

The Rising Fastball

The Newsletter of SABR's Science and Baseball Research Committee



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Greetings from the Chair

The Convention in Cincy was a great deal of fun, and science-related content continues to be well-received. Looking ahead to next year in Toronto, there are two potential panel discussions in the early stages of development, one on the Physics of the Homerun ball, and one on Injury prevention. There has been no commitment from the convention organizers as yet – a perennial issue is how to squeeze in panels. In order to gain the podium time we need to give them a proposal too good to refuse. I think that both of these can qualify. I strongly encourage committee members to submit research presentations or posters independently and believe we can have a strong presence.

Volunteers are needed for the following:

1. **Newsletter editor.** I have begun a pre-doctoral internship (conceptually similar to a medical residency although not as demanding; for example, no 24 hour shifts). Consequently I am interested in someone taking over the newsletter, at least on an interim basis for the next year or so.

2. **Webmaster.** I have been impressed by the quality of the Business of Baseball site, and see this as a model for a Science site separate from Yahoo. Is there a volunteer to develop and maintain a webpage?

3. **The Baseball Index.** We really should be entering science citations (such as those in the newsletter) into the Index. A person with limited computer skills can enter a citation on the TBI site in a minute or two. As a major goal of the committee is to capture and disseminate knowledge, this is something we should really be doing. If anyone has fifteen minutes to help out, please let me know.

4. **Articles:** No original submissions this issue. If anyone has something they can contribute, or has a topic they would like to see discussed at greater length, please get in touch.

Ken

Ken Heard (ekenheard@yahoo.com)

Research Briefs

(From PubMed)

Rehabilitation of the thrower's elbow.

Wilk KE, Reinold MM, Andrews JR.

Clin Sports Med. 2004 Oct;23(4):765-801.

The elbow joint is frequently injured in the overhead athlete, due to the large amount of forces in throwing. Injuries often occur due to repetitive microtrauma, especially in pitching. Rehabilitation following injury or surgery is vital to fully restore normal elbow function and return the

athlete to competition as quickly and safely as possible. Elbow rehabilitation must follow a progressive and sequential order to ensure that healing tissues have not been compromised. Emphasis is on restoring full motion, muscular strength, and neuromuscular control, and gradually applying loads to healing tissue. This article provides an overview of a multiphased rehabilitation program for the thrower's elbow. Rehabilitation for specific nonoperative and postoperative pathologies often observed in the throwing athlete is also discussed.

Biomechanics of the elbow in sports.

Loftice J, Fleisig GS, Zheng N, Andrews JR.

Clin Sports Med. 2004 Oct;23(4):519-30.

In throwing activities, the elbow is sometimes stressed to its biomechanical limits. In this article, forces, torques, angular velocities, and muscle activity about the elbow are reviewed for the baseball pitch, the football pass, the javelin throw, the windmill softball pitch, the tennis serve, and the golf swing. The elbow goes through rapid extension in baseball pitching (about 2400 degrees /s) and rapid flexion in the javelin throw (about 190000b0 degrees /s). During baseball pitching, the elbow joint is subject to a valgus torque reaching 64 Nm, and requires proximal forces as high as 1000 N to prevent elbow distraction. The ulnar collateral ligament (UCL) rupture in baseball pitching, lateral epicondylitis in the tennis backhand, and other injury mechanisms are also discussed.

Craniofacial fractures during recreational baseball and softball.

Bak MJ, Doerr TD.

J Oral Maxillofac Surg. 2004 Oct;62(10):1209-12.

Baseball and softball are leading causes of sports-related facial trauma in the United States. We review our institutional experience (Strong

Memorial Hospital, Rochester, NY) with these injuries and discuss measures to reduce their incidence. We review our institutions experience with facial fractures sustained during the course of a softball or baseball game over a 12-year period. With 68% of the injuries resulting from a ball impact, we endorse the recommendations of the Consumer Product Safety Commission for the use of low-impact National Operating Committee on Standards for Athletic Equipment-approved baseballs and softballs for youth and recreational leagues.

Shoulder MR Arthrography: Which Patient Group Benefits Most?

Magee T, Williams D, Mani N.

AJR Am J Roentgenol. 2004 Oct;183(4):969-74.

We sought to compare the diagnostic accuracy of conventional MRI versus MR arthrography of the shoulder in the assessment of high-performance athletes (professional baseball players) and to compare our findings in these patients with the conventional MRI and MR arthrographic findings in an age-matched control group of nonprofessional athletes. MR arthrography is considerably more sensitive for detection of partial-thickness supraspinatus tears and labral tears than conventional MRI. MR arthrography showed injuries in addition to those seen on conventional MRI in 14 of 20 patients in the high-performance athlete group. These results suggest high-performance athletes may be a subgroup of patients for whom MR arthrography yields considerably more diagnostic information than conventional MRI.

Physiologic changes and range-of-motion differences in the dominant shoulders of skeletally immature baseball players.

Mair SD, Uhl TL, Robbe RG, Brindle KA.

J Shoulder Elbow Surg. 2004 Sep-Oct;13(5):487-91.

The purpose of this study was to document range-of-motion differences and radiographic changes in the dominant shoulder of skeletally immature throwers and to determine how pain associated with throwing may relate to these changes.

The relationship between balance and pitching error in college baseball pitchers.

Marsh DW, Richard LA, Williams LA, Lynch KJ.

J Strength Cond Res. 2004 Aug;18(3):441-6.

The objective of the study was to examine the relationship between balance and pitching error in college baseball pitchers. Balance ability, expressed as average sway velocity (deg.s(-1)), during dominant leg unilateral stance with eyes open and eyes closed was quantified for each subject utilizing the Balance Master System 7.04 (long force plate). Additionally, each subject underwent sensory organization testing on the SMART EquiTest System providing information regarding the effective use of the somatosensory, visual, and vestibular inputs. Pitching error was assessed with a high-speed video camera recorder during spring practice. A JUGS radar gun measured pitch velocity. A significant negative correlation was demonstrated between sensory organization test 5 and pitching error ($r = -0.50$; $p = 0.05$) and between sensory organization test 5/1 and pitching error ($r = -0.50$; $p = 0.05$). Additionally, unilateral stance eyes closed demonstrated a positive correlation with pitch velocity ($r = 0.52$; $p = 0.04$). The results reveal that low levels of vestibular input utilization may lead to high levels of pitching error in college baseball pitchers.

Ergogenic AIDS: a review of basic science, performance, side effects, and status in sports.

Tokish JM, Kocher MS, Hawkins RJ.

Am J Sports Med. 2004 Sep;32(6):1543-53US

The use of drugs and supplements to enhance performance has become a part of mainstream athletics. Many team physicians and sports medicine practitioners are unfamiliar with the benefits and risks of these products and thus are unable to educate young athletes on this topic. In spite of numerous reports on the health risks of anabolic steroid use, 1 to 3 million Americans have used them. Human growth hormone has been tried by up to 5% of 10th graders, although no scientific study has shown that it is an effective performance-enhancing drug. Amphetamines and similar compounds may be the most widely abused drug in baseball; recently, they have come under increased scrutiny in sport. Erythropoietin is a highly effective aerobic enhancer that has been linked to multiple deaths in cyclists and other endurance athletes. The nutraceutical industry, led by supplements such as creatine, ephedra, and androstenedione, remains unregulated by the Food and Drug Administration and has serious issues with quality and side effects. An understanding of these products is essential for the sports medicine practitioner to provide sound, safe advice to the athlete.

Isokinetic performance at diagonal pattern and shoulder mobility in elite overhead athletes.

Baltaci G, Tunay VB.

Scand J Med Sci Sports. 2004 Aug;14(4):231-8.

The purpose of this study was to measure isokinetically glenohumeral joint movement peak torque and work in professional basketball, volleyball, handball and baseball players and

determine whether significant differences exist between the dominant and non-dominant extremity in athletes and controls. The results of this study are important for the application and interpretation of isokinetic data and flexibility and mobility characteristics on unilaterally dominant overhead athletes. Functional weakness in external rotators, mobility impairments in IR and muscle imbalance have been shown in the dominant arm of these overhead athletes.

Catastrophic injuries in high school and college baseball players.

Boden BP, Tacchetti R, Mueller FO.

Am J Sports Med. 2004 Jul-Aug;32(5):1189-96.
Epub 2004 May 18.

There are few epidemiologic studies of catastrophic baseball injuries. To develop a profile of catastrophic injuries in baseball players and to describe relevant risk factors, the authors reviewed 41 incidents of baseball injuries reported to the National Center for Catastrophic Sports Injury Research from 1982 until 2002. There were an estimated 1.95 direct catastrophic injuries per year, or 0.43 injuries per 100,000 participants. The most common mechanisms of injury were a collision of fielders (9) or of a base runner and a fielder (8), a pitcher hit by a batted ball (14), and an athlete hit by a thrown ball (4). Catastrophic injuries included 23 severe head injuries, 8 cervical injuries, 3 cases of commotio cordis, and 2 cases each of a collapsed trachea and facial fractures. Three athletes sustained a severe head injury and facial fractures. Ten of the 41 injuries were fatalities. Suggestions for reducing catastrophic injuries in baseball include teaching proper techniques to avoid fielding and baserunning collisions, protecting the pitcher via a combination of screens and/or helmets with faceguards, continued surveillance and modifications of the bat and ball, eliminating headfirst slides, and continued analysis of chest protectors and automatic external defibrillators for commotio cordis.

Ulnar collateral ligament reconstruction in high school baseball players: clinical results and injury risk factors.

Petty DH, Andrews JR, Fleisig GS, Cain EL.

Am J Sports Med. 2004 Jul-Aug;32(5):1158-64.
Epub 2004 May 18.

The incidence of ulnar collateral ligament injury has increased in baseball, especially at the high school level. Ulnar collateral ligament injury in high school baseball players is associated with overuse, high-velocity throwing, early throwing of breaking pitches, and improper warm-ups. Follow-up physical examination and questionnaire data were collected at an average of 35 months after ulnar collateral ligament reconstruction from 27 former high school baseball players. Six potential risk factors were evaluated: year-round throwing, seasonal overuse, event overuse, throwing velocity more than 80 mph, throwing breaking pitches before age 14, and inadequate warm-ups. Overall, 74% returned to baseball at the same or higher level. Patients averaged 3 potential risk factors, and 85% demonstrated at least one overuse category. The success rate of ulnar collateral ligament reconstruction in high school baseball players is nearly equal to that in more mature groups of throwers. Overuse of the throwing arm and throwing breaking pitches at an early age may be related to their injuries. Special attention should be paid to elite-level teenage pitchers who throw with high velocity.

A simple rule for controlling overarm throws to different targets.

Watts S, Pessotto I, Hore J.

Exp Brain Res. 2004 Jun 30 [Epub ahead of print]

We investigated the central programming of overarm throws by determining whether throws to spatially separate targets in the vertical direction

(sagittal plane) are produced by changes in hand (i.e., finger) path direction or by changes in the timing of ball release. Six skilled throwers made 30 throws at the same speed with a baseball, from a sitting position with the chest fixed, at targets at different heights and distances. Arm segment angular positions in 3D were recorded with the search-coil technique. Videotaping revealed that ball direction was not, as commonly assumed, the tangent to the finger path at ball release. Rather ball direction was the tangent to the finger path at a point about half way between initial uncoupling of the ball from the hand and final ball release. When viewed from the side, finger paths were tilted upwards for the high and the far targets and downwards for the low and near targets. This was associated with changes in angular orientation of the upper arm in space. Throwing at spatially different targets was not associated with changes in the timing of ball release. We propose that there is a simple rule by which throws to targets in different directions and at different distances are controlled: throws of the same speed are produced by different finger path directions, but the same timing of ball release. Such a mechanism would simplify the neural control of throwing to different targets.

SUGGESTED WEBSITES:

USA BASEBALL Medical & Safety Advisory: The Use of Creatine by Baseball Athletes - What is Creatine?

By Dr. Barry Goldberg, Director of Sports Medicine - Yale University & Chairman of the USA Baseball Medical & Safety Committee

Article and advisory on Creatine use.

http://www.usabaseball.com/pa_features.html

Baseball Bats.Net

This is a site devoted to the bat, and contains some short pieces on the development and history of the bat. The site contains a variety of commercial links. Caveat Emptor.

<http://www.baseball-bats.net/>

The Sports Engineering Research Group at the University of Sheffield.

SERG has been active since 1998, and conducts research projects that range from those asking fundamental questions about sports balls aerodynamics to collaborations with the sports industry seeking improved product performance. Director of the group is Dr Steve Haake, senior lecturer in mechanical engineering, technical consultant to the International Tennis Federation, and founder of the International Sports Engineering Association. SERG research is supported by the DTI, EU, EPSRC and from collaborations with sports companies (Adidas, Grays, Mitre), sports governing bodies (ITF, ECB), and elite sports organisations (UKSI, RYA, BCF, UK Athletics).

<http://www.shef.ac.uk/mecheng/sports/html/index.html>

TIBCO Software Inc. provides software that allows MLB Advanced Media to do real-time updating of MLB.com and the 30 individual clubs. A description of TIBCO's role is available at the following site under MLB Advanced Media.

http://www.tibco.com/customers/featured_communications_media.jsp