



PASIG MONTHLY CITATION BLAST: No.47

January 2010

Dear PASIG members:

We look forward to seeing you at Combined Sections Meeting in San Diego next month. We hope our members will attend all our PASIG business meeting (with continental breakfast) and programming, as well as support our members presenting their research. Below is a summary of PASIG activities and performing arts-related presentations at CSM. Poster information was not available at the time of this Blast. Stop by the Orthopaedic Section table for a handout of these PA-relevant topics or print this out.

Combined Sections Meeting, San Diego, 2010

Thursday, February 18

7:00 – 8:00 **Orthopaedic First Timers Breakfast**

EDUCATIONAL SESSIONS

- 10:30 – 12:15 **Hand Rehabilitation.** Nerve compression syndromes at the elbow.
- 10:30 – 2:00 **Orthopaedics.** ACL injury: A multidisciplinary approach to prevention, treatment, and assessment of outcomes in 2010.
- 2:30 – 3:45 **Hand Rehabilitation.** Anatomy and dysfunction of the DRUJ and TFCC.

Friday, February 19

EDUCATIONAL SESSIONS

- 8:00 – 10:45 **Sports.** Selected lower extremity injuries and the female athlete: The role of the hip and other epidemiological, screening, and treatment issues.
- 8:00 – 11:00 **Orthopaedics.** Factors that influence musculoskeletal pain: Fatigue, sex, personality, psychology, and genetics.
- 8:00 – 11:00 **Orthopaedics.** Examination and intervention strategies for overuse injuries of the foot and ankle.
- 1:00 – 4:00 **Orthopaedics.** Management of patients with sacroiliac joint region pain: What’s old, what’s new, what’s in, what’s out!

PLATFORMS

- 8:00 AM - 11:00 Orthopaedic Platform Presentations: Performing Arts, Occupational Health.
- 8:45 – 9:00 Responsiveness of the Lower Extremity Functional Scale (LEFS) in patients With Lower Extremity Musculoskeletal Dysfunction. AB Klein, PT, DPT, DSc, OCS.

- 9:00 – 9:15 Examining the Efficacy of Rehabilitation for Chronic Ankle Instability, an Item Analysis of the Foot and Ankle Disability Index Sport Subscale. NS Siegel, PT.
- 9:30 – 9:45 Lower Extremity Kinematics in the Presence of Achilles Tendinopathy During a Saut de Chat Performed by Elite Dancers. JK Loudon, PT, MS, PhD, SCS.
- 9:45 – 10:00 Movement System Impairment Examination and Treatment: Dancer With Acetabular Labral Tear. LCL Khoo-Summers, PT.
- 10:00 – 10:15 The Gymnastics Functional Measurement Tool: A Valid Way of Measuring Gymnastics Physical Abilities. MD Sleeper, PT, MS, OCS.
- 10:15 – 10:30 Pelvic and Hip Kinematics in Three Grand Battement Dance Movements. S Bronner, PT, PhD, OCS.

5:30 – 7:30 Orthopaedic Section Social Hour and Membership Meeting

7:30 – 9:30 Orthopaedic Section Awards Ceremony

Saturday, February 20

7:00 – 8:00 **PASIG Business Meeting** and breakfast.

8:00 – 11:00 **PASIG PROGRAMMING.**

Physical Therapy Management in Gymnastics: Spine, Shoulder, Wrist, Hand Injuries coupled with Stress and Eating Disorders. *A Performing Arts PT Challenge*

8:00 – 9:00 Introduction to pathology related to the sport of gymnastics: Epidemiology and evaluative screening. *Mark D. Sleeper, PT, MS, OCS*

9:00 – 9:20 Rhythmic gymnastics and spine injury. *Elizabeth Ann Darling, PT, DPT, OCS*

9:20 – 9:40 Injuries of the shoulder, wrist, and hand – Clinical pearls. *Julie Ann Guthrie, PT, DPT, OCS*

9:40 – 10:40 Gymnastics rehabilitation and progressions. *Airelle Hunter Giordana, PT, DPT, OCS, SCS*

10:40 – 11:00 Return to competition – Clinical Pearls. *Gina Pongetti PT, MPT, CSCS*

EDUCATIONAL SESSIONS

1:00 – 3:00 **Orthopaedics / Sports.** How do foot orthotic and bracing interventions really work?

1:00 – 3:00 **Orthopaedics.** Current concepts in differential diagnosis, classification-based treatment, and surgical management of hip disorders.

1:00 – 3:00 **Women's Health.** Pilates-based Physical Therapy: Creating support and healing through positive movement experiences.

PLATFORMS

8:00 AM - 11:00 Orthopaedic Platform Presentations: Foot, Ankle, and Knee

9:00 – 9:15 Talar Declination and Calcaneal Inclination Angles: Effect on Ankle Joint Motion. D Sinacore, PT, PhD.

9:15 – 9:30 Mechanism and Effectiveness of an External Shoe Modification in Reducing Metatarsalgia Symptoms. JM Hackney, PT, PhD.

10:45 – 11:00 Effects of a Tibiofibular Joint Manipulation on Ankle Range of Motion and Functional Outcomes in Individuals With Chronic Ankle Instability. JR Beazell, PT, DPT, OCS, ATC, FAAOMPT.

For this January Citation BLAST, I've selected references related to our CSM PASIG programming: "*Physical Therapy Management in Gymnastics*". The format is an annotated bibliography of articles on the selected topic from 1996 – 2008. Each month's citations and Blasts are available on the PASIG webpage for our members to access and download. (Information about EndNote referencing software can be found at <http://www.endnote.com>, including a 30-day free trial). Anyone interested in contributing a special topic citation blast, please volunteer. As always, your comments and suggestions are welcome. Please drop me an e-mail anytime.

Regards,
Shaw

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Gymnastics

The annotated bibliography this month is focused on gymnastic topics related to our CSM programming in San Diego. This includes recent publications on gymnastic injuries throughout the body, as well as on diet and anxiety in this population. I look forward to seeing all of you in San Diego.

Shaw Bronner PT, PhD, OCS
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Boden BP (2007). Prevention of catastrophic injuries in sports. *Instr Course Lect* **56**: 385-93. Catastrophic sports injuries are rare but severely debilitating events. Catastrophic injuries are divided into two etiologic categories: direct and indirect. Direct injuries are those resulting directly from participation in a sport, such as a collision in football. Football is associated with the greatest number of direct catastrophic injuries for all major team sports in the United States, whereas ice hockey, pole vaulting, gymnastics, and football have the highest incidence of direct catastrophic injuries per 100,000 male participants. Cheerleading is associated with the highest number of direct catastrophic injuries for all sports in which females participate. Indirect or nontraumatic injuries are caused by systemic failure resulting from exertion while participating in a sport and include cardiovascular conditions, heat illness, exertional hyponatremia, and dehydration. Indirect deaths in athletes are predominantly caused by cardiovascular conditions such as hypertrophic cardiomyopathy and coronary artery disease.

Burger H, Muller EJ, et al. (2006). [Avascular necrosis of the capitate in athletes]. *Sportverletz Sportschaden* **20**(2): 91-5.

The possibility of osteonecrosis of the carpal bones should always be considered when athletes present with pain of unknown origin in the hand and wrist, in particular, if they are participating in sports such as gymnastics or weight-lifting that involve extreme loading of the wrist with axial compression and microtrauma. This sort of extreme loading of the wrist combined with a constitutionally "weak" blood supply to the individual carpal bones may lead

to the formation of osteo-necrotic zones. A treatment method that can produce excellent results, depending on the pathomorphology, is available in the form of vascularized bone grafting.

Burnett A, O'Sullivan P, et al. (2008). Lower lumbar spine axial rotation is reduced in end-range sagittal postures when compared to a neutral spine posture. Man Ther **13**(4): 300-6.

Sports such as rowing, gymnastics, cycling and fast bowling in cricket that combine rotation with spine flexion and extension are known to carry greater risk of low back pain (LBP). Few studies have investigated the capacity of the lumbar spine to rotate in various sagittal positions, and further, these studies have generated disparate conclusions. The purpose of this study was to determine whether the range of lower lumbar axial rotation (L3-S2) is decreased in end-range flexion and extension postures when compared to the neutral spine posture. Eighteen adolescent female rowers (mean age=14.9 years) with no history of LBP were recruited for this study. Lower lumbar axial rotation was measured by an electromagnetic tracking system (3-Space Fastrak) in end-range flexion, extension and neutral postures, in sitting and standing positions. There was a reduction in the range of lower lumbar axial rotation in both end-range extension and flexion ($p < 0.001$) postures when compared to neutral. Further, the range of lower lumbar axial rotation measurements in flexion when sitting was reduced when compared to standing ($p = 0.013$). These findings are likely due to the anatomical limitations of the passive structures in end-range sagittal postures.

Caplan J, Julien TP, et al. (2007). Multidirectional instability of the shoulder in elite female gymnasts. Am J Orthop **36**(12): 660-5.

Multidirectional instability (MDI) of the shoulder is symptomatic laxity in 2 or more directions, 1 of which is inferior. MDI is well described in overhead athletes (eg, baseball players, tennis players, swimmers) but not in gymnasts. We conducted this study to estimate the incidence of any type of shoulder pathology in elite gymnasts, to estimate MDI incidence in this population, and to determine which if any circumstances place these gymnasts at higher risk for developing MDI. An 18-question multiple-choice questionnaire was administered to 70 female US collegiate gymnastics teams. Potential risk factors were cross-matched against those gymnasts with traumatic shoulder injuries and again against those gymnasts who met MDI study inclusion criteria. Of the 1115 questionnaires distributed, 457 (34 teams) were returned. Twenty-two percent of gymnasts suffered from a traumatic shoulder injury, and 11% met study inclusion criteria. There was a statistically significant ($P = .02$) relationship between generalized ligamentous laxity and traumatic shoulder instability but not MDI. Incidence of atraumatic or traumatic shoulder injuries in gymnasts is higher than previously recognized. Although this study did not reveal any potential risk factors, it does provide several avenues for more specific research.

Cottyn J, de Clercq D, et al. (2008). The role of preparatory heart rate deceleration on balance beam performance. J Sport Exerc Psychol **30**(2): 159-70.

Preparatory heart rate deceleration occurs in tasks with an external focus of attention and is often assumed to facilitate balance performance. However, its effects upon sport-related complex balance movements have not been studied. Heart rate patterns during the preparation period of an acrobatic element (flic-flac) on the balance beam were studied in 14 female gymnasts (M age 13.2 years). A significant heart rate deceleration was found in attempts with a fall in the consecutive acrobatic element, but not in attempts without a fall. These data suggest that preparatory heart rate deceleration may be detrimental to the performance of complex movements on the balance beam.

Cottyn J, De Clercq D, et al. (2006). The measurement of competitive anxiety during balance beam performance in gymnasts. *J Sports Sci* **24**(2): 157-64.

The purpose of the present study was to investigate competitive anxiety during balance beam performance in gymnasts. Competitive anxiety was assessed continuously by heart rate monitoring and by retrospective self-report of nervousness in eight female national level gymnasts during their balance beam routine during one competition and two training sessions. A significant negative correlation was found between the score of the retrospective self-report of nervousness and performance during the routine. There were no significant differences in performance score by the judges between the three test sessions. There were also no differences in the retrospective self-report of nervousness. However, heart rate was significantly higher during the competition session than during the training sessions. The potential value of the retrospective report of nervousness for the study of critical events during gymnastic performance is illustrated. The results are discussed in the light of catastrophe theory.

Cupisti A, D'Alessandro C, et al. (2007). Injury survey in competitive sub-elite rhythmic gymnasts: results from a prospective controlled study. *J Sports Med Phys Fitness* **47**(2): 203-7.

AIM: The aim of this study was to determine the frequency, anatomical site and types of injury incurred in rhythmic gymnastics. METHODS: An 8-month prospective and controlled injury survey was planned, including 70 club-level competitive rhythmic gymnasts, aged 13-19 years. Information on injury events was recorded weekly in an injury record booklet for any event occurring over that week. Height, weight, anthropometric measurements and time spent in physical activity were recorded at baseline. Data from 72 age-matched non-athletic females served as controls. RESULTS: Forty-nine significant injuries were reported by gymnasts and 34 by controls (70% vs 47%, $P < 0.005$, odds ratio 2.28); gymnasts sustained a rate of 1.08 injuries per 1 000 h of training. The most prevalent anatomical sites sustaining injury were the ankle and the foot (38.9%), followed by back (22.2%). Strains and sprains were frequently reported both in gymnasts and in controls. Gymnasts missed an average of 4.1 days of physical activity as compared to 18.9 days for the control females. Alternatively, modification of training sessions occurred more frequently for the gymnast group (32 vs 7 cases for controls). The total school days missed were lower for the injured gymnasts than for the injured controls (27 vs 64 days). CONCLUSION: Competitive, club-level rhythmic gymnastics show a higher prevalence of injuries than non-athletic controls, but considering the high number of hours spent in training sessions, it derives that rhythmic gymnastics is a sport discipline at relatively low risk of severe injuries. These are mainly limited to back and lower limbs, are generally not severe and do not significantly hinder the preparation for the competitions.

D'Alessandro C, Morelli E, et al. (2007). Profiling the diet and body composition of subelite adolescent rhythmic gymnasts. *Pediatr Exerc Sci* **19**(2): 215-27.

The aim of this study was to investigate the body composition and dietary intake of competitive club-level rhythmic gymnasts, who represent the larger cohort of the sport's practitioners. Fifty-five rhythmic gymnasts and 55 nonathlete females (13-19 years of age) were seen individually to collect a dietary recall and to take anthropometric data and bioelectric-impedance analysis. Gymnasts had lower body-mass index and lesser skinfold thickness, although middle arm-muscle circumference was similar in the 2 groups. Gymnasts had lower body-fat measures but normal levels of fat-free mass (FFM) and body-cellular mass. Gymnasts had better dietary habits than the age-matched controls. Low levels of calcium, phosphorous, iron, and zinc and a disparity between reported energy intake and estimated energy requirement were observed in both groups.

Durall CJ, Udermann BE, et al. (2009). The effects of preseason trunk muscle training on low-back pain occurrence in women collegiate gymnasts. J Strength Cond Res **23**(1): 86-92.

Low-back pain (LBP) in women gymnasts is relatively common. This investigation was performed to evaluate the effects of a preseason training program for the trunk extensor, lateral flexor, and flexor muscles on LBP occurrence during the subsequent competitive season. The training group consisted of 15 collegiate women gymnasts. The control group consisted of 15 nonathlete collegiate women. Pre- and posttesting for all participants consisted of static endurance tests for the trunk extensors, lateral flexors, and flexors. After pretesting, the training group completed 10 weeks of biweekly training consisting of non-foot-supported back extensions and side bridges, in addition to their usual trunk flexor exercises. The control group did not perform any specialized trunk muscle training. Mean improvements in trunk endurance, based on multivariate analysis of variance at the 5% level of significance, were significantly greater in the training group than in the control group. Mean improvements in endurance in the training group were 47 seconds for the lateral trunk flexors, 34 seconds for the trunk extensors, and 80 seconds for the trunk flexors. During the subsequent gymnastics season, none of the gymnasts reported new episodes of LBP. One gymnast with chronic LBP reported a recurrence of LBP during the season. None of the gymnasts reported that the training program adversely affected their gymnastic performance. These data suggest that training the trunk musculature twice per week during a 10-week period with a relatively simple floor exercise protocol was an effective stimulus to improve trunk endurance measures. It is encouraging that none of the gymnasts reported new episodes of LBP during the subsequent competitive gymnastics season.

Dwek JR, Cardoso F, et al. (2009). MR imaging of overuse injuries in the skeletally immature gymnast: spectrum of soft-tissue and osseous lesions in the hand and wrist. Pediatr Radiol.

BACKGROUND: In the pediatric gymnast, stress-related physeal injuries have been well described with characteristic imaging findings. However, a spectrum of overuse injuries, some rarely reported in the literature, can be encountered in the gymnast's hand and wrist. **OBJECTIVE:** To demonstrate the MR appearance of a spectrum of overuse injuries in the skeletally immature wrist and hand of pediatric gymnasts. **MATERIALS AND METHODS:** A total of 125 MR exams of the hand and wrist in skeletally immature children were performed at our institution during a 2-year period. Clinical histories were reviewed for gymnastics participation. MR studies of that subpopulation were reviewed and abnormalities tabulated. **RESULTS:** Of the MR studies reviewed, ten gymnasts were identified, all girls age 12-16 years (mean age 14.2 years) who presented with wrist or hand pain. Three of these children had bilateral MR exams. Abnormalities included chronic physeal injuries in three children. Two girls exhibited focal lunate osteochondral defects. Triangular fibrocartilage tears were present in three girls, one of whom had a scapholunate ligament tear. Two girls manifested metacarpal head flattening and necrosis. **CONCLUSION:** A variety of soft-tissue and osseous lesions can be encountered in the skeletally immature gymnast. Familiarity with these stress-related injuries is important for accurate diagnosis.

Eils E, Imberge S, et al. (2007). Passive stability characteristics of ankle braces and tape in simulated barefoot and shoe conditions. Am J Sports Med **35**(2): 282-7.

BACKGROUND: Ankle sprains are among the most common injuries in barefoot sport activities such as dance, gymnastics, or trampoline. At present, the use of external ankle devices for prevention of ligament injuries for barefoot activities remains unclear. **HYPOTHESIS:** External ankle devices have a significant loss of passive stability when used without a shoe in barefoot activities. **STUDY DESIGN:** Controlled laboratory study. **METHODS:** Twenty-five healthy subjects participated in the project (mean age, 26.2 +/- 3.3 years; mean body mass, 71.2 +/- 10.3 kg; mean height, 178 +/- 7 cm). Passive range of motion measurements were performed with 3 different ankle stabilizers (a stirrup brace, a

lace-up brace, and tape), as well as 2 different shoe conditions (cutout shoe [simulated barefoot] and normal shoe). RESULTS: In the simulated barefoot condition, a significantly reduced stabilizing effect for inversion and eversion (19% and 29%, respectively) was found for the stirrup ankle brace. Small decreases were noted with the soft brace and tape, but these were not statistically significant. CONCLUSION: The passive stability characteristics of ankle braces depend to a great extent on being used in combination with a shoe. This is especially true for semirigid braces with stirrup design. Therefore, it is recommended that soft braces (like the one tested in the present investigation) be used in barefoot sports for restricting passive range of motion of the foot and ankle complex. CLINICAL RELEVANCE: This study provides useful information for clinicians to select or recommend an external ankle stabilizing device in barefoot sports to restrict passive range of motion of the foot-ankle complex most effectively.

Guidetti L, Di Cagno A, et al. (2009). Precompetition warm-up in elite and subelite rhythmic gymnastics. J Strength Cond Res **23**(6): 1877-82.

The aim of this study was to investigate which precompetition warm-up methodologies resulted in the best overall performance in rhythmic gymnastics. The coaches of national and international clubs (60 elite and 90 subelite) were interviewed. The relationship between sport performance and precompetition warm-up routines was examined. A total of 49% of the coaches interviewed spent more than 1 hour to prepare their athletes for the competition, including 45 minutes dedicated to warm-up exercises. In spite of previous studies' suggestions, the time between the end of warm-up and the beginning of competition was more than 5 minutes for 68% of those interviewed. A slow run was the activity of choice used to begin the warm-up (96%). Significant differences between elite and subelite gymnasts were found concerning the total duration of warm-up, duration of slow running, utilization of rhythmic steps and leaps during the warm-up, the use of dynamic flexibility exercises, competition performances repetition ($p < 0.01$), and utilization of imagery ($p < 0.05$). A precompetition warm-up in rhythmic gymnastics would include static stretching exercises at least 60 minutes prior to the competition starting time and the active stretching exercises alternated with analytic muscle strengthening aimed at increasing muscle temperature. Rhythmic gymnastics coaches at all levels can use this data as a review of precompetition warm-up practices and a possible source of new ideas.

Hame SL, LaFemina JM, et al. (2004). Fractures in the collegiate athlete. Am J Sports Med **32**(2): 446-51.

PURPOSE: To determine the demographics and incidence of fractures in collegiate athletes. STUDY DESIGN: Retrospective review of prospectively collected data. METHODS: Division I collegiate athletes who sustained a fracture while enrolled at the university from 1986 to 2000 were identified through training room records. Type and location of fracture, sport, gender, age, position, height, and weight were recorded and analyzed. Team information was obtained from athletic department records and was used to calculate incidence. RESULTS: Between 1986 and 2000, 5900 Division I athletes at our institution sustained 349 primary fractures (5.9%). By gender, the incidence did not differ significantly between males and females ($P = .236$), except in water polo where the men sustained significantly more fractures. By type, females sustained significantly more stress fractures ($P = .001$) than males. Overall, by location, the hand contributed the greatest number of total fractures. By sport, the incidence rate was highest in basketball (0.081) for male athletes and in gymnastics (0.069) for female athletes. The incidence of a second fracture during the study period was twice the rate of the first fracture. CONCLUSIONS: As expected, athletes participating in contact sports contributed the greatest number of fractures. Participation in basketball for men and in gymnastics for women posed the greatest risk. Female athletes sustained significantly more stress fractures.

Hecht SS, Burton MS (2009). Medical coverage of gymnastics competitions. Curr Sports Med Rep **8**(3): 113-8.

Medical coverage of gymnastics competitions can be a challenging task for the sports medicine physician and other medical personnel because of the complexity and aerial nature of the sport. A broad understanding of the six gymnastics disciplines, along with the type of competitions, injury epidemiology, and the common acute gymnastics injuries will help sports medicine professionals in planning and delivering optimal care to the injured or ill gymnast.

Herzberg G, Mercier S, et al. (2006). Kienbock's disease in a 14-year-old gymnast: a case report. J Hand Surg [Am] **31**(2): 264-8.

Kienbock's disease is rare in children and there are few reports and therapeutic recommendations in the literature about this condition. We report a case of a 14-year-old female gymnast for whom nonsurgical treatment was followed by complete healing within 12 months. Repeated computed tomography scans provided a sequential coronal, sagittal, and transverse illustration of the progressive healing of the lunate.

Iosifidis MI, Giannoulis I, et al. (2008). Isolated acute dislocation of the proximal tibiofibular joint. Orthopedics **31**(6): 605.

Lesions of knee's lateral side are less common than medial injuries. The anatomy of the lateral ligaments and the presence of additional structures (eg, fibula head) can cause diagnostic problems. Isolated dislocation of the proximal tibiofibular joint is unusual; therefore, it may be overlooked in the emergency department. Many cases are missed due to failure of diagnosis. This type of injury is common in athletes whose sports require twisting motions of the flexed knee (eg, wrestling, parachute jumping, judo, gymnastics, skiing, rugby, football, soccer, track, baseball, basketball, racquetball, and roller-skating). Anterolateral dislocation of the proximal tibiofibular joint is seemingly rare in soccer players, as less than a handful cases have been reported in the literature. The diagnosis can be made by clinical examination, plain knee radiographs, and, sometimes, computed tomography (CT) scanning for further confirmation. Treatment usually consists of closed or open reduction. In complicated cases, however, arthrodesis or resection of the fibular head may be required. This article reports a rare case of acute isolated anterolateral dislocation of the proximal tibiofibular joint in a soccer player and discusses the joint anatomy, types of dislocations, mechanisms of injury, and treatment options.

Issever AS, Minden K, et al. (2007). Accessory navicular bone: when ankle pain does not originate from the ankle. Clin Rheumatol.

A young girl suffering from ankle pain occurring after gymnastics classes was referred to the rheumatology department by an orthopedic surgeon because a rheumatological condition was suspected to cause her symptoms. MRI was useful in pointing to the correct diagnosis of accessory navicular bone (AN). The morphological classification of ANs is discussed and the imaging modalities for diagnosis are presented.

Jung ST, Cho SB, et al. (2008). Calcaneal apophyseal fractures in young athletes: two case reports. J Pediatr Orthop B **17**(1): 11-4.

Calcaneal apophyseal fracture is especially rare in young children. Furthermore, this type of fracture is sometimes overlooked in children because of subtle radiographic findings. The studies reported on this fracture are rare. We report two calcaneal apophyseal fractures that were present in the proximal half of calcaneal apophysis and were treated with fixation of the avulsed bony fragment using nonabsorbable suture.

Kahanov L, Daly T (2009). Bilateral pulmonary emboli in a collegiate gymnast: a case report. J Athl Train 44(6): 666-71.

OBJECTIVE: To characterize the diagnosis of pulmonary embolism in collegiate student-athletes and to raise awareness among sports medicine providers of the possibility of this potentially fatal disease in the student-athlete population. **BACKGROUND:** An 18-year-old, previously healthy National Collegiate Athletic Association Division I female gymnast complained of intense pain, bilaterally, deep in her chest. The athlete was referred to her team physician, who identified normal vital signs but referred her to the emergency room because of significant pain. The student-athlete was diagnosed with bilateral pulmonary emboli in the emergency room. **DIFFERENTIAL DIAGNOSIS:** Pneumonia, renal calculi, upper urinary tract infection, intercostal muscle strain or rib fracture, pancreatitis, gall bladder disease, gastritis, ulceration, esophagitis, infection, tumor, pulmonary embolism. **TREATMENT:** The student-athlete was immediately placed on anticoagulants for 6 months. During that time, she was unable to participate in gymnastics and was limited to light conditioning. **UNIQUENESS:** Documented cases of female student-athletes developing a pulmonary embolism are lacking in the literature. Two cases of pulmonary embolism in male high school student-athletes have been documented, in addition to many cases in elderly and sedentary populations. **CONCLUSIONS:** All health care providers, including sports medicine professionals, should be aware that this condition may be present among student-athletes. During the initial evaluation, prescreening should include questions about any previous or family history of pulmonary embolism or other blood clots. Athletes who answer positively to these questions may have a higher likelihood of pulmonary embolism and should be referred for testing.

Kang C, Hwang DS, et al. (2009). Acetabular labral tears in patients with sports injury. Clin Orthop Surg 1(4): 230-5.

BACKGROUND: We wanted to investigate acetabular labral tears and their correlation with femoroacetabular impingement in patients with sports injury. **METHODS:** Among 111 patients who were diagnosed with the acetabular labral tears after arthroscopic treatment from January 2004 to December 2007, we selected 41 patients with sports injury. There were 12 cases of Taekwondo injury, 5 of golf injury, 4 of soccer injury, 3 of gymnastics injury, 2 of Hapkido injury, 2 of aerobics injury, 2 of rock-climbing injury, 2 of fitness training injury and 9 of other sports injuries. We checked the subtypes of acetabular labral tears and the accompanying femoroacetabular impingement. For the cases with accompanying femoroacetabular impingement, we investigated the subtypes according to the types of sports, gender and age. At last follow-up, we checked the Harris Hip Score (HHS), the Hip Outcome Score (HOS) sports scale and the percentage of patients who returned to their sports activity. **RESULTS:** The average age of symptomatic onset was 26 years (range, 12 to 65 years). The ratio of males to females was 29 : 12. An average duration of the hip pain was 17 months (range, 1 to 60 months). The degenerative type of acetabular labral tears was the most prevalent with 32 cases (78%), and there were 9 cases (22%) of the partial tear type. Thirty cases (73%) were accompanied by femoroacetabular impingement. The average age of the 23 cases (56%) of the cam-type was 23 years (range, 12 to 48 years), and it was more likely to occur in men (87%) and for people practicing martial arts such as Taekwondo or Hapkido. An average age of the 5 cases (12%) of the pincer-type was 26 (range, 16 to 43 years), it usually occurred in women (60%) and for non-martial arts such as golf and gymnastics. There were 2 cases of the mixed type (cam + pincer-type). At 27 months follow-up, the HHS was 61 to 92 points, the HOS sports scale increased 43 to 75%, and the rate of returning to sports was 71%. **CONCLUSIONS:** In spite of the early expression of symptoms and the short duration of the acetabular labral tears, the high rate of degenerative acetabular labral tears in sports patients is likely associated with repetitive injury after the expression of symptoms. Femoroacetabular impingement in sports patients is

seemed to be a cause of the early occurrence of acetabular labral tears. Because the possibility of acetabular labral tears is high in femoroacetabular impingement, sports patients may need to undergo early screening for the diagnosis and care of femoroacetabular impingement.

Klentrou P, Plyley M (2003). Onset of puberty, menstrual frequency, and body fat in elite rhythmic gymnasts compared with normal controls. Br J Sports Med **37**(6): 490-4.

OBJECTIVES: To assess the prevalence of delayed menarche and abnormal menstrual patterns, as well as the association of menstrual status with physical training in elite rhythmic gymnasts from Greece and Canada. **METHODS:** Fifteen Greek (mean (SEM) age 14.5 (0.2) years) and 30 Canadian (mean (SEM) age 14.7 (0.4) years) rhythmic gymnasts were surveyed for age at menarche, menstrual frequency, and training profile, and measured for height, weight, and percentage body fat (%BF). Seventy eight healthy adolescents served as country specific non-active controls: 38 Greek non-athletes (mean (SEM) age 14.5 (0.1) years) and 40 Canadian non-athletes (mean (SEM) 14.2 (0.1) years). **RESULTS:** Of the Greek gymnasts, 79% had not yet menstruated compared with 34% of the Canadian gymnasts. Menarche was significantly ($p<0.01$) delayed in the rhythmic gymnasts (composite mean 13.8 (0.3) years, $n = 45$) compared with the controls (composite mean 12.5 (0.1) years, $n = 78$). There was no significant difference between Greek and Canadian gymnasts for the age at menarche (14.2 (0.3) v 13.6 (1.2) years respectively). Menstrual irregularities were reported in 78% (61% oligomenorrhoeic and 17% amenorrhoeic) of the menarcheal athletes. Menarcheal gymnasts were found to be significantly ($p<0.05$) taller and heavier, with a higher %BF and a lower training frequency and training duration ($p<0.05$) than the premenarcheal gymnasts. Overall, the mean %BF of the gymnasts was significantly lower ($p<0.05$) than that of the control subjects. The Canadian controls exhibited a significantly ($p<0.05$) greater %BF than the Greek controls of the same age. **CONCLUSION:** Delayed menarche, menstrual irregularities, and low body fat are common in elite rhythmic gymnasts. Premenarcheal gymnasts train more often and for longer, and have a lower body mass index and less body fat, than menarcheal gymnasts. Prospective studies are needed to explore further these and other factors associated with delayed menarche and menstrual irregularities in female athletes.

Klinkowski N, Korte A, et al. (2008). Psychopathology in elite rhythmic gymnasts and anorexia nervosa patients. Eur Child Adolesc Psychiatry **17**(2): 108-13.

This study investigates current psychopathology and psychological distress in elite rhythmic gymnasts. Due to a strong emphasis on leanness in aesthetic sports and the controversial findings in literature regarding the role of anorexia nervosa (AN) in such sports, we compared elite rhythmic gymnasts ($n=51$) to inpatients with AN ($n=55$) as a disease control group and to high school students ($n=53$) as a "normal" control group. We assessed psychopathology using the Symptom Checklist (SCL-90-R). Moreover, body height, weight, Body Mass Index (BMI) and the presence of amenorrhea were assessed. Regarding physical aspects, the rhythmic gymnasts showed an intermediate position between the two other groups. In terms of psychopathology, significant differences were found between the gymnasts and the AN patients, while no differences were detected between the gymnasts and the "normal" control group. Depression discriminated best between the three groups. Elite rhythmic gymnasts may show a lean, almost anorexic-like physique. Nevertheless, no psychological distress comparable to that of AN patients was found. Therefore, even though analogies to AN might seem obvious in elite rhythmic gymnasts, this study is putting emphasis on the importance of a careful consideration of psychological distress and psychopathology.

Kruse D, Lemmen B (2009). Spine injuries in the sport of gymnastics. Curr Sports Med Rep **8**(1): 20-8.

Injury in gymnastics is not an uncommon occurrence, and an injury of the spine frequently is a source of pain in a gymnast. Because of the unique demands of this sport, which repetitively place significant forces across the spine, it becomes clear why the spine commonly is injured. Potential causes of back pain in a gymnast include spondylolysis, Scheuermann's disease, intervertebral disc pathology, and mechanical sources of pain. Much of the diagnostic workup and management of spondylolysis lesions remains controversial, but a successful management strategy can be developed for the safe return of a gymnast to the mat. Mechanical sources of pain are common and should be addressed. Psychosocial etiologies of back pain also exist in these athletes. Rehabilitation strategies should focus on improvement in the strength and function of the trunk and lumbar spine and the correction of biomechanical deficits with a goal of pain-free transition back to gymnastic-specific activities.

Lovell G (2008). Vitamin D status of females in an elite gymnastics program. Clin J Sport Med **18**(2): 159-61.

OBJECTIVE: Vitamin D plays an important role in calcium and bone metabolism. In Australia it has been assumed that all young athletes have good vitamin D levels. A survey of females in an elite gymnastics program was undertaken to determine their vitamin D and dietary calcium status. **DESIGN:** Cross-sectional survey. **SETTING:** Females in an elite gymnastics program at the Australian Institute of Sport. **PARTICIPANTS AND OUTCOME MEASURES:** Eighteen female gymnasts aged 10-17 years were assessed for vitamin D status (serum 25[OH]D) and dietary calcium intake. **RESULTS:** Fifteen were found to have levels below current recommended guidelines for optimal bone health (<75 nmol/L). Six had vitamin D levels below 50 nmol/L. Thirteen of the gymnasts also had daily dietary calcium intakes below the daily recommended intake for their age. **CONCLUSIONS:** Gymnasts and possibly other indoor athletes should be carefully reviewed for vitamin D and calcium status.

Majewski M, Susanne H, et al. (2006). Epidemiology of athletic knee injuries: A 10-year study. Knee.

The knee is an anatomically and biomechanically complex joint. Few studies have been published reporting the type and frequency of knee injuries. However, this information that may help to prevent, diagnose, and treat knee joint injuries. We have documented 17,397 patients with 19,530 sport injuries over a 10-year period of time. 6434 patients (37%) had 7769 injuries (39.8%) related to the knee joint. 68.1% of those patients were men and 31.6% were women. Almost 50% of the patients were between the ages of 20-29 (43.1%) at the time of injury. The injuries documented were ACL lesion (20.3%), medial meniscus lesion (10.8%), lateral meniscus lesion (3.7%), MCL lesion (7.9%), LCL lesion (1.1%), and PCL lesion (0.65%). The activities leading to most injuries were soccer (35%) and skiing (26%). LCL injury was associated with tennis and gymnastics, MCL with judo and skiing, ACL with handball and volleyball, PCL with handball, lateral meniscus with gymnastics and dancing, and medial meniscus with tennis and jogging.

Marini M, Sgambati E, et al. (2008). Pain syndromes in competitive elite level female artistic gymnasts. Role of specific preventive-compensative activity. Ital J Anat Embryol **113**(1): 47-54.

The pain is a serious problem in advanced level female artistic gymnasts because it decreases the performance. The pain is due to the high numbers of hours spent in training sessions and may be associated to injuries that have relatively high incidence and severity in these athletes. We investigated the role of a preventive-compensative physical activity program, implemented in the warm-up and the cool-down session of standard training, in the prevention and reduction of the pain syndromes, evaluated in elite level young female

artistic gymnasts. Thirty elite level female athletes, 10-14 years old, participated in this study and were followed for 12 weeks during the competition preparation period. Fifteen athletes were trained with preventive-compensative motory program implemented in the ordinary training (intervention group) and fifteen (control group) followed the standard training. All athletes completed a self-administered questionnaire regarding the pain intensity on the basis of a Visual Analogue Scale pre- and post- intervention. The experimental protocol consisted of three steps: the treatment of the shortened muscle chains according to Active Posture Reeducation method, the proprioceptive-coordinative training with wobble board and the mobilization and stretching of back using fitball. Before intervention, the pain in practicing this sport was reported by 83% of all the athletes. The most common primary pain sites were the ankle and low back; the pain anatomical location was correlated to the training. After intervention, low back pain assessment showed a decrease of pain identified as mild (from 56% to 44%) or moderate (from 33% to 22%) and a disappearance of severe pain (from 11% to 0%). Ankle pain decreased and/or disappeared: the mild pain from 33% to 27%, moderate from 27% to 13% and severe from 13% to 0%. The pain analysis did not show different results in the control group. Our results indicated that the performed preventive-compensative training is of value, in a short time perspective, in preventing and reducing the pain syndromes in these athletes.

Marshall SW, Covassin T, et al. (2007). Descriptive epidemiology of collegiate women's gymnastics injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 through 2003-2004. *J Athl Train* **42**(2): 234-40.

OBJECTIVE: To review 16 years of National Collegiate Athletic Association (NCAA) injury surveillance data for women's gymnastics and identify potential areas for injury prevention initiatives. **BACKGROUND:** In the 1988-1989 academic year, 112 schools were sponsoring varsity women's gymnastics teams, with approximately 1550 participants. By 2003-2004, the number of varsity teams had decreased 23% to 86, involving 1380 participants. Significant participation reductions during this time were particularly apparent in Divisions II and III. **MAIN RESULTS:** A significant annual average decrease was noted in competition (-4.0%, $P < .01$) but not in practice (-1.0%, $P = .35$) injury rates during the sample period. Over the 16 years, the rate of injury in competition was more than 2 times higher than in practice (15.19 versus 6.07 injuries per 1000 athlete-exposures; rate ratio = 2.5, 95% confidence interval [CI] = 2.3, 2.8). A total of 53% of all competition and 69% of all practice injuries were to the lower extremity. A participant was almost 6 times more likely to sustain a knee internal derangement injury in competition than in practice (rate ratio = 5.7, 95% CI = 4.5, 7.3) and almost 3 times more likely to sustain an ankle ligament sprain (rate ratio = 2.7, 95% CI = 2.1, 3.4). The majority of competition injuries (approximately 70%) resulted from either landings in floor exercises or dismounts. **RECOMMENDATIONS:** Gymnasts with a previous history of ankle sprain should either wear an ankle brace or use prophylactic tape on their ankles to decrease the risk of recurrent injury. Preventive efforts may incorporate more neuromuscular training and core stability programs in the off-season and preseason conditioning to enhance proper landing and skill mechanics. Equipment manufacturers are encouraged to reevaluate the design of the landing mats to allow for better absorption of forces.

Meyer C, Cammarata E, et al. (2006). Why do idiopathic scoliosis patients participate more in gymnastics? *Scand J Med Sci Sports* **16**(4): 231-6.

The influence of physical and sporting activities (PSA) on idiopathic scoliosis (IS) is still obscure. The aim of this study was to investigate whether such an influence exists and if so, to determine its characteristics. Two hundred and one teenagers with IS and a control group of 192 adolescents completed an epidemiological questionnaire. Those practising gymnastics were more numerous in the IS group than in the control group. Moreover, the practice of gymnastics was chosen before IS was diagnosed. As gymnastic activities are

considered neither as a therapy nor as a precursor of IS, the distribution observed could be linked to a common factor that both increases the likelihood of IS and favors the practice of gymnastics. Joint laxity (JL) may be such a common factor, and was therefore tested (wrist and middle finger) on 42 girls with IS and 21 girls of a control group. IS patients, practising gymnastics or not, showed a higher JL than the control group practising gymnastics or not. Furthermore, the groups practising gymnastic activities did not show higher JL levels than the other groups. Children with a high JL could be drawn toward gymnastics because of their ability to adapt to the constraints of this sport. Girls with a high JL may therefore be prone to developing IS. The fact that most teenagers with IS practise gymnastics could be related to a higher JL.

Meyer C, Haumont T, et al. (2008). The practice of physical and sporting activity in teenagers with idiopathic scoliosis is related to the curve type. Scand J Med Sci Sports **18**(6): 751-5.

Idiopathic scoliosis (IS) is correlated with a muscular disequilibrium of the spine and an alteration of balance control, efficient performance of the latter being necessary for physical and sporting activities (PSA). However, the type of the IS curve has different effects on muscle and on balance control according to the primary curve location. This study aimed to determine the relationships between IS type and PSA practice. One hundred and sixty-nine girl adolescents with IS [double major curve (DMC) scoliosis: n=74; single major curve (SMC) scoliosis: n=95] and 100 age-matched control girl adolescents completed an epidemiological questionnaire informing on curricular and extracurricular PSA. Adolescents with DMC scoliosis practised more PSA than those with SMC scoliosis. Moreover, among all PSA referenced, gymnastic activities are the most practiced PSA both in IS teenagers, whatever the curve type, and in controls. Besides, teenagers practising gymnastics were more numerous in those with DMC scoliosis than those with SMC scoliosis and controls. The highest proportion of adolescents with DMC scoliosis practising PSA, especially gymnastics, could be linked to the fact that they are less subject to scoliosis-related biomechanical repercussions leading to a better balance control, which is essential in these PSA.

Mountcastle, S. B., M. Posner, et al. (2007). "Gender differences in anterior cruciate ligament injury vary with activity: Epidemiology of anterior cruciate ligament injuries in a young, athletic population." Am J Sports Med.

BACKGROUND: Previous studies have shown that women involved in similar activities as men are at increased risk for anterior cruciate ligament injuries. HYPOTHESIS: The incidence rate of complete anterior cruciate ligament tears for men and women in our athletic, college-aged population is similar. STUDY DESIGN: Descriptive epidemiology study. METHODS: Students graduating in class years 1994 to 2003 at our institution who sustained complete anterior cruciate ligament tears were assessed for mechanism of injury and type of sport played at time of injury. We calculated the incidence proportion, an estimation of risk, by gender and class year, and the incidence proportion ratio comparing men and women by class year. We also calculated incidence rates by gender and type of sport played and incidence rate ratios comparing men and women. RESULTS: There were 353 anterior cruciate ligament injuries in the 10 classes studied. We found an overall, 4-year incidence proportion of 3.24 per 100 (95% confidence interval, 2.89-3.63) for men and 3.51 (95% confidence interval, 2.65-4.65) for women (incidence proportion ratio, 1.09 [95% confidence interval, 0.80-1.47]). The overall anterior cruciate ligament injury rate, excluding male-only sports, was significantly greater in women (incidence rate ratio, 1.51 [95% confidence interval, 1.03-2.21]). We found significantly greater injury rates among women in a gymnastics course (incidence rate ratio, 5.67 [95% confidence interval, 1.99-16.16]), indoor obstacle course test (incidence rate ratio, 3.72 [95% confidence interval, 1.25-11.10]), and basketball (incidence rate ratio, 2.42 [95% confidence interval, 1.05-5.59]).

CONCLUSION: We found little gender difference in the overall risk of an anterior cruciate ligament tear; however, there were gender differences in injury rates when specific sports and activities were compared and when male-only sports were removed from the overall rate assessment.

Nihal A, Trepman E, et al. (2009). First ray disorders in athletes. Sports Med Arthrosc 17(3): 160-6.

Athletes who participate in contact sports (American football, soccer, rugby) or who are involved in high-impact sports (dancing, running, gymnastics) are susceptible to first ray forefoot injuries. Common first ray disorders in athletes include hallux rigidus, turf toe, sand toe, sesamoid disorders, and fractures. First ray disorders in athletes frequently are treated by nonoperative methods including relative rest, ice, elevation, activity modification, shoe modification, and insoles.

Oliva F, Del Frate D, et al. (2009). Peroneal tendons subluxation. Sports Med Arthrosc 17(2): 105-11.

Subluxation of the peroneal tendons is uncommon. It occurs especially in skiing, soccer, basketball, rugby, ice skating, judo, sprint, water-skiing, mountaineering, and gymnastics. We present an overview of the injury, with the classification commonly used. Many surgical techniques have been described to manage recurrent subluxation of the peroneal tendons, but only Level IV/Grade C evidence has been produced. Thus, randomized controlled trials are necessary to determine the best surgical management method. It appears that high-demand individuals should be primarily managed surgically, and retinaculoplasty seems to be, when indicated, the best surgical option: it affords less complications and a high rate of return to sports without reducing their activity levels.

Pidcoe PE, Burnet EN (2007). Rehabilitation of an elite gymnast with a Type II manubriosternal dislocation. Phys Ther.

BACKGROUND AND PURPOSE: This case report describes the rehabilitation of an elite, 15-year-old gymnast after a nonreduced type II manubriosternal dislocation. The rehabilitation took place in a gymnastics venue but was guided by a physician and a licensed physical therapist. CASE DESCRIPTION: The gymnast participated in a 13-week rehabilitation program for range of motion and strengthening that was based on a biomechanical hierarchy. Rehabilitation began at week 2 after injury for the lower extremities and at week 4 for the upper extremities. OUTCOMES: By week 4, the patient began upper-extremity strengthening, and by week 6, the patient had no pain with palpation and tolerated light sternal loading. At week 9, a plain-film radiograph revealed a stable manubriosternal joint, and by week 13, the patient returned to gymnastics pain-free. DISCUSSION: This case report shows that, after a 13-week regimen of progressive and repetitive, cyclical tensile and compressive loading, the manubriosternal joint was stable, and the elite gymnast was able to return to the sport, successfully competing in a regional competition.

Salbach H, Klinkowski N, et al. (2007). Body image and attitudinal aspects of eating disorders in rhythmic gymnasts. Psychopathology 40(6): 388-93.

BACKGROUND: Aesthetic sports, especially on a competitive level, are often considered as a risk factor for the development of an eating disorder. A few studies have examined this issue in rhythmic gymnasts, but no reports on body image disturbance exist for these athletes compared to anorectic patients. SAMPLING AND METHODS: Fifty elite rhythmic gymnasts (average age 14.8 years) including the German national team, 58 female patients with anorexia nervosa (AN; average age 15.5 years), and 56 high school girls (average age 14.9 years) completed the Eating Disorder Inventory-2 and the Test for Detecting Body Image Distortion in Children and Adolescents (Test zur Erfassung der Körperbildstörung bei

Kindern und Jugendlichen). Furthermore, body weight and height, body mass index, presence of amenorrhea and frequency of exercise were surveyed. RESULTS: Body mass index was significantly lower in the elite rhythmic gymnasts than in the high school students, and significantly higher than in the AN patients. Both the elite rhythmic gymnasts and the AN patients were significantly smaller than the high school students. The elite rhythmic gymnasts trained significantly more frequently compared with the AN group and the high school group. Regarding the Eating Disorder Inventory-2 and the Test for Detecting Body Image Distortion in Children and Adolescents, AN patients scored significantly higher on all explored subscales than both the elite rhythmic gymnasts and the high school students. CONCLUSIONS: Even though some physical similarities were found for the elite rhythmic gymnasts and the AN patients, contrary to previous studies, no noticeable problems related to attitudinal aspects of eating disorders were detected in the elite rhythmic gymnasts. A mildly distorted body image of the abdomen was identified in elite rhythmic gymnasts, while AN patients expressed a broad body image distortion and students expressed no body image distortion. Our data do not allow us to draw conclusions regarding prevalence rates, long-term effects or male athletes.

Schevchenko I, Abramov VV, et al. (2008). Medical supervision of young female athletes training in complex coordinational sports. Int J Adolesc Med Health **20**(3): 343-51.

This article proposes simple medical criteria that can be used by trainers and others for effective medical supervision of young female athletes. METHODS: The cross-sectional, age-stratified study compared girls 10-17 years of age involved in intensive training in gymnastic floor exercises, trampoline, or badminton. Each sport and/or control group was represented by 40-45 girls. Data included medical history, morphometric variables and observation of biological development. RESULTS: Gymnasts started training earliest (approximately 5-years-old) and trained most intensely (18-20 h/wk), followed by trampolinists and then badmintonists. Height, weight, body mass index, and % body fat were reduced in athletes, with gymnasts showing the greatest reduction. Athletes showed higher ratios of leg length to height and shoulder width/hip width, and smaller pelvic size compared to height. The average age of menarche of gymnasts was 13.8 (1.6 year later than controls). Delays of biological development of more than 2 years were common in athletes, and some gymnasts showed more than a 4-year delay. These delays were related to morphometric indicators of hormonal imbalance and to low body fat. Gymnasts had more childhood diseases, with an infection index of 2.8 compared to 1.1 for the control group, and had a higher level of chronic ENT problems. CONCLUSIONS: Trainers need to protect the health of athletes. During the course of training, anamneses, delayed menarche and other signs of delayed biological development must be monitored. Morphometric measures and indicators of biological development are proposed to provide simple criteria important in protecting the athletes' health.

Singh S, Smith GA, et al. (2008). Gymnastics-related injuries to children treated in emergency departments in the United States, 1990-2005. Pediatrics **121**(4): e954-60.

OBJECTIVE: The objective of this study was to describe the epidemiology of gymnastics-related injuries among children in the United States. METHODS: A retrospective analysis was conducted of data for children 6 through 17 years of age from the National Electronic Injury Surveillance System of the US Consumer Product Safety Commission for 1990 through 2005. Sample weights provided by the National Electronic Injury Surveillance System were used to calculate national estimates of gymnastics-related injuries. Injury rates were calculated for the most frequently occurring types of injury using gymnastics participation data. RESULTS: An estimated 425,900 children 6 through 17 years of age were treated in US hospital emergency departments for gymnastics-related injuries during the 16-year period of 1990-2005. The number of injuries averaged 26,600 annually. The

number of injuries sustained per 1000 gymnastics participants per year for the pediatric population was 4.8. The number of injuries sustained per 1000 participants per year was greater for the ages 12 to 17 years (7.4) than for the ages 6 to 11 years (3.6). The place where an injury occurred include school (40.0%), a place of recreation or sports (39.7%), home (14.5%), or on other public property (5.8%). The body parts injured were upper extremity (42.3%), lower extremity (33.8%), head/neck (12.9%), trunk (10.4%), and other (0.6%). Injury diagnoses were strain/sprain (44.5%), fracture/dislocation (30.4%), abrasion/contusion (15.6%), laceration/avulsion (3.7%), concussion/closed head injury (1.7%), and other (4.2%). The majority (97.1%) of patients with gymnastics-related injuries were treated and released from the emergency department. **CONCLUSIONS:** Gymnastics has one of the highest injury rates of all girls' sports. Establishment of a national database for gymnastics-related injuries, including exposure data for direct calculation of injury rates, would permit better identification and monitoring of risk factors for gymnastics-related injuries and aid in the development, implementation, and evaluation of injury prevention strategies based on epidemiologic evidence.

Soric M, Misigoj-Durakovic M, et al. (2008). Dietary intake and body composition of prepubescent female aesthetic athletes. Int J Sport Nutr Exerc Metab **18**(3): 343-54.

The purpose of this study was to assess dietary intake and body composition of prepubescent girls competing in 3 aesthetic sports (artistic and rhythmic gymnastics and ballet). Because physiological demands of ballet training are similar to those in other aesthetic sports, ballet dancers were, for the purpose of this study, regarded as athletes. The sample consisted of 39 athletes (median age, 11 years, range 9-13) and 15 controls (median age, 11 years, range 10-12). Dietary intake was assessed using a quantitative food frequency questionnaire, and body composition, by means of anthropometry. There was no significant difference in total energy intake between groups, but there was a significant difference in energy substrate distribution. Artistic gymnasts reported significantly higher carbohydrate and lower fat contribution to total energy (57% +/- 6% and 29% +/- 5%, respectively) than rhythmic gymnasts (48% +/- 6% and 36% +/- 5%), ballet dancers (51% +/- 4% and 34% +/- 3%), or controls (51% +/- 5% and 34% +/- 4%). Relative to body weight, artistic gymnasts reported higher intake of carbohydrates (9.1 +/- 4.2 g/kg) than rhythmic gymnasts (5.6 +/- 3.1 g/kg), ballet dancers (6.6 +/- 2.5 g/kg), or controls (5.4 +/- 1.9 g/kg). Artistic gymnasts also had the lowest body-fat percentage among the groups. In all the groups mean reported daily intakes of most nutrients were higher than the current daily recommended intakes. The exceptions were dietary fiber and calcium. The proportion of athletes with an inadequate reported intake was highest for phosphorus (33%), followed by vitamin A and niacin (18%) and zinc (13%).

Van Sonhoven F, Geusens E, et al. (2009). Osteochondrosis dissecans of the elbow. JBR-BTR **92**(4): 207-10.

This case shows a typical presentation of an osteochondrosis dissecans lesion on the capitellum, with associated intra-articular loose body(s), diagnosed on plain film. Osteochondrosis dissecans (OCD) is a rather common entity. Mostly the knee joint is involved. Only 5% of OCD lesions occur in the elbow joint. Possible causes of osteochondrosis dissecans include (repetitive) trauma (e.g. in throwing sports or gymnastics), ischemia, ossification defects, and genetic factors. Conventional radiography mostly has a low sensitivity to detect OCD lesions, and is often normal in early stages. CT is more sensitive to detect intra-articular loose bodies. MRI detects very early stages of OCD and radiographically occult lesions that may not be evident on CT.

Vormittag K, Calonje R, et al. (2009). Foot and ankle injuries in the barefoot sports. Curr Sports Med Rep **8**(5): 262-6.

Playing sports barefoot has been contested since the very beginnings of athletic competition. Even today, some data suggest that shoes may limit the adaptive pronation that occurs after footstrike during running gait. This pronation likely protects runners from injury. Boardsport participants who perform their sports barefoot on the water seem to be at risk for foot and ankle injuries. The high-impact forces in gymnastics place participants at risk for foot and ankle injuries, as well. Swimming and diving have a low rate of foot and ankle injuries. The risk of ankle sprain in beach volleyball, which is played barefoot, seems to be lower than that for indoor volleyball, played wearing shoes. Martial arts place competitors at risk for injuries to the foot and ankle from torsional and impact mechanisms. Athletes who hope to return to barefoot competition after injury should perform their rehabilitation in their bare feet.

Vrable A, Sherman AL (2009). Elite male adolescent gymnast who achieved union of a persistent bilateral pars defect. Am J Phys Med Rehabil **88**(2): 156-60.

An adolescent 15-yr-old male competitive gymnast presented to a university-based multidisciplinary spine institute with a persistent low-back pain for 18 mos. Although the results of x-rays were negative, his pain rendered him unable to compete in his sport any longer. A computed tomography scan was performed, which showed a bilateral pars fracture at L5, without spondylolisthesis. A nuclear medicine bone scan revealed negative findings, confirming chronic nonunion. The patient completed a 4-wk course of physical therapy 6 mos before our intervention, without any relief of pain or radiologic evidence of healing. The patient was treated with a bone stimulator for 4 hrs/day and was recommended to wear a warm-and-form-type brace. Isometric core trunk exercises were also initiated. Only after 6 wks of treatment, the subject showed clinical improvement at the follow-up visit. Computed tomography scan performed 12 wks after the initial scan showed complete union of the fracture correlating with clinical improvement. Two years later, the athlete remains completely pain-free, is training regularly, and is able to compete on a national and, possibly, international level.

Webb BG, Rettig LA (2008). Gymnastic wrist injuries. Curr Sports Med Rep **7**(5): 289-95.

During gymnastic activities, the wrist is exposed to many different types of stresses, including repetitive motion, high impact loading, axial compression, torsional forces, and distraction in varying degrees of ulnar or radial deviation and hyperextension. Many of these stresses are increased during upper extremity weight-bearing and predispose the wrist to high rates of injury during gymnastics. Distal radius stress injuries are the most common and most documented gymnastic wrist conditions. Other conditions include scaphoid impaction syndrome, dorsal impingement, scaphoid fractures, scaphoid stress reactions/fractures, capitate avascular necrosis, ganglia, carpal instability, triangular fibrocartilage complex tears, ulnar impaction syndrome, and lunotriquetral impingement. It is important to diagnose quickly and accurately the specific injury to initiate expediently the proper treatment and limit the extent of injury. In addition, a gymnast's training regimen should also include elements of injury prevention.

Wilson SM, Dubert T, et al. (2006). Extensor tendon impingement in a gymnast. J Hand Surg [Br] **31**(1): 66-7.

Wrist injuries in the gymnast are due to the transformation of the upper extremity into a weight bearing entity. Gymnast wrist pain presents a difficult diagnostic and therapeutic challenge. Here, we present a new case of extensor tendon impingement in an elite gymnast. To our knowledge, there is no similar report in the literature.