breaking balls at too early an age may damage a child's arm. For example, James Andrews, MD, chairman and medical director for the American Sports Medicine Institute says, "The general rule is, they shouldn't throw a curve ball until they shave."

In short, players who throw too many pitches during a game or a season, or pitch without enough rest may injure their throwing arm, perhaps permanently. Unfortunately, it is difficult to assess how much pitching is "too much."

What's the Medical Research Say?

A significant amount of research has been conducted on the mechanics of pitching and the stresses on the body. This research has been combined with epidemiological data (i.e., data collected from a significant number of players) as reported in the article *Young Pitchers at Risk for Serious Injuries*, which can be found in the Appendix or at http://graphics.fansonly.com/photos/schools/usab/genrel/auto_pdf/pitching-risk.pdf¹

¹ Also, see the Appendix for a list of documents, web sites and medical abstracts for further background.

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Some of these recommendations in this paper include:²

- Limit pitches during a game, week, season and year.
- Delay breaking balls until bones have developed appropriately (13-15)
- Listen to pain
- Pitch in only one league
- Don't participate in Showcases
- Don't emulate professional pitchers
- Don't return to the mound after being removed.

Other Considerations

As part of this discussion, some people with considerable experience with youth baseball expressed alternate points of view. They made the following points:

- Every child is different. Some managers claim to understand the limits of individual players and establish pitching limits accordingly.
- Kids will throw curve balls regardless of limits placed within Little League. Improper technique can more seriously injure a player than proper form. It is therefore best to teach proper technique to each player so that those inevitable curve balls will be less injurious.

What are the International Little League Rules?³

Little League already limits pitching with the intent of protecting children. The current rules, such as Rule VI(b), limit the number of innings a player may pitch in a game and mandates rest periods.

However, these rules may fall short of truly protecting pitchers. For example, they do not limit the number of pitches thrown in an inning, and they do not limit the number pitches thrown during a game. Also, they do not account for pitches thrown outside of Little League.

Little League International is considering a rule change that would limit pitches, rather than innings, thrown. This was tested in a limited pilot during the 2005 season. The pilot is now being expanded for the 2006 season. See the program announcement at <http://www.littleleague.org/media/pitchcountpilot.asp> and the draft rule change at http://www.littleleague.org/media/Pitch_Count_Regulation_06.pdf.

Palo Alto Little League Board Action

In July 2005, the PALL Board adopted the recommendations summarized above, with the intention of implementing them in 2006. The Board is now reviewing implementation issues and waiting for clarification from Little League International about adopting an official pitch count program.

² Many of the recommendations are derived from Lyman S, Fleisig GS, Andrews JR, Osinski ED. "Effect of pitch type, pitch count, and pitching mechanics on risk of elbow and shoulder pain in youth baseball pitchers." *The American Journal of Sports Medicine* 30(4):463-468, 2002

³ For current rules on pitching see *Official Regulations and Playing Rules (green rule book)*, "Rule VI – Pitchers."

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How to Learn More

Updated information can be found on the Palo Alto Little League home page at <http://www.pabaseball.org>, where you can also sign up for the PALL e-newsletter.

For more information on these and other safety issues, see <http://www.pabaseball.org/info/safety.html>.

See APPENDIX 1 for Documents and Web Sites

See APPENDIX 2 for American Journal for Sports Medicine Abstracts

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APPENDIX 1: Documents and Web Sites

Key research and recommendations

ASMI Recommendation: [http--www.asmi.org-SportsMed-youth-PITCHCNT.PDF](http://www.asmi.org-SportsMed-youth-PITCHCNT.PDF)

One of the source articles: [Effect of Pitch Type, Pitch Count, and Pitching Mechanics on Risk of Elbow and Shoulder Pain in Youth Baseball Pitchers -- Lyma](http://ajs.sagepub.com/cgi/content/abstract/30/4/463?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=pitch+count&searchid=1121403454301_4557&stored_se arch=&FIRSTINDEX=0&sortspec=relevance&journalcode=amjsports)
http://ajs.sagepub.com/cgi/content/abstract/30/4/463?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=pitch+count&searchid=1121403454301_4557&stored_se arch=&FIRSTINDEX=0&sortspec=relevance&journalcode=amjsports
<http://darkwing.uoregon.edu/~jchien/04.pdf>

USA Baseball Recommendation (based on ASMI research and other sources):
http://www.collegesports.com/auto_pdf/p_hotos/s_chools/usab/genrel/auto_pdf/pitching-risk

USA Baseball Medical Safety Site (other interesting articles):
<http://www.usabaseball.com/ot/usab-med-safety-list.html>

Contemporary Pediatrics - Don't let Little League shoulder or elbow sideline your patient permanently
<http://www.contemporarypediatrics.com/contpeds/article/articleDetail.jsp?id=125488>

Adolescent Sports Injuries (includes good references) [http--www.sportsmed.org-secure-reveal-admin-uploads-documents-SMU2003MayJun.pdf](http://www.sportsmed.org-secure-reveal-admin-uploads-documents-SMU2003MayJun.pdf)

Little League Pitch Count Pilot Program for 2005 season

Little League Pitch Count Pilot Program:
<http://www.rnllbaseball.org/PDFs/PitchCountInstructions.pdf>

The following are other articles based on the same research:

American Amateur Baseball Congress: http://www.aabc.us/ksm_xml_art23.asp

QC Baseball http://www.qcbaseball.com/philosophy/pitch_count1.aspx

Coaches' Corner (a variety of references)
<http://www.rnllbaseball.org/Pages/CoachCornerPage.htm>

CBS News Injury Epidemic In Youth Baseball June 28, 2005 163001
<http://www.cbsnews.com/stories/2005/06/23/eveningnews/main703839.shtml>

More extensive bibliography from National Institute of Health (actually a search):
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Link&db=PubMed&dbFrom=PubMed&from_uid=12130397

General Statement about baseball injuries

The Physician and Sportsmedicine Injuries in Little League Baseball From 1987 Through 1996 http://www.physsportsmed.com/issues/2001/07_01/mueller.htm

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APPENDIX 2: American Journal for Sports Medicine Abstracts

- David Wei Hang, Chien Ming Chao, and Yi-Shiong Hang
A Clinical and Roentgenographic Study of Little League Elbow
Am J Sports Med 32: 79-84.
- ↓ William G. Carson, Jr, and Seth I. Gasser
Little Leaguer's Shoulder: A Report of 23 Cases
Am J Sports Med 26: 575-580.
- ↓ E. Lyle Cain, Jr., Jeffrey R. Dugas, Robert S. Wolf, and James R. Andrews
Elbow Injuries in Throwing Athletes: A Current Concepts Review
Am J Sports Med 31: 621-635.
- ↓ Keith Meister
Injuries to the Shoulder in the Throwing Athlete: Part Two: Evaluation/Treatment
Am J Sports Med 28: 587-601.
- ↓ Stephen Lyman, Glenn S. Fleisig, James R. Andrews, and E. David Osinski
Effect of Pitch Type, Pitch Count, and Pitching Mechanics on Risk of Elbow and Shoulder Pain in Youth Baseball Pitchers
Am J Sports Med 30: 463-468.
- ↓ Keith Meister
Injuries to the Shoulder in the Throwing Athlete: Part One: Biomechanics/Pathophysiology/Classification of Injury
Am J Sports Med 28: 265-275.
- ↓ Steven M. Kane, Hugh O. House, and Kristi A. Overgaard
Head-First Versus Feet-First Sliding: A Comparison of Speed from Base to Base
Am J Sports Med 30: 834-836.
- ↓ Todd C. Battaglia, Michelle A. Barr, and David R. Diduch
Rotator Cuff Tear in a 13-Year-Old Baseball Player: A Case Report
Am J Sports Med 31: 779-782.
- ↓ ME Allen
Stress fracture of the humerus. A case study
Am J Sports Med 12: 244-245.
- ↓ RL Larson, KM Singer, R Bergstrom, and S Thomas
Little League survey: the Eugene study
Am J Sports Med 4: 201-209.
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Abstract 1 of 10  *The American Journal of Sports Medicine* 32:79-84 (2004)

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A Clinical and Roentgenographic Study of Little League Elbow

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Background: Comparisons of medial elbow injury rate and the incidence of clinical and radiographic findings among Little League baseball players have not been documented.

Hypothesis: Injury rate and clinical and radiographic findings in Little Leaguers of different positions may be similar.

Study Design: Survey and retrospective review.


Methods: Altogether, 343 Little Leaguers (120 pitchers, 40 catchers, and 183 fielders) participated in the study. The survey (including age, playing position, playing experience, and symptoms), clinical examination, and roentgenogram of both elbows were obtained for analysis using Pearson's chi-square test.

Results: Clinically, 58% of the pitchers presented with soreness compared to 63% in catchers and 47% in fielders. Radiographic examination revealed hypertrophy of the medial humeral epicondyle in all pitchers and catchers and 90% of the fielders. Separation of the medial epicondyle was found in 63% of pitchers, 70% of catchers, and 50% of fielders, while fragmentation was found in 19% of pitchers, 40% of catchers, and 15% of fielders. In subjects with separation or fragmentation, 49% and 56% complained of elbow soreness, respectively.

Conclusion: Similar rates of medial elbow changes in Little Leaguers may imply that the roentgenological changes of the medial epicondyle could be an adaptive yet physiological reaction to the excessive valgus stress of throwing. The higher incidence of medial epicondylar separation and fragmentation in catchers that has not been reported before may be secondary to the increased stress placed on the elbow when throwing from the squatting position.

Key Words: elbow • pitching • adolescent • Little League

[\[Full Text of Hang et al.\]](#) [\[Reprint \(PDF\) Version of Hang et al.\]](#)

Abstract 2 of 10  *The American Journal of Sports Medicine* 26:575-580 (1998)

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Little Leaguer's Shoulder

A Report of 23 Cases

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Presented at the 23rd annual meeting of the AOSSM, Sun Valley, Idaho, June 1997.

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Twenty-three cases of Little Leaguer's shoulder were reviewed including the history and physical examination findings, as well as bilateral internal and external rotation anteroposterior comparison radiographs of the proximal humerus. The average follow-up was 9.6 months (range, 1.5 to 54), and all patients were observed until they had either returned to baseball or their symptoms had resolved. The average age of the patients in this series was 14 years. The chief complaint in all patients was pain localizing to the proximal humerus during the act of throwing. The average duration of symptoms was 7.7 months. Nineteen patients (83%) were pitchers. Physical examination revealed tenderness to palpation over the proximal humerus in 20 patients (87%), with 16 (70%) demonstrating specific tenderness over the lateral aspect of the proximal humerus. Swelling, weakness, atrophy, and loss of motion were uncommon findings. All 23 patients demonstrated radiographic widening of the proximal humeral physis of the throwing arm on internal and external rotation comparison anteroposterior radiographs of the shoulder. All patients were treated with rest from baseball throwing for an average of 3 months. Twenty-one of the 23 patients (91%) returned to playing baseball and were asymptomatic. The classic radiographic finding of widening of the proximal humeral physis can easily be seen on bilateral anteroposterior internal and external rotation radiographs of the proximal humerus. Rest from throwing for at least 3 months is recommended, followed by a gradual return to throwing in an asymptomatic shoulder.

[\[Full Text of Carson and Gasser\]](#) [\[Reprint \(PDF\) Version of Carson and Gasser\]](#)

Abstract 3 of 10  *The American Journal of Sports Medicine* 31:621-635 (2003)

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Current Concepts

Elbow Injuries in Throwing Athletes

A Current Concepts Review

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Repetitive overhead throwing imparts high valgus and extension loads to the athlete's elbow, often leading to either acute or chronic injury or progressive structural change. Tensile force is applied to the medial stabilizing structures with compression on the lateral compartment and shear stress posteriorly. Common injuries encountered in the throwing elbow include ulnar collateral ligament tears, ulnar neuritis, flexor-pronator muscle strain or tendinitis, medial epicondyle apophysitis or avulsion, valgus extension overload syndrome with olecranon osteophytes, olecranon stress fractures, osteochondritis dissecans of the capitellum, and loose bodies. Knowledge of the anatomy and function of the elbow complex, along with an understanding of throwing biomechanics, is imperative

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to properly diagnose and treat the throwing athlete. Recent advantages in arthroscopic surgical techniques and ligament reconstruction in the elbow have improved the prognosis for return to competition for the highly motivated athlete. However, continued overhead throwing often results in subsequent injury and symptom recurrence in the competitive athlete.

[\[Full Text of Cain et al.\]](#) [\[Reprint \(PDF\) Version of Cain et al.\]](#)

Abstract 4 of 10  *The American Journal of Sports Medicine* 28:587-601 (2000)
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Current Concepts

Injuries to the Shoulder in the Throwing Athlete

Part Two: Evaluation/Treatment

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In part one of this three-part series (March/April 2000), I concentrated on summarizing the biomechanics of the normal throwing shoulder and the pathophysiology of injury. A classification of injury was presented that was based on the principles contained in that article. Part two of this series will focus on the evaluation and treatment of injuries, expanded from an understanding of the principles learned in part one. The ability to perform a skillful examination, and thus develop an accurate diagnosis, is the foundation for treatment. Fortunately, many difficulties encountered in a thrower's shoulder can be treated with a nonoperative approach. However, in instances where conservative measures fail, an improved understanding of the pathophysiology of injury and the development of improved surgical techniques are leading to more accurate diagnoses and more successful rates of return of the athlete to a pre-morbid level of activity.

[\[Full Text of Meister\]](#) [\[Reprint \(PDF\) Version of Meister\]](#)

Abstract 5 of 10  *The American Journal of Sports Medicine* 30:463-468 (2002)
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Effect of Pitch Type, Pitch Count, and Pitching Mechanics on Risk of Elbow and Shoulder Pain in Youth Baseball Pitchers

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Background: Joint pain is thought to be an early sign of injury to a pitcher.

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Objective: To evaluate the association between pitch counts, pitch types, and pitching mechanics and shoulder and elbow pain in young pitchers.

Study Design: Prospective cohort study.

Methods: Four hundred and seventy-six young (ages 9 to 14 years) baseball pitchers were followed for one season. Data were collected from pre- and postseason questionnaires, injury and performance interviews after each game, pitch count logs, and video analysis of pitching mechanics. Generalized estimating equations and logistic regression analysis were used.

Results: Half of the subjects experienced elbow or shoulder pain during the season. The curveball was associated with a 52% increased risk of shoulder pain and the slider was associated with an 86% increased risk of elbow pain. There was a significant association between the number of pitches thrown in a game and during the season and the rate of elbow pain and shoulder pain.

Conclusions: Pitchers in this age group should be cautioned about throwing breaking pitches (curveballs and sliders) because of the increased risk of elbow and shoulder pain. Limitations on pitches thrown in a game and in a season can also reduce the risk of pain. Further evaluation of pain and pitching mechanics is necessary.

[\[Full Text of Lyman et al.\]](#) [\[Reprint \(PDF\) Version of Lyman et al.\]](#)

Abstract 6 of 10  *The American Journal of Sports Medicine* 28:265-275 (2000)

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Current Concepts

Injuries to the Shoulder in the Throwing Athlete

Part One: Biomechanics/Pathophysiology/Classification of Injury

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Over the last decade, significant advances have been made in the study and understanding of shoulder mechanics. Much of this may be attributed to the use of more sophisticated technology to improve our ability to assess the shoulder in real-time athletics. As a consequence of these advances, our understanding of the pathophysiology of injury has also increased. Our manual examination skills have improved and our noninvasive diagnostic techniques have advanced greatly. New insight into forces at play during actions as complex as the throwing motion has allowed us to develop better protocols for the prevention and treatment of the most common injuries. Additionally, paralleling improvements in the understanding of shoulder kinematics and the pathophysiology of injury, advances in surgical techniques, particularly arthroscopy, have aided in the diagnosis of and the development of less invasive surgical treatments for injuries that do not respond to nonoperative measures. Undoubtedly, an up-to-date understanding of the developments in shoulder biomechanics, pathophysiology of injury, diagnostic

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techniques, and surgical management is necessary for the clinician who wishes to continue to apply proper skills in the sports medicine setting.

[\[Full Text of Meister\]](#) [\[Reprint \(PDF\) Version of Meister\]](#)

Abstract 7 of 10  *The American Journal of Sports Medicine* 30:834-836 (2002)

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Head-First Versus Feet-First Sliding: A Comparison of Speed from Base to Base

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Background: Two basic baseball sliding techniques, feet-first and head-first, are taught at all levels of play. Because of the risk for injury to the upper extremities and the cervical spine during head-first sliding, it is potentially more dangerous than feet-first sliding. There is an assumption among coaches that head-first sliding is more aggressive and faster, but there has been no scientific study to prove this claim.

Purpose: The purpose of this study was to determine which technique provides a faster slide into the base.

Study Design: Controlled field study.

Methods: A total of 60 players ranging from Little League to college level was analyzed. Each athlete was evaluated three times from a standing start at first base to either a head-first or feet-first touch of second base. Each athlete was also timed in a 40-yard sprint and his or her preferred sliding technique was recorded.

Results: We found no statistically significant difference in speed between head-first and feet-first sliding at all levels of play in this study.

[\[Full Text of Kane et al.\]](#) [\[Reprint \(PDF\) Version of Kane et al.\]](#)

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[\[Full Text of Battaglia et al.\]](#) [\[Reprint \(PDF\) Version of Battaglia et al.\]](#)

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JOURNAL ARTICLES

Stress fracture of the humerus. A case study

ME Allen

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A 13-year-old male Little League pitcher sustained a displaced spiral fracture of the right midhumerus while in midpitch. Deep ache prodrome symptoms in the midhumerus at rest and during pitching occurred during the preceding week, suggestive of a stress fracture that later completed to an overt fracture during the added stress of a forceful side-arm curve ball pitch, his specialty. Osteonal remodeling in stress fractures is discussed.

Abstract 10 of 10

American Journal of Sports Medicine, Vol 4, Issue 5 201-209, Copyright © 1976 by American Orthopaedic Society for Sports Medicine

JOURNAL ARTICLES

Little League survey: the Eugene study

RL Larson, KM Singer, R Bergstrom and S Thomas

In a clinical and radiographic survey of the elbows of 120 pitchers ages 11 and 12, 20% were found to have symptoms, 10% flexion contractures, and 23% roentgenographic changes related to traction stresses on the medial side of the elbow. Five per cent had more serious lateral compression findings related to the radial head or capitellum, but none of these had symptoms. Although this represents a definite incidence of abnormal occurrence, there were no statistically significant correlations or interrelations found relating to pitching experience, valgus elbow deformities, symptoms, flexion contractures, or x-ray findings.