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TABLE OF CONTENTS

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Editorial

As chiropractors provide healthcare to a growing pediatric population, it behooves members of the profession to understand the complexity of "sport" and how it affects this patient population. The chiropractor's diagnostic skills are sharpened by understanding the ergonomics of any individual sport (the batter's swing, the cross country runner's gait, how the soccer goalie blocks the ball, etc.) as well as the most common injuries and how they are sustained — for example, the "clipping injury" in football when a player is tackled laterally to medially at the level of the knee when their foot is firmly planted on the ground resulting in a strain or rupture of the medial collateral ligament. Therapeutic skills need to encompass both acute and chronic care treatment protocols and state-of-the-art rehabilitation techniques ranging from applying KinesioTape to using a balance board or "Bozu".

The philosophy of chiropractic healthcare encompasses the whole child and includes not only the structural but also the biochemical, psychosocial, and mental/spiritual aspects of the child's well-being. The discussion in the chiropractor's office may range from appropriate nutrition to the effects of performance enhancing drugs on a child. It may also be about undiagnosed eating disorders and antisocial behaviors cultivated in an over-competitive environment. Chiropractors can enhance their care of a patient by familiarizing themselves with and making appropriate referrals for co-management to other professionals. These range from orthopedists, physiatrists, physical therapists and athletic trainers, to nutritionists and mental health providers who specialize in working with pediatric athletes.

Chiropractors can also provide community service by offering in-service training to teacher, coaches, support staff of local schools, recreation departments and private athletic organizations (Little League, schools of dance or gymnastics, martial arts dojos, skating rinks) or at organized athletic events such as the Junior Olympics or Special Olympics (which will be covered in detail in a future issue dedicated to this special population). They can offer screenings and clinics for parents and young athletes. In some states, chiropractors might also provide the service of performing athletic physicals (based on the local regulatory agencies).

This issue of the *Journal of Clinical Chiropractic Pediatrics* includes articles that demonstrate the inroads chiropractors have made in the sports world. It also includes articles that provide the practitioner with clinical information on nutrition, diagnostic imaging, ergonomics and rehabilitation designed to assist them when children with challenges associated with sports participation present in their offices. Early detection and correction of any sports-related compromise may prevent chronic injury, loss of playing time and interference with appropriate growth and development (both physical and mental) of these young athletes.

It has been a journey of discovery for the editors of this journal, one we hope you will travel with us.

Sharon A. Vallone, D.C., F.I.C.C.P.
Co-Editor

Children and Sport

RUSS EBBETS, D.C.

ABSTRACT

Introduction: With the growing concern over the health status of children in the United States, a solution offered by popular media and educational theorists alike is to promote the participation of youth in some form of regular exercise.

Objective: It is the objective of this paper to discuss the opportunities and challenges that arise when athletic opportunities for children shift from youth led recreation to highly structured activities.

Discussion: Some generally accepted components of athletic participation will be explored. Points to be discussed include: biomotor skill development, the age of specialization, volume and intensity, psychological factors, the role of winning and injuries and illnesses.

Conclusion: It is important for the coach or consulting physician to strive to be continuously aware of the demands of athletic participation, particularly at the entry levels. As with any activity there is the potential for benefit or abuse. Pursuit of post graduate education or a variety of sports certifications will serve to deepen the understanding of a sport's demands and allow for a fuller more factually based discussion regarding the best path for the proper preparation and training for the young athlete.

Key Words: Children, Sports, Specialization

Introduction

Rarely a week passes without a national media outlet bemoaning the current health status of children in the United States. The Center for Disease Control reports that currently 16% of American children are obese and that the obesity rate has tripled since 1980.[1] With these numbers slowly spiraling upwards and the looming complications of diabetes and heart disease, the focus seems well justified.

The Simple Solution

One of the solutions to the problem offered by popular media and educational theorists alike is to promote the participation of youth in some form of regular exercise. Numerous national sports governing bodies (NFL, NBA, US Soccer, USA Track and Field, NHL. etc.) have joined the chorus promoting various activities to separate the child from the computer and introduce him or her to fresh air.

But the solutions come with their own set of challenges. In American society the athletic opportunities for children have morphed over the last few decades into highly structured activities. Gone are the days of the neighborhood sandlot games. It seems, as often as not, the only athletic experiences available to today's youth are through structured, adult supervised activities, with the possible exception of skateboarding.

The reasons for this change are outside the scope of this article but this author will posit several issues that play a significant role in the transition of youth activities from self-directed to adult supervised including but not limited to, the liability issues surrounding the "attractive nuisance" of a vacant lot, the highly visible yet equally tragic reality of child abduction and the magnetic attraction of the visual media within our culture.

The Science of Sport

In spite of the current more structured reality of athletic opportunities, the potential of tracking positive outcome data increases when youth programs are developed with care and foresight. Certainly the Eastern Bloc satellites and the former Soviet Union ran successful sports schools and feeder programs that allowed a small country like East Germany to compete on par with the US and Soviet Union, countries that had 15-20 times the population base to draw from. First competing in the Winter Games of 1968 (placing 5th), East Germany progressed to place third, with the Soviet Union in first place and the United States second in the 1972 Summer Olympics. By the 1976 Olympic Games, East Germany won 40 Gold, 25 Silver and 25 Bronze medals passing third place United States (34/35/25) and second only to the Soviet Union (49/41/35).[2]

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How did the East Germans do this? The foundation of their sports system was talent identification, talent development and talent management. One of the great advantages the East Germans enjoyed was the small size of the country, roughly the size of Ohio. With their sports schools strategically located in the metropolitan centers they were able to centralize talented groups of individuals early in their careers, provide coaching and administrative support and mold the individual or team into a dynamic force.[3]

An important point to note was the physical testing the athletes underwent. Athletes were selected for certain sports or teams based on their performance on these physical tests. The tests were used to identify skills and abilities. The basis of this testing was the expression of the five biomotor skills (speed, strength, endurance, flexibility and the ABC's of agility, balance and coordination). Additionally, important consideration was given to anthropometric measurements of the athlete. These baselines were derived from years and years and thousands and thousands of athletes who had "come before" whose testing scores, height, weight, reaction times, jumping ability and other measures of speed and strength were used to create standard values.[4]

The "American" System

This method of talent identification runs counter to the American system of "free choice" that allows the young athlete to make his or her own decision as to what sport they will pursue. While free choice is part of the American ethos as often as not it has lead to misguided decisions. Everyday examples would be the blossoming 5'6" 12-year-old female with designs on becoming an Olympic gymnast or the 5'6" 16-year-old male who has designs on a college basketball scholarship and a career in the NBA. While American opportunities may have separated the child from an obsession with sedentary computer or video games, one has to ask if the best choice has been made for future development or success.

What about this development and success? There is an old coaching adage that elite performances are the result of 10,000 hours work over a 10-year period. Malcolm Gladwell in his book *Outliers* detailed the lengthy process necessary for one to acquire expertise in any discipline. Three to four hours training a day, 300 days a year becomes a difficult pill to swallow for a society with an "aspirin" mentality and a short attention span.[5]

The foregoing paragraphs raise another critical issue surrounding youth athletics. Is the goal of childhood sports long-term success or should the focus be on participation? There is no simple answer.

While one could argue strongly either side of the issue this author thinks that both sides would agree that regardless of the long-term goal the budding athlete needs to start somewhere.

Exactly where they need to start will be the focus of the remainder of this article. Some generally accepted components of athletic participation will be explored. Points to be discussed include: biomotor skill development, the age of specialization, volume and intensity, psychological factors, the role of winning and injuries and illnesses.

Biomotor Skill Development

All sporting activities are an expression of a combination of the five biomotor skills of speed, strength, endurance, flexibility and the ABC's of agility, balance and coordination. Any entry-level program, for it to truly service the needs of the athlete, must address and develop these skills.[6]

Sound training principles dictate that during the course of a workout each biomotor skill should be addressed. Regardless of the major focus of a sport or activity (speed, strength, power, etc.) overall development dictates that each skill must be frequently trained, ideally on a daily basis.[6]

The mastery of applied skills such as running, jumping, kicking or throwing need to be the focus of any entry-level program be it soccer, basketball or an individual sport like track and field, cross country or tennis. The goal is to prepare the athlete, in a general sense, with a broad-based athletic skill inventory that can be drawn upon come the age of specialization.

Age of Specialization

Another issue that is often hotly debated or unfortunately, often simply ignored, is the age of specialization. There comes a time in an athlete's life when participation in multiple sports becomes counterproductive. Participation as a two or three-sport athlete blurs the focus necessary for success at the higher levels.

Time is the limiting factor in athletic development. In theory that means that with enough time and daily improvement one could take any 12-year-old and make him or her an Olympic contender. The reality is that physical improvement stagnates by age 25 rendering this "theory" invalid.[4] Those athletically gifted who begin life with skills and abilities tested at the 95 or 98th percentile have a chance at achieving greatness.

Table 1. Age of Specialization Recommendations[4]

Sport	Suggested Start Age *(years)*	Age of Specialization *(years)*
Baseball	10-12	15-16
Gymnastics		
Girls	6-8	9-10
Boys	8-9	14-15
Football	12-14	16-18
Soccer	10-12	14-16
Distance Running	14-16	17-20
Tennis		
Girls	7-8	11-13
Boys	7-8	12-14
Swimming		
Girls	7-9	11-13
Boys	7-8	13-15

The age of specialization differs greatly for different sports or events *(Table 1)*. Because of this it becomes necessary for a nine- or ten-year-old female gymnast to dedicate herself at that age. Conversely, the budding football star may be better served with continuing to participate in multiple sports throughout high school (and possibly college) that continue to challenge and develop an inventory of athletic skills necessary for success in football.

It should be noted though that one can specialize too early. In this author's opinion this can have a detrimental effect on the young athlete as it will deprive them of activities and physical challenges that would broaden their athletic skill inventory, problem solving skills and potentially stifle other developmental opportunities that would be denied with early specialization.

Volume and Intensity

Volume and intensity are two training variables that represent "how much" work is done and "how hard" the workout was and what level of effort was required. In the adult these variables become a large component of work capacity. Work capacity can be quantified as pounds lifted, miles run, technical elements performed, pitches thrown, etc. Each sport discipline has benchmark standards, which are numbers that represent a degree of accomplishment that most elite performers could reproduce.[4]

The problem arises when the child is measured against the adult standard and they are trained as "little adults." Many of the adult principles regarding strength development, speed development, recovery rates, physiologic endurance goals or psychological coping skills do not appropriately apply when dealing with children. In fact when a coach does apply the adult workloads, long-term results are often disappointing if not disastrous, however well intentioned the coaching may be.

Children are not "little adults." A case in point is that of Richard Sandrak, born in the Ukraine on April 15, 1992, also known as Little Hercules, is a bodybuilder, martial artist and actor, renowned for his muscular physique at an extremely young age. Early specialization and celebrity status compromised any future promise and potential that Little Hercules might have had.[7]

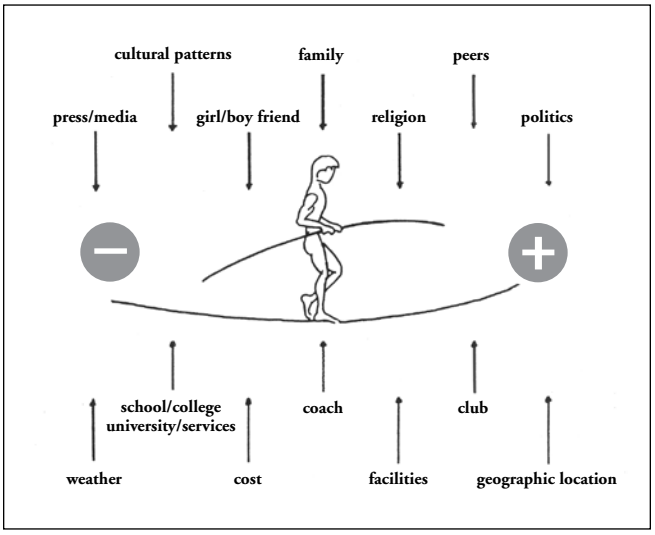
This poses a dilemma. What should the focus of childhood training be? Is it towards training and competition or growth and development? Tudor Bompa, regarded worldwide as the leading specialist in the area of theory of training, coaching and fitness states when training the young, "what is really important is managing the strain, the stress coming either as endurance training, lactic acid tolerance training and strength training."[8] Here this author emphasizes, "…don't fatigue the system". Workout design should not be so physically challenging that energies used to complete a workout are of such magnitude that they steal from those energies needed for growth and development.

What constitutes fatigue? It occurs when lactic acid accumulates, ATP/CP and glycogen stores are depleted and/or local physical (neuromuscular) weakness presents. Bompa recommended avoiding maximum loads opting for efforts under eighty percent.[8] Eighty percent effort may be difficult to quantify but a hands on the knees position or lack of desire to participate are significant clues that fatigue is present.

Ideally, entry-level programs should promote skill development without fatiguing the system.[9] It should be obvious that as the athlete matures there is a gradual transition towards increasing work capacity and competitive opportunities. How does one know? Therein lies the art of coaching, a subject for another paper.

In part this depends on the individual athlete which only further complicates the issue, especially with regards to a team sport. Added to the mix is the looming age of specialization and the ticking clock registering the 10 year,

Figure 1. The Stresses of Youth[18]



10,000 hours of training window to elite status. This is another example of the challenges and art of coaching.

Psychological Development

At an elite level the psychological component is often credited with being the difference between success and failure. Yogi Berra said, "90% of this game is half mental."[10] While such psychological concepts as visualization, guided imagery or scripting may be beyond the intellectual capacity of the average youth there are any number of psychological concepts that can be introduced and engrained as they are the concomitant "life lessons" that can result from sports participation. An excellent example would be UCLA Coach, John Wooden's "pyramid of success."[11]

Sports participation offers countless opportunities for socialization activities such as teamwork, fair play, respect for others, interpersonal communication, self-esteem building, goal setting, personal discipline. There are even opportunities for developing coping mechanisms for anxiety, stress and all the other factors that make up an adolescent's life. *(Figure 1)*[18]

Every effort should be made to promote these qualities as they will solidify into the core values that will help set one's moral compass later in life. The superstar and celebrity scandals that are the fodder for the television newsmagazines are evidence of this. In times of crisis or moments of doubt it is these deeply engrained core values that will prove to be the rudder of the ship and ultimately prove to be the best coping mechanism whether the outcome be victory or defeat.

The Role of Winning

"Winning isn't everything, it's the only thing."
– Vince Lombardi[12]

This quote, in many ways, summarizes all that is right and wrong with American sport. The unfortunate reality of our soundbyte culture is that this is the last line of a paragraph where Lombardi equated personal excellence and, doing the best you can, with winning. When viewed in this light, the striving for excellence is the only thing.

Most national governing bodies (NGB's) for sport discount the importance of winning in their entry-level programs instead opting for "success." Success is variously defined as self-mastery or personal improvement in such areas a team work, communication skills, etc. In this author's opinion as one masters the composite skills required to be on a team and if everyone on the team is on the same page, winning will take care of itself.

Dr. S. Danish, a registered sports psychologist of the Sports Medicine Division of the United States Olympic Committee, conducted a comprehensive survey in the 90's regarding early adolescent sports participation and concluded there needs to be a balance struck between sporting challenge and skill mastery. He found that if the challenge continually outweighs the current skill level, anxiety will be result. Conversely, boredom will result if the challenge is minimal. In either case the result will be an early departure from sport.[13] Yet another example of the art of coaching.

Because of this I have long felt that winning is a learned skill. Success is often not the result of doing one thing right but rather hundreds of little things right. Whether the "little things" are codified into rituals or the result of personal decisions based on core values they can be detailed as part of a competition plan. The sophistication of the plan is age dependent and it will evolve in complexity with maturity and specialization.

Coincidentally, Danish found that to the young athlete winning is of significantly lesser import than a number of other variables, ranking 10th on the list. *(Table 2)*[14]

Injuries and Illnesses

Pediatric sports related illnesses and injuries are a book in itself. Strains, sprains, head trauma, joint instabilities or growth plate problems could be discussed ad infinitum. While many of these maladies can be prevented or significantly reduced by attention to developing a strong foot or improving one's balance and proprioception the damage

Table 2. Why I Play Sports[13]

1.	Fun
2.	Improve skills
3.	Stay in shape
4.	Do something good at
5.	Excitement of competition
6.	Get exercise
7.	Play as part of team
8.	Challenge of competition
9.	Learn new skill
10.	To win

incurred by incidental contact cannot. My interpretation of the work of training theorist Vern Gambetta leads me to conclude that most non-contact sport related injuries are the result of poor program design.[15]

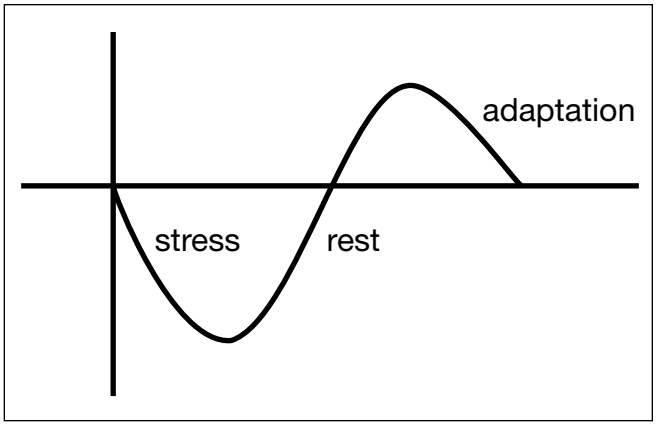
For many, athletic injury is part and parcel of the chosen sport. In fact the National Football League reports a 68% injury rate for its players during the course of a season.[15] Some believe it is closer to 100%.[16] But these are adults. Pediatric sporting injuries are more problematic because they not only preclude current sports participation they may also stunt future growth and development.

The body adapts to many of the stresses placed upon it, to a point. However, significant macrotrauma or recurrent microtraumas may limit normal growth in children. Fortunately, the incidence of injury can be reduced with careful program design and implementation. It is necessary to delve into training theory for a moment to illustrate this fact.

Modern training theory is an outgrowth of Hans Selye's work on stress from the 1950's. Russian sport scientists took Selye's stress curve and modified it to explain the stresses of daily training. Yakolev is credited with promoting the model that bears his name.[17] Graphically Yakolev's Model is a sequence of stress-rest-adaptation (Figure 2).[4] Repeated application of this model becomes problematic when applied to an entry-level sports population (generally children) as its application may violate principle "do not fatigue the system".

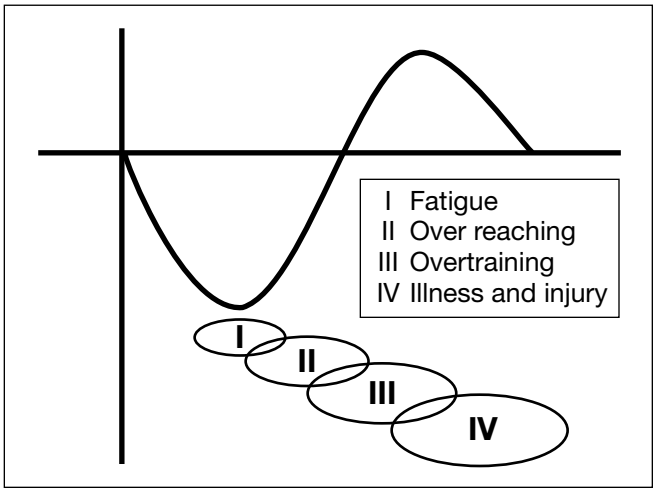
Athletic training needs to be a series of physical challenges followed by rest and recovery time that ideally develops the five biomotor skills. If too much work is done in too short a time period (a day, a week or a month) there is the potential for breakdown. Athletic improvement is a slow progressive process that generally requires over 10 years or 10,000 hours of training for one to attain elite status.

Figure 2. Yakolev's model[4]



Cumulative microtraumas over time without allowing enough time for recovery cause the athlete to descend progressively down the "y" axis from fatigue (1-2 days) to overreaching (3-5 days), over training (weeks to months) and finally illness and injury (weeks to months) (Figure 3). What exactly constitutes "illness and injury" is ultimately the weak link in an athlete's constitution. The problem may present as a stress fracture, growth plate injury, soft tissue injury or a physiologic imbalance that compromises immunity allowing for a cold or flu that precludes participation. Poor planning design may lead to psychological disturbances of anxiety or boredom which are at the heart of Danish's findings.[13]

Figure 3. Fatigue syndromes



Poor program design would include a lack of individualization in the training program, a rigid adherence to some preconceived plan or inappropriate training loads for an athlete at their particular stage of development. Individually or collectively these factors combine to surpass the recovery ability of an individual at their current state, fatiguing the system (and then some) and producing the negative sequelae.

This issue is at the crux of the debate regarding youth athletic participation — should it be training and competition or allow for growth and development?

The *Uneven Playing Field,* an expose on a high school girls' soccer program published by Michael Sokolove in the New York Times, notes the physical and emotional dilemma many athletes face following serious injury. Who should be responsible for preventing the long term effects that can evolve when the athlete returns to play in spite of pain and professional advise to the contrary? At present there appears to be an absence of any clear guidelines.[16]

Knowledge and experience lie at the heart of good coaching. Academic study may offer direction but there is no replacement for the skill that comes with the repeated application, the trial and error of field practice. While successful coaches can be glorified, idolized, even deified at the core of their success is the ability to blend the fundamentals of the sport with exceptional common sense, also known as the art of coaching.

Conclusion

At first blush the goals of elite sport science and performance based sport are diametrically opposed to the developmental goals of most entry-level youth athletic programs. But it can be counter argued that if the child is not properly "developed" they will never reach their potential.

What cannot be argued is that all things only grow once. It becomes imperative for the coach or consulting physician to strive to be continuously aware of the demands of athletic participation, particularly at the entry levels.

To that end answers to the following questions may offer some direction:

- Is the activity appropriate for the child's development?
- Is there a potential for growth plate injury?
- What stresses are placed on the body?
- Will the activity cause undue, long-term fatigue?
- Are the activities fun?

As with any activity there is the potential for benefit or abuse. This is not lost on the national governing bodies. It would behoove the sports minded physician to become familiar with the programs currently offered through the USOC or the NGB's. They may be well advised to pursue certification. This pursuit will serve to broaden one's horizons, deepen the understanding of a sport's demands and allow for a fuller more factually based discussion regarding the best path for the proper preparation and training for the young athlete.

References

1. CDC. Obesity, Halting the Epidemic by Making Health Easier: Ata Glance, 2009. *www.cdc.gov/chronicdisease/resounces/publications/AAG/obesity.htm*
2. Olympic.org. *http://www.olympic.org/en/*
3. Witt K. *Only with Passion.* New York: Public Affairs, 2005.
4. Bompa TO. *Periodization: Theory and Methodology of Training.* Champaign, IL: Human Kinetics 1999;16:35-6.
5. Gladwell M. *Outliers.* New York: Little, Brown and Co, 2008.
6. Ebbets R. First trimester chiropractic students' reactions to a multistation teaching Format for Learning Psychomotor skills. *J Chiropr Educ* 2002;16(2):107-113.
7. "The World's Strongest Boy — Young Bodybuilder Tells of Isolated Childhood". ABC News. 03-14-2005. *http://abcnews.go.com/2020/Health/story?id=570290.*
8. Ebbets R. Track coach talks to Tudor Bompa. *Track Coach.* Track and Field News: Los Altos, CA, 2001;164:5243-5247.
9. Ebbets R. "Skills and Drills." *Track Coach.* Track and Field News: Los Altos, CA, 2009;189:6034-6039.
10. Crouser D. *It's Unlucky to be Behind at the End of the Game.* New York: Quill, 1983.
11. Johnson N. *The John Wooden Pyramid of Success.* Los Angeles: Cool Titles, 2003:470.
12. Maraniss D. *When Pride Still Mattered: A Life Of Vince Lombardi.* New York: Simon & Schuster, 2000.
13. Danish S. *American Youth Sports Participation Survey.* Virginia Commonwealth University, 1990. unpublished document.
14. Gambetta V. Athletic Development. Champaign, IL: Human Kinetics, 2007:215.
15. Prince C. Bloody Sundays. *Pittsburgh Tribune Review.* January 9, 2005. Retrieved from: *www.pittsburghlive.com/x/pittsburghtrib/print.*
16. Sokolove M. "Uneven playing field." *NY Times Magazine,* May 11, 2008. Retrieved from *www.nytimes.com/2008/05/11/11/magazine.*
17. Viru A. Early contributions of Russian stress and exercise physiologists. *J Applied Physiol* 2002;92:1378-1382.
18. Dick F. *Training Theory.* Birmingham, Engl: British Amateur Athletic Board, 1991:15, 39.

Chiropractic Management of Elite Athletes Under 18 Years of Age: Chiropractic Participation on the United States Olympic Medical Team

GREGORY G. BRUNO, D.C., C.C.S.P., C.C.E.P.

ABSTRACT

Introduction: The world of elite athletes is embracing chiropractic as healthcare team players in the global sports world. The United States Olympic Committee (USOC) began utilizing chiropractors on their medical team in 1987. Since that time the number of chiropractors on the medical team has grown each year directly reflecting this demand for non surgical, non pharmaceutical intervention.

Objective: the objective of this paper is to review the author's experiences with injuries in elite athletes while serving as an intern at the United States Olympic Committee Sports Medicine Complex in Colorado Springs, Colorado in 2005.

Discussion: The predominant injuries addressed by this author, who served as an intern on the USOC medical team, varied by sport and, although there were clear associations between certain injuries and certain sports, injuries were not always predictable.

Conclusion: The most challenging job for the practitioner working with elite athletes was responding to the need of the athlete to resume play as quickly and safely as possible as well as communicating clear, precise recommendations for recovery for both their short-term and the long-term goals.

Key Words: chiropractic, elite athletes, United States Olympic Committee

Introduction

The world of elite athletes is embracing chiropractic as healthcare team players in the global sports world. The enforcement of strict requirements around the use of pharmaceuticals and monitoring thorough mandated drug testing[1] motivate these athletes to seek alternatives that effectively and rapidly return them to play at full capacity. Chiropractors have been on the forefront of this holistic revolution for many years, and they are ready to meet this growing demand.

Having worked extensively with many athletes under the age of 18 years providing chiropractic care as well as general sports injury management in his clinical practice, the author has served as an intern at the United States Olympic Committee Sports Medicine Complex in Colorado Springs, Colorado in 2005.

The Medical Team of the United States Olympic Committee

The United States Olympic Committee (USOC) began utilizing chiropractors on their medical team in 1987. Since that time the number of chiropractors on the medical team has grown each year directly reflecting this demand for non surgical, non pharmaceutical intervention. Currently, each medical team includes five chiropractors. The full team is comprised of medical doctors (orthopedists, physiatrists, etc), podiatrists, optometrists, physical therapists, athletic trainers and massage therapists. The athletes encountered in this Olympic environment are the best of the best, and any new medical team participant must quickly familiarize themselves with not only the athlete's motivation, but their injuries. The athletes share a unified set of goals: to practice and to compete. There are multiple sports and varied disciplines practicing at the facility and they are all housed under one roof. The volunteer medical staff bunks with the athletes to make them more accessible. This same staff needs to become functional immediately upon arrival without extensive orientation.[2]

During the summer months the athletes populating the complex are practicing and competing in the sports specific to the warmer seasons including baseball, basketball, swimming, archery, roller blade sports, volleyball, fencing, triathlon, and wrestling. Figure skaters are also in residents because they are the one group that will train all year.

Like the broad array of athletic activities represented, the medical team itself consisted of members of different backgrounds and disciplines bringing their individual

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clinical training and experience together to best serve these dedicated athletes under unusual and sometimes stressful circumstances. The injuries addressed by the medical team were as varied and wide-ranging as the number of popular sports practicing side by side in this large complex.

Injuries in Athletes under 18 years of age

Roller Blade Sports

In this author's experience the most common athletes in the under 18 age group were participating in the roller blade sports consisting of racing, team racing, roller hockey and distance skating. The types of injuries most commonly associated with these sports were injuries to the ankles and knees. The most frequent of these injuries were severe sprains to the ankle. In these cases, it is important to immediately initiate an aggressive physical therapy program, including unloaded kinetic exercises and a gradual, supervised return to practice and competition. It was expected that there would be a quick turn around and the athlete would be promptly returned to play. Fortunately, these athletes encountered here were some of the most resilient teens and pre-teens as a result of their excellent conditioning and demonstrated a rapid healing and recovery capacity. Initially the athlete was treated as quickly after the incident as could be accomplished. At the USOC, initial treatment consisted of ultrasound at 2.0 W/cm2 , underwater followed by light soft tissue mobilization. The treatments rendered, were used more frequently than with a non-athlete due to the needs for return to play and the high metabolic conditioning of these athletes. The most common technique used, and preferred by the athletes, is Graston Technique, an instrument assisted cross-fiber treatment shown to accelerate healing of soft tissue injuries.[3,4]

Other injuries in this age group included ACL tears and meniscal injuries. As a chiropractor these injuries would be managed by mobilization, soft tissue work and ultrasound therapy set to continuous at a high power for rapid healing and pain relief.

In this age group, it was important to manage the patient's injury by encouraging compliance to a specific treatment plan. For example, the growth plate is still active and makes the athlete susceptible to specific injuries that might not be seen in older athletes (i.e. Osgood Schlatter's, Sever's, etc.). It is critically important to manage the athlete's injury by encouraging compliance to a specific treatment plan to prevent re-injury or disability.

After ruling out a serious injury via the medical team approach, and outlining the treatment plan to the parents, coach and the athlete, the most frequently asked question is "when can I go back?" Of course the medical team's goal at an elite facility must be geared to support the athlete's ability to return to practice and competition. But most important for the provider is the question of what action is best suited to the total recovery and future for this patient. It can be challenging to communicate the importance of this recommendation to the parents, coach and to the athlete. It may prove difficult to effectively communicate this information without the provider cultivating a demeanor that conveys to his audience the gravity of the situation and the importance of the athlete following a prescribed treatment plan to recovery optimally. Chronic injury will not only hinder performance but may put an end to an otherwise promising athletic career.

Wrestling

Wrestling is another popular sport for this age group. The two most common injuries in wrestling are disc herniations and concussions. Disc herniations are debilitating and can lead to long term disability if not managed swiftly and appropriately. There is also a high incidence of disc herniations as well in this age group. These are most often a result of the impact sustained from sudden throws and slams to the mat as well as wrenching motions that often take place in this sport. These patients required aggressive chiropractic treatments as well as physical therapy and specific spinal traction to be able to return to full contact. This is initially provided on a flexion/distraction table and then may progress to intersegmental mechanical traction, at the provider's discretion.

Wrestlers are at risk for concussion. Most providers are aware of the ongoing and changing debate on concussions. The latest research for teenage athletes points to the dangers of repetitive concussions.[5,6] At these facilities concussions are very well documented and these documents travel with the athlete. The short and long term ramifications of concussion and increased risks of repeat occurrences are emphasized to both the athlete and the parents repeatedly.

Fencing

Fencing resulted in a number of teenage shoulder problems. In a skeletally immature athlete the demands on the shoulder joint while fencing are tremendous. Many bursitis and tendonosis cases as well as a few tears to the supraspinatus have been observed. Again, these types of injuries required extensive soft tissue therapy, mainly Graston Technique. Soft tissue techniques are effective and offer quick results promoting recovery of function as opposed to

passive physical therapy modalities or traditional athletic taping protocols. These athletes, like all the others, require aggressive management as they tend to want to return to competition before it is advisable. At times, it seems the biggest job of the health care provider is to repeatedly and clearly spell out the recovery process and the ramifications of failure to be compliant with the prescribed treatment plan.[7]

Gymnastics

The most common injury among the gymnasts were low back complaints. This was the group that required the most direct chiropractic interventions using specific joint manipulation and flexion/distraction of the lumbar spine which resulted in the best outcomes and return to athletic activity.

Spondylolisthesis was another common injury reported by gymnasts and swimmers. The aggressive stretching and positions required by this type of athlete are not judged to be biomechanically safe by many chiropractors It is only in the last four years that the USOC has banned these athletes from prone stretching of each other due to the propensity for increased spondylolisthesis incidents.

Conclusion

In conclusion, working with elite teenage athletes is a great opportunity to be exposed to some of the most hard working and successful young athletes in the world. It is also a unique opportunity for the practitioner to be exposed to a fast paced clinic where the goal is to return the athlete to competition quickly and safely. The predominant injuries vary by sport and, although there are clear associations between certain injuries and certain sports, injuries are not always predictable. The most challenging job for the practitioner working with elite athletes was responding to the need of the athlete to resume play as quickly and safely as possible with an aggressive treatment plan as well as communicating clear, precise recommendations for recovery for both their short-term and the long-term goals.

References

1. World Anti Doping Agency, Montreal, Canada. *http://www.wada-ama.org/en/*
2. Editors of Scientific American. Building the Elite Athlete. New York, New York: Nature Publishing Group, May 2007.
3. *www.GrastonTechnique.com*
4. Standish WD. Overuse injuries in athletes: a perspective. *Med, Sci in Sports & Exercise*1984;115(3):84-87.
5. McCroy P, Meeuwisse W, Johnston K, Dvorak J, Aubry M, Molley M, Cantu R. Consensus statement on concussion in sport: the 3rd international conference on concussion in sport. Zurich, Switzerland, November, 2008 Proceedings.
6. Putukian M, Aubr, Cant, R. Return to play after sports concussion in elite and non-elite athletes? *British J Sports Med* 2009;40(1):28-31
7. Orchard JW et al. The early management of muscle strains in the elite athlete: best practice in a world with limited evidence basis. *British J Sports Med* 2008; 42:158-159 doi:10.1136/bjsm.2008.046722.

Post-Traumatic Thoracolumbar Spinal Pain in the Adolescent Athlete: Recognizing the Significance of Subtle Radiographic Findings

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ABSTRACT

Many sports-related spinal disorders of the adolescent athlete have been extensively researched and, as a result, are well understood. A plethora of information is available to clinicians on conditions such as muscular strains, ligamentous sprains, spondylolysis/spondylolisthesis and acute vertebral fractures involving the vertebral body, spinous process or transverse processes. Less understood conditions exist, however, and for best management to occur an accurate diagnosis is critical. Athletes are often anxious to get back into competition, putting pressure on the clinician to quickly diagnose and treat athletic injuries. However, it is imperative that the clinician is alerted to less obvious traumatic conditions that, if not recognized early, can not only adversely affect athletic performance but may also compromise long-term spinal health. The initial plain film radiographic findings of some of these traumatic spinal injuries in the adolescent can be very subtle, therefore easily overlooked, and may lead to mismanagement of the athlete. This article will review the imaging features of two more commonly misunderstood conditions: the acute traumatic intraosseous disc herniation and the ring apophyseal fracture, both of which more commonly occur in the adolescent athlete than the non-athlete.

Key Words: adolescent athlete, pediatric trauma, traumatic intraosseous disc herniation, Scheuermann's disease, ring apophyseal fracture, posterior limbus vertebra, Schmorl's node, posterior Schmorl's node, anterior Schmorl's node.

Introduction

Many sports-related spinal disorders of the adolescent athlete have been extensively researched and are well understood. A plethora of information is available to clinicians on conditions such as muscular strains, ligamentous sprains, spondylolysis/spondylolisthesis and acute vertebral fractures involving the vertebral body, spinous process or transverse processes. Less understood conditions exist, however, and for best management to occur an accurate diagnosis is critical. Athletes are often anxious to get back into competition, putting pressure on the clinician to quickly diagnose and treat athletic injuries. However, it is imperative that the clinician is alerted to less obvious traumatic conditions that, if not recognized early, can not only adversely affect athletic performance but can also compromise long-term spinal health. The initial plain film radiographic findings of some of these traumatic spinal injuries in the adolescent can be very subtle, therefore easily overlooked, and may lead to mismanagement of the athlete. This article will review the imaging features of two more commonly misunderstood conditions: the acute traumatic intraosseous disc herniation and the ring apophyseal fracture, both of which more commonly occur in the adolescent athlete than the nonathlete.

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Traumatic intraosseous disc herniation (aka lumbar Scheuermann's disease)

Traumatic intraosseous disc herniation may produce considerable pain and disability in the adolescent athlete and plain film radiography is the best initial imaging choice when spinal trauma is suspected. However, if the clinician is unaware that the radiographic findings associated with this condition can be very subtle an accurate diagnosis may be delayed. As the weakest point of the vertebra, the end plate is vulnerable to injury especially during the growth phase as seen in the adolescent. Schmorl's nodes are defined as loss of nuclear material through the cartilage plate, the growth plate and the end plate with displacement into the vertebral body.[1] These may or may not be associated with trauma, producing a potential source of confusion for the clinician. Adding to this confusion, traumatic intraosseous disc herniation is frequently referred to as an "atypical" or "lumbar" Scheuermann's disease.[1-5] However, key differences exist between Scheuermann's disease and traumatic intraosseous disc herniation and it is imperative that the clinician appreciate these differences. In contrast to classic Scheuermann's disease in which the Schmorl's nodes are more central and involve multiple contiguous levels, the

Table 1: Key differences between Traumatic Intraosseous Disc Herniation and Scheuermann's disease

	Traumatic Intraosseous Disc Herniation	Scheuermann's disease
Typical mechanism of injury	Axial compression with flexion component	No known mechanism of injury
Radiographic characteristics	One or two vertebrae involved, usually T10 through L4	Three or more consecutive vertebrae each wedged 5 degrees or more with Schmorl's nodes or irregularity of the endplates
Location of Schmorl's node	Marginal location	Central location
Painful Schmorl's nodes	Yes	No
Findings on sequential radiographs	Evolution from poor definition of Schmorl's node to marginal sclerosis and cortication	Static appearance
Bone scintigraphy findings	Localized isotopic activity	Lack of isotopic activity

traumatic Schmorl's nodes (intraosseous disc herniation) are often found in the anterior part of the vertebral ring apophysis of the lower thoracic and the upper lumbar spine and usually involve just one or two vertebrae.[1-5] Although the Schmorl's node may be well visualized on radiographs, the clinician still needs to be aware that on occasion the initial plain film radiographs may not demonstrate the lesion. It is, therefore, imperative that the clinician carefully scrutinizes the radiographs for subtle changes such as intervertebral disc space narrowing. Radiographs suggesting diminished disc space height in the adolescent with excessive vertical compression/flexion impact to the spine suggest this underlying injury.[1,5,6] Early recognition of this condition may prevent long-term spinal pain. As the lesion of the marginal end plate evolves and becomes more evident on plain film radiography, marginal sclerosis may

Figure 1. *Note the L4/L5 intervertebral disc space narrowing with a Schmorl's node involving the anterior aspect of the superior end plate of L5.*

Figure 2. *MRI demonstrating displacement of discal material.*

Table 2. Imaging characteristics of Traumatic Intraosseous Disc Herniation

Plain film findings	Magnetic resonance imaging findings
Narrowed intervertebral disc space	Narrowed intervertebral disc space
Marginal Schmorl's node involving one or two vertebral levels may or may not be seen	Marked signal loss of disc on T2-weighted pulse sequence
As Schmorl's node evolves, marginal sclerosis and cortication may be visualized	Endplate defect with direct visualization of disc prolapsed beneath vertebral apophysis
	Associated marrow edema that may be localized or extend throughout the vertebral body (low signal on T1-weighted sequences, high signal on T2-weighted and STIR sequences)

become apparent. *(Figure 1)* This evolution of the lesion also suggests a traumatic etiology by comparison to static findings seen in classic Scheuermann's disease. Magnetic resonance imaging (MRI) is noninvasive and is highly sensitive for evaluation of traumatic as well as nontraumatic causes of back pain.[7] MRI allows for direct visualization of the displaced discal tissue as well as demonstrating the extent of this disorder.[6,7] *(Figure 1)* In addition to revealing the displaced discal tissue, MRI will also demonstrate the presence of associated marrow edema (low signal on T1-weighted sequences, high signal on T2-weighted and STIR sequences) supporting a traumatic etiology.[6,7] *(Table 1 and Figure 2)*

Ring apophyseal fracture (aka posterior limbus vertebra)

Another potential spinal condition affecting the vulnerable end plate that may be overlooked in our adolescent athlete is the ring apophyseal fracture. Similar to the traumatic intraosseous disc herniation, the radiographic features of this condition can be very subtle with the only indication being intervertebral disc space narrowing.[8] Again, it is important to emphasize that the clinician be astutely aware of the subtle radiographic findings and that the displaced ring apophysis, even when not directly visualized, may cause significant narrowing of the spinal canal.[8,9] *(Figure 4)* These patients often have an associated intervertebral disc

Figure 3. *MRI demonstrating surrounding bone marrow edema associated with traumatic intraosseous disc herniation.*

Figure 4. *Plain film radiographs in a young athlete demonstrating L4/L5 intervertebral disc space narrowing without direct visualization of displaced ring apophyseal fracture (see Figure 6).*

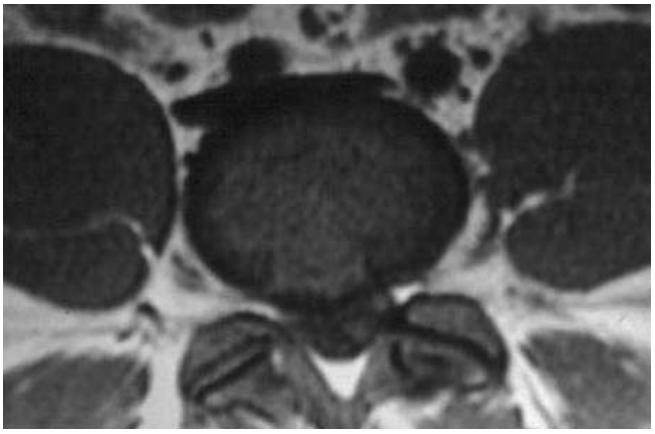

Figure 5. *MRI showing associated disc herniation in a patient with ring apophyseal fracture.*

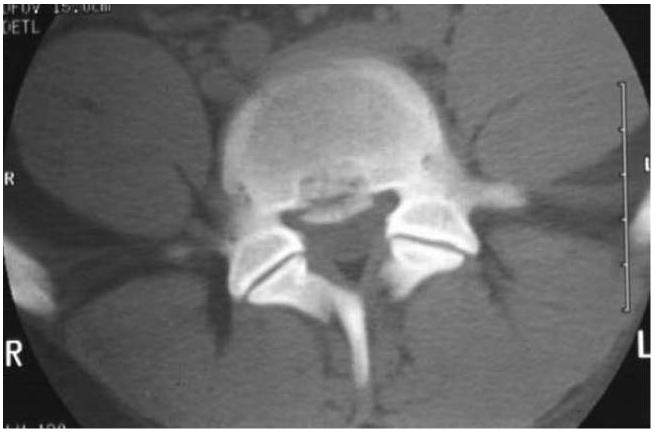

Figure 6. *CT demonstrating ring apophyseal fracture with cancellous bone narrowing significantly the spinal canal.*

herniation.[8] *(Figure 5)* If suspected, computed tomography will confirm presence of the fracture whereas MRI will be depict the associated intervertebral disc herniation. *(Figure 6)* Small apophyseal fragments may not have any long term spinal health impact, however, the presence of large apophyseal fragments may predispose the patient to chronic back pain.[8] Generally, rates of surgery are higher in the disc herniation patient with apophyseal fractures.[8] However, in these injuries surgical decision depends largely on clinical symptoms rather than radiographic findings.[8]

Conclusion

Both the traumatic intraosseous disc herniation and the ring apophyseal fracture, may significantly impact spinal health of the adolescent athlete. Accurate diagnosis will ensure best management. Awareness that the plain film radiographic findings are often subtle will alert the clinician to order advanced imaging. The effective utilization of MRI or CT will allow for prompt diagnosis with more expeditious and appropriate management.[8] An additional value of ordering MRI is the exclusion of nontraumatic causes of back pain such as inflammatory spondyloarthropathies, neoplasm, diskitis or osteomyelitis. Recognizing these conditions early will improve management and the ability to attain full and pain-free range of motion, appropriate spinal posture during sport activity and returning of the pre-deficit strength and endurance of the adolescent athlete. Furthermore, establishing an accurate early diagnosis with good management will help prevent complications with long-term spinal health.

References

1. McCall IW, William MP, O'Brien JP, Seal V. Acute traumatic intraosseous disc herniation. *Spine.* 1985;10(2):134-137.
2. Waicus KM, Smith BW. Back injuries in the pediatric athlete. *Current Sports Medicine Reports.* 2002;I:52-58.
3. Kruse D, Lemmen B. Spine injuries in the sport of gymnastics. *Current Sports Medicine Reports.* 2009 Jan;8(1):20-8. Available from: *http://ezproxy.wschiro.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=36261163&site=ehost-live.*
4. Jackson DW, Wiltse LL. Low back pain in young athletes. *Physician & Sportsmedicine.* 1974;2(11):53-60. Available from: *http://articles.sirc.ca/search.cfm?id=11036; http://ezproxy.wschiro.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=SPH11036&site=ehost-live; http://articles.sirc.ca/search.cfm?id=11036.*
5. Rachbauer F, Sterzinger W, Eibl G. Radiographic abnormalities in the thoracolumbar spine of young elite skiers. / anomalies radiographiques de la region lombo-thoraciques chez des jeunes skieurs de haut niveau. *Am J Sports Med.* 2001 July;29(4):446-9. Available from: *http://articles.sirc.ca/search.cfm?id=S-805041; http://ezproxy.wschiro.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=SPHS-805041&site=ehost-live; http://articles.sirc.ca/search.cfm?id=S-805041.*
6. Seymour R, Williams LA, Rees JI, Lyons K, Lloyd DCF. Magnetic resonance imaging of acute intraosseous disc herniation. *Clinical Radiology.* 1998;53:363-368.
7. Greenan TJ. Diagnostic imaging of sports-related spinal disorders. *Clinics in Sports Medicine.* 1993;12(3):487,487-505.
8. Chang CH, Lee ZL, Chen WJ, Tan CF, Chen LH. Clinical signifiance of ring apophysis fracture in adolescent lumbar disc herniation. *Spine.* 2008;33(16):1750-1754.
9. Browne TD, Yost RP, McCarron RF. Lumbar ring apophyseal fracture in an adolescent weight lifter. A case report. *Am J Sports Med.* 1990 Sept;18(5):533-5. Available from: *http://articles.sirc.ca/search.cfm?id=265355; http://ezproxy.wschiro.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=SPH265355&site=ehost-live; http://articles.sirc.ca/search.cfm?id=265355; http://www.aossm.org/.*
10. Baker RJ, Patel D. Lower back pain the athlete: Common conditions and treatment. *Prim Care Clin Office Pract.* 2005;32:201-229.

The High School Sports Examination

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ABSTRACT

This paper describes the services chiropractic practitioners can offer high school athletes to enhance their athletic performance. The major areas required for the clinician to complete basic high school screening examinations are also outlined.

Key Words: chiropractic, sports physical examination, sports participation physical examination, preparticipation physical examination

Introduction

The purpose of mandatory high school sports screening is to ensure that the athlete is healthy and physically capable of competing, which should also minimize the risk of injury. This practice was developed for the benefit of the athlete as well as for the prevention of liability for the school. If the sports screening is administered properly, the individual athlete (and his/her parents) should have the reasonable expectation that the possibility of the existence of an undetected pre-existing condition has been ruled out. It is this author's contention that chiropractors are qualified to perform the high school sports screening. The chiropractor's comprehensive history and physical examination are ideal tools for gathering the information needed to complete a competent screening. As the sophistication of the high school athlete evolves, both physically and mentally, the chiropractor can serve his or her community and patients by participating in the evaluation of these young students. The chiropractor's education has equipped him or her to detect the biomechanical abnormalities and/or dysfunctions which can lead to a higher occurrence of injuries in young athletes.

Discussion

It is tragic when a high school student suffers a catastrophic event on the playing field. According to Bob Colgate, assistant director of the National Federation of School High School Athletic Associations, there were seven high school football-related deaths and one in high school soccer, from July 1, 2008 through September 30, 2008.[1] Could these deaths have been prevented through the correct utilization of a well-designed sports screening? Investigations into the deaths show that some may have been preventable. Although four of the deaths were trauma-induced, three seemed to be related to heat. The heat-related deaths may have had underlying causes which may have been detected through a pre-screening process. The question of an underlying, undetected cause arises when a death is caused from the elements. Why do some individual's systems fail while others remain unaffected? For some reason, those who succumbed did not have the same ability to adapt to their environmental stress as did their teammates. Thoroughly evaluating youthful athletes before they embark on their training venues would be a valuable contribution of the chiropractic profession.

The Screening

The screening itself is simple and aligns with the general focus of chiropractic. Most chiropractic offices are readily equipped to perform the basic screening and exam. The school district or individual high school provides the form to the potential student athlete. The form consists of a systems review portion for the athlete/parent to fill out and the exam portion for the examining physician to complete.

The medical history is a vital tool in the athletic preparticipation evaluation. When completed and thoroughly reviewed, it provides the physician with information to decide if an athlete can safely compete in a particular sport. The athlete's medical history should focus on the sports they wish to or currently participate in, previous and current diseases, surgeries, hospitalizations, previous and current injuries, cardiovascular abnormalities, musculoskeletal abnormalities, current treatments and medications. If the athlete's medical history suggests the presence of any problems, question him or her for further details, order appropriate diagnostic testing and consider referral for further evaluation of these problems.

Many athletes are minors and their medical and surgical histories must be obtained with a parent or guardian present. If this is not convenient, history forms may be completed and then sent to a parent or legal guardian for his or her signature. Without the parent's or guardian's participation or at least approval, the athlete's history can-

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not always be considered reliable. Chiropractors should also be careful to obtain fully informed consent from the athlete and his or her parents or guardian. This informed consent should be provided verbally allowing adequate opportunity for questions as well as obtaining the patient's and parent's or guardian's signature on an appropriate form to be maintained in the patient's chart and updated with any new injury or treatment plan.

In reviewing pre-participation exam forms from all over the United States, one notes that they are very similar. Many established tools have been developed to facilitate the collection of key medical information. Forms are readily available that are jointly recommended by the American Osteopathic Academy of Sports Medicine (AOASM), the American Academy of Family Physicians (AAFP), the American Medical Society for Sports Medicine (AMSSM), and the American Orthopaedic Society for Sports Medicine (AOSSM).[2] Because of their sources, most of the forms reviewed include "MD" or "DO" after the signature. It should not be assumed that an exam from a DC will not be accepted, but it is a gray area that requires individual research in the chiropractor's own state or local area. First, the chiropractor should check with his or her State Board of Chiropractic Examiners to make sure that sports screenings are within the chiropractic scope of practice. Second, carefully review the form to see if it specifically states the requirement that an MD or DO perform the exam. Chiropractors should check with their local school board for clarification. A few of the school district administrators interviewed by the author stated that they do not accept screenings performed by DCs because their liability insurance only accepts those performed by MDs or DOs. Others indicate that, although the titles of MD and DO are the only physicians listed on the form, they do accept screenings performed by a DC based on their individual scope of practice guidelines or local regulatory designation.

Figure 1 is an exam form that is used by the schools in the author's district. In reviewing this form, one can see that it is in an oversimplified format. Ten different physicians may approach the exam in ten different ways; the screening can be performed in as little as three to five minutes, or it can be an outline for a very extensive and thorough examination. Some practitioners approach sports physicals as thorough, periodic health evaluations, whereas others consider these evaluations to be risk-based screening examinations. For example, as most sports injuries are musculoskeletal in nature, this author focuses significant attention on the biomechanical portion of the exam without neglecting the other components of the comprehensive evaluation.

The chiropractor, by education, should be able to fulfill the requirements of the examination and to fill out even the most detailed forms. It is also this author's opinion that if a chiropractor does not feel competent in performing any aspect of this important evaluation (for example, auscultating the heart and ruling out murmurs or arrhythmias), then he or she should decline to perform the examination and refer the patient to another DC or other qualified healthcare professional, instead of doing an incomplete examination which could leave the athlete vulnerable to an undetected pre-existing condition.

Reiterating the goals of the pre-participation sports exam, the practitioner is attempting to determine the athlete's general health and level of fitness, assess size and developmental maturity of the athlete, detect any conditions that would predispose or increase the risk of injury to the athlete (including any preexisting injuries, congenital anomalies or poor conditioning).

The timing of performing the pre-participation physical is important. It should be performed approximately 6 weeks before the onset of the sports season because this period affords time for the further evaluation and treatment (or rehabilitation) of any problems that are discovered. Furthermore, unconditioned athletes may have an opportunity to improve their conditioning in this time to help prevent potential injuries. Exams performed too close to the season will not allow for recovery or rehabilitative time for any discovered injury or de-conditioning. Exams performed too early allow too much time for other conditions to develop, and the findings of the initial evaluation may no longer be up to date. It is the recommendation of this author that students who participate in multiple sports/multiple seasons would benefit from evaluation 6 weeks before each season.[3]

The typical pre-participation sports physical should include:

- **Physical observation:** It is often helpful to observe static posture, gait, and general mobility as your patient walks to the examination room. Once the patient is gowned or dressed in shorts, the chiropractor should perform a general evaluation of physical habitus attendant to physical detail: observe the skin (for example, infectious skin lesions would eliminate a student from participating in contact athletics like

Figure 1. Sports screening assessment.

SPORTS SCREENING ASSESSMENT

STUDENT'S NAME (PRINT) _____

DATE OF BIRTH _____ SEX: ☐ M ☐ F GRADE _____

ADDRESS_____

CITY_____ STATE _____ ZIP _____

PHONE _____

WEIGHT: _____ HEIGHT: _____ BLOOD PRESSURE: _____ /_____ PULSE: _____ RESP: _____

CIRCLE APPROPRIATE FINDINGS:

LUNGS: CLEAR WHEEZING RALES OTHER _____ **PEAK FLOW** _____

CARDIAC: RRRsM: MURMURS _____**/6: ARRTHYMIAS OTHER** _____

ABDOMEN: NORMAL (SOFT, BOWEL SOUNDS NL, NO MASSES) **OTHER** _____

HERNIAS: (INGUINAL, MALES ONLY) **FOUND NOT FOUND**

NECK: (NORMAL ORM): **YES NO** (CHIN TO CHEST, 90 DEG ROTATION, EAR TO SHLD R AND L, 45 DEG EXT)

MUSCULOSKELETAL: CHECK ASYMMETRIC ROM, MUSCLE IMBLALANCE, JOINT LAXITY, DEFORMITY, PAIN/SWELLING

CIRCLE ANY JOINT WITH ABNORMAL FINDINGS AND ELABORATE:

SHOULDER _____

ELBOW _____

WRIST _____

HAND _____

BACK _____

HIPS _____

KNEES _____

ANKLES _____

FEET _____

EVALUATION (CIRCLE ONE)

1. UNLIMITED ATHLETIC PARTICIPATION

2. MAY PARTICIPATE PENDING FURTHER EVALUATION

Recommendation for further W/U _____

Referral to: _____

3. LIMITED ATHLETIC PARTICIPATION

Orthopedic limitations _____

4. ATHLETIC PARTICIPATION DENIED

Reasons _____

SIGNATURE OF EXAMINING/EVALUATING PHYSICIAN: _____

DATE: *(Mandatory)* _____

Table 1.
Classification of Hypertension by Age Group[3]

Age Group	Significant Hypertension, mm Hg		Severe Hypertension, mm Hg	
	Systolic BP	Diastolic BP	Systolic BP	Diastolic BP
Children				
6-9	122	78	130	86
10-12	126	82	134	90
Adolescents				
13-15	136	86	144	92
15-18	142	92	150	98

Source: Report of the Second Task Force on Blood Pressure Control in Children, 1987.[3]

wrestling); fingernails (cyanosis); appearance of skin (sweating, flushed, mottled or pale); enlargement of the thyroid, lymph nodes; abnormalities of the eyes, etc. Also of note are tattoos, bruising, cuts, scrapes, and potential needle marks.

- **Vital signs:** height and weight (is the patient mature enough to compete in a specific sport (like football) or at a specific level, or is there an indication of an eating disorder?); heart rate; blood pressure *(Table 1);* pupil reactivity (for example, anisicoria could be an indication of previous head injury); and visual acuity. Vitals should be performed pre- and post-exercise and compared. To achieve this, the patient should perform jumping jacks for one minute. The doctor should observe for an appropriate increase in heart rate and note any changes in the heart rhythm as the rate increases. Any presence of cyanosis or unusual breathlessness following the exercise should also be noted.

  After completing the vitals, auscultation of the heart, lungs, and bowel sounds is performed. This is an area where critics feel that chiropractors do not have sufficient expertise. If the chiropractic field clinician does not feel experienced enough to determine normal heart sounds from common murmurs and arrhythmias, congestion, consolidation or air flow restriction in the lungs or normal bowel sounds, he or she should refer the athlete to a practitioner who is more experienced in these important areas.

  If the chiropractor detects any cardiac irregularities, he or she is responsible for referral of the athlete to a cardiologist or the family's usual physician for clarification of findings. One of the most common causes of sudden cardiac death in athletes is hypertrophic cardiomyopathy. The classic murmur in this anomaly is a systolic murmur along the left sternal border, which is accentuated by Valsalva maneuvers and standing; the murmur decreases with handgrip and squat maneuvers.

  The internet provides excellent resources for continuing education to refresh or fine tune one's ability to differentiate a variety of heart sounds. An example, of an excellent web site to review heart sounds is from the University of Washington *(http://depts.washington.edu/physdx/heart/index.html).*[5]

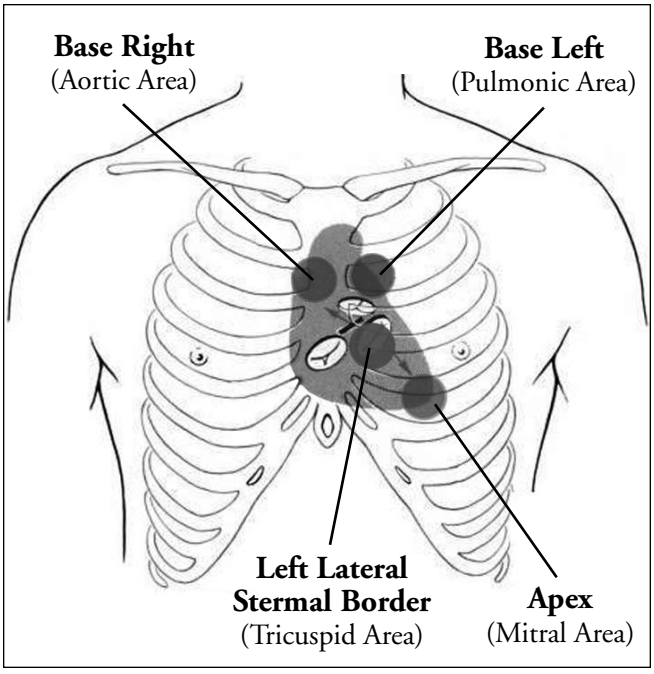
- When auscultating the heart for murmurs or irregular rhythms, auscultation should be obtained with the patient in at least 2 positions (usually sitting and supine), which increase the likelihood of detecting subtle abnormalities. There are four locations at which to listen which provide the clearest sounds. Each spot enhances the sounds of a specific heart valve. They are: Base Right (second intercostal space on the right) for the aortic valve; Base Left (second intercostal space on the left) for the pulmonary valve; Apex (fifth intercostal space on the left midclavicular) for the mitral valve; and Erb's Point (third intercostal space on the left) for the tricuspid valve *(Figure 2).*

- Next, auscultate the lungs. It is essential to listen to all five lobes of the lungs, starting at the clavicle next to the sternum, and moving to the opposite side. Then, move inferiorly listening at each intercostal space. From there, move out to the lateral area of the lungs. Finally auscultate the posterior chest wall Check for rales, rattles, crackles, and especially expiratory wheezes which may disclose an undetected condition. There are also numerous web sites that offer auscultation tutorials.[7,8]

- Now, proceed to the abdomen and listen for the presence of sounds in all four quadrants. Normal bowel activity should be detected immediately in a well-fed, healthy teen. It is the absence of sound that would be of concern and require a referral for further investigation.

- Palpate all four quadrants of the abdomen to rule out organomegaly, especially splenomegaly (because of the risk of rupture in contact sports). Palpate

Figure 2.



along the abdominal midline, looking for any notable pulsations along the abdominal aorta. The absence of the pulses help to rule out aneurisms.

- The last thing to examine on male athletes is the inguinal area to rule out the possible presence of direct or indirect inguinal herniations.
- The next part of the screening with which chiropractors should be very familiar is the musculoskeletal exam. The following are specific items that will help pinpoint potential problems:

1. Evaluate spinal and extremity ranges of motion (shoulders to fingers, hip to foot includingpatellar tracking to movement and strength of the toes). Always compare range of motion bilaterally, comparing one side against the other since within teens and young adults there is a wide range of "normal." Rule out scoliosis upright and in flexion.
2. Some of the more common musculoskeletal derangements found to be problematic are: anterior shoulder rotation, as often seen in scoliosis or young women who are developing early and are shy about breast development,pronated or supinated feet, as well as inversion and eversion of the foot.
3. Any biomechanical abnormality, dysfunction, or their concommittant compensations will increase the likelihood of future injury. It is this author's opinion that all athletes with such biomechanical dysfunctions would benefit by chiropractic care to correct the dysfunction. It is up to the doctor in each individual case to determine if the abnormality or dysfunction in question is severe enough to exclude the student from playing their sport.
4. All sports have some degree of risk associated with play, and it is the examiner's responsibility to ascertain if the athlete has an increased risk of injury.
5. Some physicians include performance testing in their evaluation. Flexibility can be tested through complex goniometric measurements or simple observation by putting the patient through specific ranges of motion. Endurance measurements may include a timed run, maximal weight lift, vertical leaping and may be best performed in the gym by the coach or trainer if the physician's office is not equipped for these activities.

Clearance for Sports Participation

An athlete can be medically cleared for full sports participation or restricted sports participation based on the medical history and physical findings of their pre-participation physical. The results of the physical may also clear him or her to participate in one sport but not another; the physician must be specific in his or her recommendations to the athlete and the coaching staff. If the athlete is deemed fit for unrestricted participation in a contact sport with high dynamic and static physical demands (like cycling, football and ice hockey), he or she is most likely fit to compete in any sport. Restricted participation may be based on the athlete's physical ability to compete in contact vs non-contact sports. Some athletes who may not be able to physically endure the contact involved in basketball, football or hockey, may be able to participate safely in limited or non-contact sports like baseball, crew, gymnastics or golf.

Some athletes may be cleared with specific qualifying instructions to the athlete and coach. Examples include athletes who have atlanto-axial instability; a heart murmur; only one kidney; have epilepsy or exercise-induced asthma. Alerting all parties to the best ways to manage the specific condition allows the athlete to participate without increased risk of injury. Athletes who may have a suspicious history or symptoms that are not ruled benign in the exam (ie a sus-

pected murmur or a suspected concussion) may have their clearance deferred until further evaluation is performed. In rare cases, an athlete may be disqualified from participation in a specific sport. Whether this is reversible depends on the reason and may not preclude their participation in a sport of lower risk.[3]

Communicating What Chiropractic Has to Offer

Performing the high school sports screening is a great opportunity for reaching the teenage athletes in one's community. Chiropractors may wish to communicate to their current patients, as well as local schools and recreation departments that conduct athletic activities, that they are available to provide sports screenings. Another way to reach a larger group within the community is to offer services to the coach or booster club and set up a group screening at the school or recreation department. Many doctors charge a flat cash fee for each athlete, then donate all or part of the proceeds back to the team. This allows one-on-one contact with a developing athlete and introduces them to the benefits of chiropractic care to their overall health and athletic performance.

Chiropractors working with these young people may wish to let them know that many professional and top amateur athletes are routinely examined for biomechanical dysfunction and/or subluxations, and that there are now several chiropractors that serve on US Olympic training teams.[9] If the school district does not allow chiropractors to perform the exams, it is possible to partner with a DO or MD (not necessarily an orthopedist.) to become involved in this area. The "partner physician" will perform the physical exam; and the chiropractor will complete the musculoskeletal and biomechanical evaluation. In these situations, the "partner doctor" will need to sign off on the form.

Conclusion

The mandatory high school sports screening is an often over-looked area that may be included in chiropractic practice. The format is virtually universal across the country, yet the same form can be interpreted very differently by different doctors. Historically, the focus of sports screenings (the detection of biomechanical dysfunction) is the forte of chiropractors. Chiropractors can educate their community on the unique perspective they bring to sports screening. Every high school athlete deserves the right to receive the opportunity to take their health and athletic performance to the next level.

References

1. newbserver.com. *http://blogs.newsobserver.com/prepsnow/high-school-athletics-deaths-up-nationally#ixzz0j3lpqoTy*
2. American Academy of Family Physicians, American Academy of Pediatrics, American College of Sports Medicine, American Medical Society for Sports Medicine, American Orthopedic Society for Sports Medicine, American Osteopathic Academy of Sports Medicine. *Pre-participation Physical Examination.* 3rd ed. Minneapolis, Minn: McGraw-Hill; 2004:1-82.
3. Saglimbeni AJ. Sports Physicals. Emedicine. Feb 28, 2010. *http://emedicine.medscape.com/article/88972-overview*
4. Task Force on Blood Pressure Control in Children. National Heart, Lung, and Blood Institute, Bethesda, Maryland. Report of the Second Task Force on Blood Pressure Control in Children 1987. *Pediatrics.* Jan; 1987;79(1):1-25.
5. University of Washington Department of Medicine. Advanced Physical Diagnosis. Heart Sounds and Murmurs. *http://depts.washington.edu/physdx/heart/index.html*
6. *http://www.ecconline.info/assets/images/a_auscultation_areas.jpg*
7. The Auscultation Assistant. *http://www.wilkes.med.ucla.edu/inex.htm*
8. Kaelin M. Auscultation: Listening to Determine Dysfunction. Professionalization of Exercise Physiology. August 2001;4(8).
9. College Athletic Trainer's Society. *http://www.collegeathletictrainer.org/resources/usoc.html*

Does Evidence Support the Use of Performance-Enhancing Supplements in Youth Sports? A Qualitative Review of Literature and Policy

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Introduction

Doctors of chiropractic (DCs) see approximately 10% of the US population in a given year making them among the most visited practitioners outside of conventional medicine for general health problems and especially back and neck conditions.[1,2] In addition, one of the fastest growing areas of specialty treatment is in the area of sports injury. Today, most professional teams, the US Olympic Team, and many college or high school sports programs have a DC either on staff or available to treat athletes as part of the sports medicine team.[3,4] There are also specialty programs for training of DCs in the area of sports medicine as well as pediatric care.[5]

Current research available from the National Board of Chiropractic Examiners (NBCE) and other studies that have assessed the nutritional recommendations made by DCs indicates that nutritional supplementation is a large part of many chiropractic practices.[2,6,7] Evidence also indicates an increasing incidence of spinal problems for adolescents in general.[8] With this will likely come an increase in numbers of adolescents seeing DCs for sports related injuries and other back-related health conditions.

The purpose of this paper is to describe the use of nutritional supplements for enhancement of sports performance in young athletes along with any national policies that exist related to this topic. This will benefit DCs treating young athletes as they seek to improve clinical outcomes and assist those athletes in their efforts to improve at sports.

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Background

In 2008-09, almost 8 million athletes participated in organized high school sports, the largest group of participants to date.[9] Additionally, over 44 million youth athletes play in organized leagues each year in the United States.[10] The experiences of youth participating in sports are seen through a societal lens as beneficial for growth and physical and personal development and are generally encouraged. These experiences however can differ greatly based on competitive level, length of season, cost to competitors, qualifications of coaches and officials, and skill level of athletes. Given this, it is crucial that information about health related areas such as sports nutrition be accurate and based on protection of the young athlete's health, rather than performance. Misinformation in the general media and consumer marketing by sports nutrition companies, namely dietary supplement manufacturers, can cause coaches, parents, and athletes to be confused about using these products, at times resulting in unhealthy and potentially dangerous nutritional practices. While proper nutrition is one factor that can contribute to making sports a positive experience for adolescents and is recommended by most national nutritional organizations, supplementing the diet of healthy young athletes with performance enhancers is generally not warranted. This paper will overview the proper precautions health professionals, including DCs, need to take when discussing performance enhancing dietary supplements. It will also review national policy statements by leading organizations in the field regarding performance enhancers with a focus on an athlete's health and not performance.

Performance-Enhancing Dietary Supplements and Young Athletes

The popular notion exists that for active athletes, extra emphasis should be placed on supplementing the diet with products that promise to enhance performance. Athletes, coaches, (and parents) are often lured by promises made by over-the-counter dietary supplement manufacturers, particularly those marketed as sports supplements. Claims

of increased lean muscle mass, speed, endurance, fat loss, and recovery appeal to athletes across all sports, and coaches often emphasize that dietary supplements are a necessary training tool. In one national study, of 414 high school and college coaches surveyed, 87% believed dietary supplements to be safe, and 80% of coaches surveyed spoke to their athletes regularly about supplements. With 92% of coaches surveyed believing that more athletes were turning to dietary supplements than ever before, approximately 77% said they often or sometimes recommended supplements. Perhaps most alarming, when asked where coaches obtained the latest studies and information about dietary supplements, 77% of coaches said magazines, newspapers, and websites.[11] In reality, little if any evidence suggests that a healthy athlete in training needs to go outside current recommended nutritional requirements for active young adults. That has not stopped this issue from becoming one that is hotly debated, both within the nutrition and sports industries, and within society in general.

Traditional sports aside, there is a growing trend among young athletes to compete in extreme sports such as skateboarding, wakeboarding, surfing, bodyboarding, snowboarding, and inline skating. Another clear trend is the increase in females participating at every level of sport. The National Youth Council reports that female participation in youth sports increased in every age group other than the 16-to-18 year old age group while male participation has decreased in every age group other than the 16-to-18 year old age group.[10] In 1972, one in 27 females participated in high school sports; by 2001; that figure had grown to 1 in 2.5, an increase of more than 800%.[10] With this growth trend it is very concerning that data on use of sport supplement products by females is almost unknown. With such a potential pool of athletes, it is little wonder that the CDC reports a 300% increase in anabolic steroid use of among youth under 18 years of age.[12] Among published reasons for use, young athletes report improving performance, muscle development, treating illness, helping with growth, and combating tiredness.[13] Influences on use by young athletes consistently cite parents, peers, coaches, the media, professional athletes, health food stores, and health clubs or gyms.[13]

Current levels of legislative oversight have allowed sport supplement products to flourish. In 1994 the Dietary Supplement Health and Education Act (DSHEA) was passed; and, with very few changes, is still in effect today.[14] A crucial outcome of the DSHEA was that ingredients found in dietary supplement products were now exempt from premarket evaluations for efficacy and safety that were required for new food ingredients. Once products become available for consumer use, the Food and Drug Administration (FDA) is tasked with addressing complaints and reports of adverse effects. The burden of proof is placed on the FDA, not on the manufacturer, to identify dietary supplement ingredients that may cause harm to the user. Until recently, the consumer of these products was asked to assume that safety standards have been met by the supplement maker and not by any federal agency. New Current Good Manufacturing Practice (CGMP) regulations in August of 2007 will help to improve the quality of ingredients in these products.[15]

The dietary supplement industry is a rapidly growing market. Based on industry sales data from 1994 to 2000, sales of dietary supplements have been increasing at an annual average rate of 12% per year across all product categories.[16] In 2008 the dietary supplement industry saw profits of $25.2 billion dollars of which sports supplement products accounted for 2.2 billion.[17] There are estimates of 30,000 dietary supplement products currently on the market; what part of that number are sports supplement products is difficult to estimate.[18]

While the national debate plays out in the scientific and athletic arena, the focus of concern remains on the scarcity of long-term clinical evidence to support dietary supplement products in young athletes for performance reasons or otherwise. Creatine, the most popular dietary supplement today and a household word had total sales of $400-500 million in 2006.[19] While creatine is currently not banned by any organized sports agency and athletes are not tested for use, there are concerns regarding its use by young athletes. Highly researched, creatine has been the subject of well-controlled studies to gauge its effectiveness as an ergogenic aid. Almost all experimental studies have been on adult athletes. Few clinical trials exist for healthy athletes under the age of 18; rarely would an institutional review board agree to test a non-prescription product with healthy subjects under the age of 18 "just to see what happens." This holds true for sport supplements as a whole; sadly there are products that are targeted to "athletes" as young as four years old.[20] From a health care standpoint, this is highly unethical. In May of 2007, the state of New Jersey took the ultimate step in proposing the banning of the sale or distribution of creatine and other similar performance-enhancing substances to minors. This New Jersey law was approved by the Senate Law, Public Safety, and Veterans Affairs Committee.[21]

Policy Statements

As the debate over the use of performance-enhancing

supplements continues, national organizations representing both health care professionals and young athletes have weighed in with policy statements on this topic. In 2004 the American Academy of Pediatrics began a discussion on Performance-Enhancing Substances, and subsequently published a policy statement entitled "Use of Performance-Enhancing Substances".[22] In 2004 the AAP wrote:

> *"The temptation of using performance-enhancing drugs and supplements as shortcuts to improving athletic performance or even to enhance appearance is very seductive to adolescents. Pediatricians need to rely on research when available, stay current on trends in athletes' drug and supplement use, and discuss the individual athlete's concerns when they arise. A reasonable strength and conditioning program and a well-balanced diet must be presented as a sensible alternative to a riskier shortcut training approach. It is important to recognize that release and widespread use of new supplements often occur before significant clinical study of benefit and adverse effects takes place. Virtually no data are available on the efficacy and safety of widely used performance-enhancing substances in children and adolescents.* ***The American Academy of Pediatrics strongly condemns the use of performance-enhancing substances and vigorously endorses efforts to eliminate their use among children and adolescents."*** *[22, p.1]*

Focused mainly on athletes under the age of 18, the subsequent policy's major recommendation was that use of performance-enhancing substances for athletic or other purposes should be strongly discouraged. Among the position paper's strongest points was the recognition that these substances may pose a significant health risk to younger individuals. The position paper also encouraged parents, coaches, and school and sports organizations to stress whole, nutritious foods to young athletes, and to seek out appropriate professional and clinical resources regarding this issue.[23]

The National Federation of State High School Associations is the national leadership organization for high school sports in the US and represents 185,000 high schools and over 11 million students involved in athletic and activity programs. Their Sports Medicine Advisory Committee Position Statement on Supplements[24] clearly articulates their philosophy:

> *"The NFHS Sports Medicine Advisory Committee (SMAC) strongly opposes the use of dietary supplements for the purpose of athletic advantage. Research data shows widespread use of dietary supplements by adolescent and high school athletes, despite considerable safety concerns. Dietary s upplements are marketed as an easy way to enhance athletic performance, increase energy levels, lose weight, and feel better. It is proven that adolescents are more susceptible to advertising messages and peer pressure, increasing the risk of dietary supplement usage. This can create a culture more concerned about short term performance rather than overall long term health.*
>
> *The NFHS SMAC discourages the use of supplements by athletes due to the lack of published, reproducible scientific research addressing the benefits and documenting long term adverse health effects of the supplements, particularly in the adolescent age group. Dietary supplements should be used only upon the advice of one's health care provider. School personnel and coaches should never recommend, endorse or encourage the use of any dietary supplement, drug, or medication for performance enhancement.*
>
> *We recommend that coaches, athletic directors, and school personnel develop strategies that address the growing concerns of using dietary supplements. Such strategies may include conversations with athletes and their parents about the potential dangers of dietary supplement use. Athletes should be encouraged to pursue their goals through hard work and good nutrition, not dietary shortcuts."* *[24, p.1]*

The National Collegiate Athletic Association (NCAA)[25] also has a strict policy regarding performance enhancing products among its student-athletes.

> *"An institution may only provide permissible non-muscle-building nutritional supplements to a student-athlete for the purpose of providing additional calories and electrolytes. Permissible nutritional supplements do not contain any NCAA banned substances and are identified according to the following classes: Carbohydrate/electrolyte drinks, energy bars, carbohydrate boosters and vitamins and minerals."* *[25, p. 201]*

Policies such as these provide clear and salient arguments against recommending performance enhancing supplements to youth athletes. When the athlete's health is considered to be the top priority, the ethical and scientific

evidence provides the final critical piece of the debate.

Recommendations for Clinicians

Until such time that the DSHEA allows for greater regulation of sports supplements, nutrition and sport personnel should proactively and collectively discourage their use, and encourage use of whole foods as part of a training regimen. The following three recommendations from the AAP are particularly useful for DC's when working with young athletes:

1. Inquiries about the use of performance-enhancing substances should be made in a manner similar to inquiries about use of tobacco, alcohol, or other substances of abuse. Guidelines for patient confidentiality should be followed and explained to the patient.

2. The pediatric health care professional providing care for an athlete who admits to using a performance-enhancing substance should explore the athlete's motivations for using these substances, evaluate other associated high-risk behaviors, and provide counseling on safer, more appropriate alternatives for meeting fitness or sports-performance goals.

3. Pediatric health care professionals should promote safe physical activity and sports participation by providing or making available sound medical information on exercise physiology, conditioning, nutrition, weight management, and injury prevention and by helping to care for sports related medical conditions and injuries.

Clinicians treating adolescents involved in sports should always take a complete history on the patient including a detailed history related to drug and supplement history. Should the patient report use of sport supplements, the clinician must discuss the potential dangers of the products and should include the parent in the conversation as well. Dialogue related to why an athlete is taking the product may open up an opportunity to discuss healthy eating and a diet conducive to healthy sport participation.

In addition to warning the athlete and parents about potential dangers in use of sport supplements, messaging related to safe play and safe return to play after injury will be a part of any advisory role the DC may have with this subset of athletics. Partnership with school superintendents, athletic directors, athletic trainers, coaches and parents groups to educate about the use of these products should be an area the DC can work. However, parents, coaches, and some DCs may be advising the use of sport supplements and this may provide a barrier to accomplishing guidelines or restrictions on their use. A list a helpful websites and resources can be found in Table 1.

Table 1. Websites and Resources for Clinicians

• American Academy of Pediatrics	***www.aap.org***
• The National Center for Drug Free Sport	***www.drugfreesport.com***
• National Collegiate Athletic Association (NCAA)	***www.ncaa.org***
• National Federation of State High School Associations	***www.nfsh.org***
• American College of Sports Medicine	***www.acsm.org***
• American Medical Society for Sports Medicine	***www.amssm.org***
• Consumer Lab *(Independently tests dietary supplements and reports findings)*	***www.consumerlab.com***
• The National Athletic Trainers Association	***www.nata.org***

Conclusion

There is substantial evidence to discourage use of performance enhancers by young athletes. Furthermore, health care professionals have an ethical obligation to promote healthful practices among young adults; in this regard evidenced-based recommendations must take precedence over consumer trends. Given that playing youth sports is regarded as a positive activity in a young person's life and should be encouraged, adults who can have an impact on healthful decisions should do so with the young athletes' best interest in mind. DCs should be familiar with the most accepted policies on use of sport enhancing products, ask athletes about their use, and advise them to avoid these substances whenever possible.

References

1. Ndetan, HT, Bae, S, Evans, M, Rupert, R, Singh KP. Characterization of health status and modifiable risk behavior — United States adults using chiropractic care as compared to general medi-

cal care. *J Manipul and Physiol Therap* 2009, 32(6):414-422.

2. Christensen MG, Kollasch MW. Job Analysis of Chiropractic: A project report, survey analysis and summary of the practice of chiropractic within the United States — 2005. NBCE. 2005. Greeley, CO.
3. Nichols AW, Harrigan R. Complementary and alternative medicine usage by intercollegiate Athletes. *Clin J Sport Med* 2006;16(3):232-237.
4. Uchacz GP. 2010 Olympic Winter Games chiropractic: the making of history. *J Can Chiropr Assoc* 2010;54(1):14-16.
5. The Certified Chiropractic Sports Physician. American Chiropractic Board of Sports Physicians. Accessed at: *www.acbsp.com* April 5, 2010.
6. Walker BH, Mattfeldt-Beman MK, Tomazic TJ, Sawicki MA. Provision of nutrition counseling, referrals to registered dietitians, and sources of nutrition information among practicing chiropractors in the United States. *J Am Diet Assoc* 2000;100:928-933.
7. Holtzman D., & Burke J. Nutritional counseling in the chiropractic practice: a survey of New York practitioners. *J Chiro Med* 2007;6:27-31.
8. Jeffries LJ, Milanese SF, Grimmer-Somers KA. Epidemiology of adolescent spinal pain. *Spine* 2007;32(23):2630-2637.
9. The National Federation of State High School Associations. 2008-2009 High School Athletics Participation Survey, September 18, 2006. Accessed March 28, 2010 at: *http://www.nfhs.org/content.aspx?id=3282&linkidentifier=id&itemid=3282*
10. National Council of Youth Sports. NCYS Membership Survey, 2008-09. Accessed April 3, 2010 at: *http://www.ncys.org/pdf/marketResearch.pdf.*
11. GNC Nutrition Centers. Eighty-seven percent of coaches believe supplements to be safe, July 22, 2002. Accessed April 2, 2010 at: *http://gnc.mediaroom.com/index.php?s=43&item=77.*
12. Centers for Disease Control and Prevention, "Youth Risk Behavior Surveillance — United States, 2003," *MMWR.* Vol 53; May 21, 2004.
13. Sobal, J, & Marquart, LF. Vitamin/mineral supplement use among athletes: A review of the literature. *Int J Sports Nutr.* 1994; 4:320-334.
14. Dietary Supplement Health and Education Act, Public Law 103-417, 103rd Congress, 1994.
15. Food and Drug Administration. Final Rule Promotes Safe Use of Dietary Supplements, June 22, 2007. Accessed April 3, 2010 at: *http://www.fda.gov/Food/DietarySupplements/GuidanceComplianceRegulatoryInformation/RegulationsLaws/ucm079496.htm.*
16. Muth MK, Domanico JL, Anderson DW, Siegel PH, Bloch LJ. Dietary Supplement Sales Information: A Final Report. Prepared for DHHS/Food and Drug Administration, Contract No. 223-96-2290: Research Triangle Park, NC: Research Triangle Institute; October 1999.
17. Nutrition Business Journals Sports Nutrition and Weight Loss Report — Executive Summary, 2009. Accessed March 30, 2010 at: *http://lib.store.yahoo.net/lib/nbj/supreptoc.pdf.*
18. Food and Drug Administration. Accessed April 2, 2010 at: *http://www.fda.gov/Food/DietarySupplements/default.htm*
19. Nutrition Business Journal. Accessed March 29, 2010 at: *http://subscribers.nutritionbusinessjournal.com/supplements/science_lines_up_beta_0906/wall.html?*
20. Wilson, D. A Sports Drink for Children is Jangling Some Nerves. New York Times, September 25, 2005. Accessed April 2, 2010 at: *http://www.nytimes.com/2005/09/25/sports/othersports/25drink.html*
21. Codey/Girdelli bill banning sale of creatine to minors passes committee, press release May 21, 2007. Accessed April 3, 2010: *http://www.njsendems.com/*
22. American Academy of Pediatrics, Section on Sports Medicine and Fitness. Sports shorts: performance-enhancing substances. Accessed April 3, 2010 at: *www.aap.org/family/sportsshorts12.pdf.*
23. American Academy of Pediatrics Committee on Sports Medicine and Fitness. Use of performance enhancing substances. *Pediatrics.* 2005;115;1103-1106.
24. National Federation of State High School Associations Sports Medicine Advisory Committee Position Statement on Supplements, 2009. Accessed April 3, 2010: *http://www.nfhs.org/content.aspx?id=3325*
25. National Collegiate Athletic Association 2009-2010 Division 1 Manual. NCAA bylaw 16.5.2.g. Accessed April 3, 2010: *http://www.ncaapublications.com/p-3934-2009-2010-ncaa-division-i-manual.aspx*

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Return to Play Considerations in an 11-Year-Old Boy Following a Football Injury

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ABSTRACT

The purpose of this case report is to describe a pediatric chiropractic patient presenting with neck pain and limited range-of-motion following multiple traumas during participation in sports. Discussion is presented on the impact of a common normal variant x-ray finding in pediatric patients, the patient's response to chiropractic care and issues related to pressure exerted on the physician, by the parent, for premature return-to-play.

Key Words: chiropractic; neck pain; pseudosubluxation; return-to-play.

Introduction

Ten percent of the 10,000 cervical spine injuries that occur annually in the United States are secondary to athletic participation.[1] Cervical spine injuries occur at all levels in sports ranging from recreational to organized participation, including football, wrestling, and gymnastics. Of these, football mishaps account for the highest number among children, claiming nearly one third of all sports-related cervical spine injuries.[2,3] The decision of return-to-play following cervical spine injuries, especially in children, can be very challenging with a wide variation of opinion concerning appropriate management.[4,5] The majority of cervical spine injuries among children occur between 10-12 years of age and the upper cervical spine is frequently involved in this age group.[2,6,7]

Adding to the challenge of management is that spinal injury often presents in children with minimal or equivocal signs using x-ray examination, so that advanced imaging is sometimes needed for accurate diagnosis.[2,8] Pseudosubluxation in the upper cervical spine is estimated to be present in approximately 1 out of 5 children, and this also complicates the assessment of children who have a history of trauma.[9] Additionally the physician may face intense pressure from coaches, trainers, other physicians, parents or the child to return to play prematurely.[10-12] The following case report describes an 11-year-old boy with neck pain following a football injury. Issues related to attempts to influence the decision of the physician related to return to play are discussed.

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Case Report

History: An 11-year-old boy, accompanied by his father, presented to a private chiropractic clinic complaining of significant neck and upper back pain and difficulty turning his head. Prior to the visit, while calling to schedule the appointment the chiropractor (after a brief discussion of the problem) encouraged the father to immediately obtain x-rays of the neck at a local imaging center so that fracture or other significant injuries could be identified. The father brought the x-rays and report to the visit. They described the onset of mild neck pain following a full-contact football practice one week prior, with more significant neck pain during a full-contact football practice three days prior. The patient did not stop participation during the initial onset period but felt enough pain following a head-to-head hit during the recent practice to immediately stop participation. The father, who was present during the most recent practice, reported that the coaching staff attended to the boy, assisted him off the field and suggested he seek care prior to return-to-play.

They denied any loss or alteration in consciousness at the time of contact. The boy stated that he felt "electrical" sensations in both arms for a few minutes after the contact at the recent practice. The boy and his father denied any history of back or neck injury and previous fracture or surgery. The boy was not taking any medication, and family history was noncontributory. He denied current alteration in sensation in his extremities. At the time of his visit he complained of neck and upper back pain (described as a 5.3 on a visual analog scale) and stated that he was unable

Figure 1. *Example of pseudosubluxation in neutral positioning*

to move his head backward or turn his head.

Examination: The patient displayed significant limitation in active cervical extension and right cervical rotation, with these movements associated with apparent significant pain (quantified as 9.2 on a visual analog scale). Active cervical flexion was mildly decreased and only moderately painful. Cervical compression testing was mildly provocative, causing apparent localized neck pain, especially in the region of the cervicothoracic junction, but did not produce radicular symptoms. Deep tendon reflexes were normal in the upper and lower extremities, and there was no gross extremity weakness or apparent alteration in sensitivity in the extremities. Cranial nerves II–XII were grossly intact. No bruits were present in the neck. Palpation revealed apparent tenderness at the C1 TVP on the left and over the spinous processes of C7 and T1. The sternocleidomastoid muscles were not tender, and the anterior neck was symmetrical with no apparent swelling or lymphadenopathy.

Diagnostic Imaging: The father brought cervical x-ray films accompanied by a radiologist's report, which the chiropractor had ordered previously. Radiographic views obtained included obliques and flexion/extension views of the cervical spine, although the patient was unable to move into an extended position for the study. The x-rays were read as normal by the medical radiologist in his report but upon review the chiropractor was concerned over the appearance of apparent forward displacement of the C2 vertebra upon C3 during flexion. In addition the chiropractor noted that there was significant loss of the normal lordosis with no other abnormalities noted. Although the chiropractor was aware that this appearance of a pseudosubluxation at C2 is occasionally present in children and considered physiologically normal, he was concerned due to the history and presentation of the complaint and ordered an MRI to further evaluate the cervical spine with emphasis on ligamentous structures and to rule out other occult problems. The father agreed to obtain an MRI examination of the boy's cervical spine and the imaging study demonstrated loss of lordosis but was otherwise normal.

Intervention: Since diagnostic imaging proved negative for significant structural alteration, the chiropractor proposed a trial of chiropractic care to the father and the patient. After a discussion of the findings, plan and discussion of the risks of cervical manipulation the father provided consent for the child to undergo a trial of chiropractic care. Additionally the parent gave consent to have personal health information published in a journal without divulging personal identifiers. The patient was treated with a combination of diversified (high-velocity, low amplitude) manipulation to the cervicothoracic region using a malar contact with cavitation, and instrument-assisted manipulation (with an Activator IV instrument) to the C1 transverse process on the left without cavitation, and manipulation of posterior ribs 1 through 4 bilaterally, again using instrument-assisted manipulation. In addition the patient was treated with instrument assisted soft tissue mobilization using Graston Technique directed to the posterior muscles in the paraspinal cervicothoracic and cervical regions. The patient improved dramatically after one visit with 75% improvement in active extension and with immediate significant reduction in pain. The patient was pain free with normal active range of motion after 3 visits (during 1 week) and maintained this pain free report at the end of week 2. In spite of the reduction in pain and return to full, active movement there was very moderate apparent weakness in cervical movement with resisted active flexion and extension.

On the third visit, the chiropractor started the patient on a program of cervical strengthening exercises (with emphasis on improving cervical extension strength as well as the deep neck flexors) to do in the office and at home. These included isometric resistance exercises, progressing

Figure 2. *Another example of pseudosubluxation in neutral positioning.*

to graded, light resistance strength training using a playground ball against a wall as well as latex bands held by the patient's father. The chiropractor demonstrated the exercises to the father and the patient, encouraging slow movements primarily done in all planes of motion including flexion, extension, and bilateral lateral bending, with 1 additional set for the extension movement.

The chiropractor recommended continued avoidance of contact for a minimum of four weeks to allow full development of strength and to evaluate for continued full pain-free active and passive movement. The father balked at this suggestion and stated that he felt that his son was so improved that he could return to his team quickly. The chiropractor stated that he was not comfortable with this and released the patient, explaining that he felt that the boy needed additional treatment, primarily strengthening and then further ongoing evaluation, either by a chiropractor, physical therapist and/or a pediatric orthopedic surgeon. He also sent a registered letter to the patient's father restating his concerns, clearly stating that he was not releasing the boy to return to contact, and encouraging further strengthening and evaluation prior a return to contact sports.

Discussion

This case describes the partially successful treatment and ill-advised return-to-play of an 11-year-old boy after a football injury. Complicating this case was the presence of pseudosubluxation of C2, which mimics the appearance of ligamentous injury and prompted the chiropractor to obtain special imaging prior to initiation of treatment. Among the normal radiological variants of children, pseudosubluxation is the most frequent.[9] The pseudosubluxation occurs when there is a slight (less than 2mm usually) anterolistheis of C2 or C3 in patients under the age of 15 or 16.[7-9] Figures 1 and 2 display examples of pseudosubluxation as it appears on plain film x-ray. The entity is not uncommon in children and is considered to be of no clinical significance but can be confusing when presented with a patient with a traumatic history. Presentation of this normal, physiological variant can lead to expensive and unnecessary imaging and incorrect treatment of a patient, but in this case special imaging was warranted as this child had a multiple, significant trauma and potentially significant injury, and importantly was planning to return to contact sports activities.[6] In addition a confusing element related to this finding is that ligamentous injuries in children following trauma more commonly affect the same region (C1-C2) that is commonly associated with pseudosubluxation.[9]

Conclusion

Return-to-play decisions should be guided by the patient's physical and neurological complaints, physical examination and appropriate evaluation. Complicating this case was the father's insistence of allowing his child to return to contact as the boy became non-painful, rather than allowing the boy to adequately regain full motion and strength. In addition to symptomatic and structural evaluation, return-to-play decisions should be individually based upon functional evaluation looking at the athlete's ability to perform pain-free active range of motion with adequate strength and no pain provocation with movement or resisted movement. The absence of pain alone is not an appropriate rationale for return-to-play. Additional consensus on return-to-contact sports following neck injury in children is needed.

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References

1. Vaccaro AR, Watkins B, Albert TJ, Pfaff WL, Klein GR, Silber JS. Cervical spine injuries in athletes: current return-to-play criteria. *Orthopedics.* Jul 2001;24(7):699-703; quiz 704-695.
2. Brown RL, Brunn MA, Garcia VF. Cervical spine injuries in children: a review of 103 patients treated consecutively at a level 1 pediatric trauma center. *J Pediatr Surg.* Aug 2001;36(8):1107-1114.
3. Bailes JE, Hadley MN, Quigley MR, Sonntag VK, Cerullo LJ. Management of athletic injuries of the cervical spine and spinal cord. *Neurosurgery.* Oct 1991;29(4):491-497.
4. Eddy D, Congeni J, Loud K. A review of spine injuries and

return to play. *Clin J Sport Med.* Nov 2005;15(6):453-458.

5. Morganti C, Sweeney CA, Albanese SA, Burak C, Hosea T, Connolly PJ. Return to play after cervical spine injury. *Spine* (Phila Pa 1976). May 15 2001;26(10):1131-1136.
6. Dogan S, Safavi-Abbasi S, Theodore N, Horn E, Rekate HL, Sonntag VK. Pediatric subaxial cervical spine injuries: origins, management, and outcome in 51 patients. *Neurosurg Focus.* 2006;20(2):E1.
7. Lustrin ES, Karakas SP, Ortiz AO, et al. Pediatric cervical spine: normal anatomy, variants, and trauma. *Radiographics.* May-Jun 2003;23(3):539-560.
8. McCall T, Fassett D, Brockmeyer D. Cervical spine trauma in children: a review. *Neurosurg Focus.* 2006;20(2):E5.
9. Shaw M, Burnett H, Wilson A, Chan O. Pseudosubluxation of C2 on C3 in polytraumatized children — prevalence and significance. *Clin Radiol.* Jun 1999;54(6):377-380.
10. Morganti C. Recommendations for return to sports following cervical spine injuries. *Sports Med.* 2003;33(8):563-573.
11. Clover J, Wall J. Return-to-play criteria following sports injury. *Clin Sports Med.* Jan;29(1):169-175, table of contents.
12. Vaccaro AR, Klein GR, Ciccoti M, et al. Return to play criteria for the athlete with cervical spine injuries resulting in stinger and transient quadriplegia/paresis. *Spine J.* Sep-Oct 2002;2(5):351-356.

Driven To Win: Recognizing Over-Competitive Behavior in Pediatric Patients

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ABSTRACT

Chiropractors care for children of all ages, from many backgrounds and with varied interests. Children are encouraged from an early age to participate in competitive activities to enhance cognitive and physical development. Many of these children may exhibit over-competitive behaviors which may become detrimental to their health. Over-competitiveness is found in children participating not only at the elite level in sports, but in drama, music, academics and become intertwined and possibly interfere with their social development. This paper discusses where it might begin and the yellow flags that chiropractors may note in the pediatric history or regular office visit. Options chiropractors may consider for monitoring and/or co-management are discussed, and approaches to gathering information from the child and parent(s) are offered.

Key Words: Chiropractic; pediatrics, competitiveness, elite athletes; competitive sports

Introduction

The chiropractic profession, from its inception, has encouraged and promoted healthy, harmonious lifestyles integrating the mind, body and spirit. Chiropractors support and encourage children to live an active, healthy lifestyle exploring their capabilities physically, emotionally and intellectually. But when do the benefits of the activities that children undertake become outweighed by other issues? How do practitioners and parents recognize when this begins to interfere with a child's well being?

Discussion

The Origins of "Over Competitiveness"

A stimulating academic environment, organized athletics[1] and a wide variety of extra curricular social activities[2,3] have been shown to help children develop self confidence, motivation, teamwork, organizational skills and self discipline. The foundation for this development of a child's character lay in the opportunities presented to them in their earliest years as they are encouraged to participate in natural play.

It is well known that children learn through play.[4] According to the educational program developed by The Learning Seed, "Play is the engine that drives child development".[5] Play is the primary means of learning for young children. Allowing the child to determine the nature of play gives them the freedom to explore and learn on their own terms. Yet it is often in play, that the beginnings of competitiveness are fostered. Dr. Wendi Lopez, a clinical psychologist at Cincinnati Children's Hospital, explains that children from ages 2-4 are unable to see another's perspective. They have a constant need to be the center of attention, and it would be considered age appropriate for them to be upset when they don't win. At this age they should be learning essential skills and not focused on competing. If children haven't outgrown the need to be the center of attention by the age of 5-6, parents should identify any factors reinforcing this attitude and take steps to change them.[6]

Children constantly assume new roles, test limits and develop physical, emotional and mental skills through play. Each type of play is beneficial, from independent play with stuffed toys and dolls, interactive play with parents and other children to organized sport. Play can be categorized as practice, parallel, cooperative, sensory, creative and symbolic.[5] Age appropriate play can foster moral behavior, as moral development is stimulated or impeded by the child's environment and experience. There are many benefits in encouraging play for the sake of play, not for the encouragement of winning.

Children learn not only through play but also by modeling what they observe at home,[7] in the neighborhood, in school and through exposure to mass media.[8,9] Parents, for example, may inadvertently encourage over-competitive behavior through their acknowledgement and rewarding of "winners." The impact of parents' words and actions on their children is profound. A parental attitude of the "to win is good, to lose is bad" can impair a child's esteem. It is important that parents do not equate how deserving a child is of love with whether he or she wins or loses. Such attitudes in children's parents and other important mentors

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(teachers, coaches, clergy, other children's parents) may influence how they see their peers and how they choose friends.[6]

As children reach the preteen (10-12 years of age) and teen years (13 years and older), common motivators become peer pressure and the compulsion to perform at all costs. Exposure to, or experimentation with, alcohol, as well as other substances, may occur as a byproduct of the need to fit in, as a vent for stress or to gain the competitive edge by enhancing performance.[10] A study presented at the annual meeting of the American Public Health Association found that boys' participation in team sports correlated with increased likelihood of increased aggression, fighting, drinking and binge drinking.[11]

Abuse of substances that enhance performance is not limited solely to older children. A study from the British Journal of Sports Medicine noted that more than 1% of 11-year-olds admit to using performance enhancing drugs and by age 15 the proportion taking them had increased to 3%. Boys were more likely to use these drugs than girls. Health problems associated with the drug use included becoming violent, a change in voice and loss of consciousness in 4 % of users.[12]

Mass media messages encourage children to equate winning with fame and fortune. Examples of this are found in reality television shows such as the "Amazing Race" or "Are you Smarter than a Fifth Grader?" Movies spotlight tantrums from youths who did not get the lead role in a play, dance or musical. The message, whether overt or subtle, is "you are popular if you win and worthless if you lose." This may lead to poor self-esteem for those identifying with the latter category.

As children become involved in more focused activities (from academics to athletics), over-competitiveness often develops as a direct outcome of parents' attitudes and behaviors. Parents may live vicariously through their children, and as a result, inadvertently pressure their child to win or succeed. Other parents cultivate an attitude of superiority in their children in hopes of creating a mental edge over their competitors which also often inadvertently serves to isolate them socially.

In other cases, over-competiveness originates with an authority figure placing demands on the child or encouraging aberrant behavior. For example, inappropriate demands made by individuals who coach sports emphasizing a thin build with the appearance of leanness (i.e. gymnastics, long distance runners, divers, swimmers, figure skaters.) expose children to a greater risk of developing an eating disorder.[13,14]

Often the messaging through the "ideal" serves to reinforce eating disorders or other disorders due to the behaviors considered acceptable and often encouraged by peers, coaches and mentors to get ahead of other competitors in the sport. Such messaging usually overemphasizes the following qualities: discipline, compulsiveness, competitiveness, excessive exercise or practice time, emphasis on weight, body size and shape, perfectionism, attention to detail,[15] anxiety in attaining the perfect performance.[16]

In an NCAA survey of collegiate athletics conducted in 1992, "93% of the programs reporting eating disorders were in women's sports."[17]

For some sports such as gymnastics, physical development into adulthood signifies huge challenges. Height and weight gain, development of wider hips and breasts "could provoke a conflict in which the athlete struggles to prevent or counter the natural physical changes precipitated by growth and maturity."[18,19]

What role can chiropractors, along with other health care providers, play in safeguarding the health and welfare of these children?

The Chiropractor's Role

Should a chiropractor be concerned when he or she suspects that a child is becoming or already has become an over-achiever at any and all cost? What might prompt a chiropractor to probe deeper or co-manage with other professionals?

Primary health care providers, including chiropractors, have the responsibility to provide guidance for children's optimal growth and development. This includes being observant of their mental-emotional health and well-being. If the provider observes behavioral pattern changes in an any child, it is this author's recommendation to document those concerns within the patient file and make appropriate and timely referrals.

Changes for which providers should be alert include but are not limited to:

- Exhaustion
- Change in health status, ranging from aggravation of common teenage skin conditions like acne to recurring colds and infections, or more serious illnesses like mononucleosis.
- Body dysmorphia/Eating disorders:

  - Recurrent focus and discussion around body size, particularly if these are negative in affect (i.e., weight, height, maturation of breasts, development of muscles.)
  - Rapid weight loss, which the child may try to conceal with loose clothing
  - Unusual eating habits, such as avoiding meals, eating in secret, monitoring every bite of food, or eating only certain foods in small amounts
  - Diagnosed eating disorders like anorexia, bulimia
- Becoming withdrawn, solitary
- Tendency to make excessively demeaning comments toward peers
- Focus on weight gain, especially muscle mass
- Signs of steroid, alcohol and/or drug abuse
- Anxiety, depression; exhibiting perfectionism, or being highly self-critical
- Excessive or compulsive exercising (the focus may be on mastery of the activity or the endorphin high of exercise and not necessarily to lose or regulate weight).
- Menstruation that becomes infrequent or stops

After first asking permission from the child or, with younger children, the parent., the chiropractor can open their interview with verbal prompts in an attempt to reveal the motivation behind a child's behaviors. Complexity of the interview will be dictated by the age and level of maturity of the child and will be guided by the clinical judgment of the examiner, unless specific aspects are required by regulatory law. It is also important to realize that a child's response may be influenced by the examiner's nonverbal behavior[20] as well as the presence of a parent or guardian. These circumstances may necessitate creative approaches in order to provide the child the opportunity to confide in the healthcare provider. Information gathering is best framed by asking the patient questions which facilitate self-discovery and are open-ended rather than closed-ended. Examples of open ended questions are:

- "Would you tell me more about that?
- "How do you feel about that?"
- "How is that working for you?"
- "What concerns do you have about…?"

To elicit honest, introspective answers from older children and, when appropriate, their parents, questions, besides being opened ended, should be non-judgmental. "Why" questions should be avoided because they often carry a judgmental connotation. Instead, use the "reflective listening" technique,[20,21] in which the provider echoes the patient's answers. Reflective listening means responding to, rather than leading, the patient. If a patient does not respond immediately, do not rush in to fill the silence with another question. Rather, be patient and allow the child to answer in his or her own time..

Eliciting information from a younger child may involve recruiting the parent but be careful to attend closely to the child's answers, facial expressions and body language. Avoid talking over him or her to the parent. Direct your question to the young child. If a question is directed to the parent, it can be followed up with a question to the child such as, "Is there anything else you'd like to tell me?" to maintain an inclusive atmosphere. An older child might contribute more to the interview process, and as stated earlier, his or her answers may be inhibited by the presence of a parent. Careful attention to this may result in a direct request to interview the child alone or the use of crayons and paper to formal questionnaires that allow older children to express themselves privately.

Involving both the child and the parent, at any age, is important once the interview process has revealed over-competitiveness as a core issue. The technique of enabling decisional balance,[23] in which the patient makes a list of pro's and con's of the behavior being considered, can help demonstrate that competitiveness may have negative aspects as well as positive ones. Discussions about the difference between healthy competition versus overachieving or over-competitiveness can be helpful. Look for judgmental language towards others, and simply point it out to the child (or parents) when it occurs. Once they become aware of this behavior, they are then able to choose a different option. However, it is important in the interview process, that the chiropractor not present himself or herself as a psychotherapist. Some patients may require more in-depth observation and counseling, through a referral to a mental health professional with whom the chiropractor is familiar.

The chiropractor may need to assist parents in how they should explain some issues related to over-competitive children's understanding of rules. Many overly competitive children will claim that rules are "wrong" or "unfair", or that other children "aren't playing the game right." This is expected in pre-schoolers (3-4 years of age) and the earlier grades (5-6 years of age) since they see life revolving only around them. Older children should be guided to under-

stand that there are benefits to both winning or losing ("it's not whether you win or lose, it's how you play the game"), and that there is no shame in either. Suggested reading may also offer support to parents in providing tools to help encourage safe and cooperative play.[24]

Once the provider has confirmed observations indicating the presence of negative effects of over-competitiveness, consultation or co-management with a mental health expert or child advocate group such as Children's Aid or Child and Family Services might lend support or direction for the chiropractor and/or parent.

Conclusion

When we are able to observe children in self-organized play, the focus is on the activity, not the outcome. Even if the structure of the game is clearly competitive, the spirit of the game remains social and cooperative. The makeup of the team depends on who shows up on any given day and the final score is quickly forgotten in light of the next activity.

Despite individual coaches and mentors who teach sportsmanship and an emphasis on personal skill development, organized, competitive sports have the tendency to cultivate the "winning is everything" attitude and create a win/lose scenario that has potential long term effects on the child's self image, self esteem, character development, mental and physical health.

The chiropractor can play an important role in maintaining the physical and mental health of the young athlete by detecting and intervening when the issues of over-competitiveness are observed.

References

1. Stephens, L. J. Schaben, L. A. The effect of interscholastic sports participation on academic achievement of middle level school activities *National Association of Secondary School Principals Bulletin.* 2002 March; 86:34-42.
2. Broh, B. A. Linking extracurricular programming to academic achievement: Who benefits and why? *Sociology of Education.* 2002 Jan; 75: 69-96.
3. Howie LD, Lukacs SL, Pastor PN, Reuben CA, Mendola P. Participation in activities outside of school hours in relation to problem behavior and social skills in middle childhood. *J Sch Health.* 2010 Mar;80(3):119-25.
4. Ginsburg KR. The Importance of Play in Promoting Healthy Child Development and Maintaining Strong Parent-Child Bonds, *Pediatrics.* 2007 Jan; 119(1):182-191.
5. McKee G. Child's Play: How Having Fun Turns Kids into Adults (the Teaching Guide). The Learning Seed, Early Childhood Education 2004 Chicago, Illinois. *http://www.learningseed.com*
6. Driven to Win, Cincinnati Children's Hospital Young and Healthy. 2007 Winter. *www.cincinnatichildrens.org/health/yh/archives/2007/winter/driven-to-win.htm*
7. Eriksson M, Nordqvist T, Rasmussen F. Associations between parents' and 12-year-old children's sport and vigorous activity: the role of self-esteem and athletic competence. *J Phys Act Health.* 2008 May;5(3):359-73.
8. Vandewater EA, Bickham DS, Lee JH. Time well spent? Relating television use to children's free-time activities. *Pediatrics.* 2006 Feb;117(2):181-91.
9. Zimmerman FJ, Christakis DA. Children's television viewing and cognitive outcomes: a longitudinal analysis of national data. *Arch Pediatr Adolesc Med.* 2005 Jul;159(7):619-25.
10. Committee on Sports Medicine and Fitness, American Academy of Pediatrics, Policy Statement: Use of Performance-Enhancing Substances. *Pediatrics.* 2005April; 115(4): 1103-1106.
11. Connor. S. Team Sports Participation Increased Some Unhealthy Behaviors in Male Teens; Positive Associations Seen for Females. *American Public Health Association Presentation at 137th Annual Meeting.* 2009.
12. Laurie P., C Binsinger. Doping Prevalence among preadolescent athletes: a 4 year follow-up. *British Journal of Sports Medicine.* 2007; 41(10): 660-663.
13. Risk Factors, Female Athlete Triad Coalition. *http://www.femaleathletetriad.org/for-athletes-coaches/risk-factors/*
14. White J. The Female Athlete Triad and its Relevancy to Today's Female Athlete. Health Psychology Homepage Vanderbilt University 2009 April. *http://healthpsych.psy.vanderbilt.edu/2009/FemaleAthleteTriad.htm*
15. Ludwig, M. A Sport Psychology Perspective. *Journal of Physical Education Recreation & Dance.* 1996; 67: 31-35.
16. Williamson, D. et al Structural equation modeling of risk factors for the development of eating disorder symptoms in female athletes. *International Journal of Eating Disorders.* 1995; 17:387-393.
17. "Dying to win". *Sports Illustrated.* 1994. 81: 52-59.
18. Sundgot-Borgen, J. Risk and trigger factors for the development of eating disorders in female elite athletes. *Med Sci Sports Exerc.* 1994 April; 23(4): 414-419.
19. Harris, B., & Greco, D. Weight control and weight concern in competitive female gymnasts. *Journal of Sport and Exercise Psychology.* 1990; 12: 427-433.
20. How interviewers' nonverbal behaviors can affect children's perceptions and suggestibility. Almerigogna J, Ost J, Akehurst L, Fluck M. *J Exp Child Psychol.* 2008 May; 100(1):17-39.
21. Fisher D. Communication in organizations. 1991, St. Paul, Minnesota: West Publishing Company.
22. Rogers C. Client-Centered Therapy: its current practice, implications, and theory. 1951, Boston: Houghton Mifflin.
23. Zimmerman GL Olsen C, Bosworth MF. A 'stages of change' approach to helping patients change behavior. *American Family Physician.* 2000;61:1409-1416.
24. Perry Susan K. Playing Smart: The Family Guide to Enriching, Offbeat Learning Activities for Ages 4-14. Nov 2002. Minneapolis, MN, Monarch Books. Second Revised Edition.

Grand Rounds Case #1: Pre-Adolescent Gymnast with Sever's Disease

PRESENTER

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History and chief complaint

10-year-old Caucasian female referred to the office for a consultation by her chiropractor presents with chronic left heel pain (approximately 6 months in duration) and right ankle pain from an inversion injury 5 days earlier. She is a competitive gymnast and both problems can be traced to an incident during practice or competition although no direct trauma was noted. The pain is worse with activity as she is currently active in sports and the pain is relieved with rest and ice.

Examination

- ***Vascular:*** dorsalis pedis and posterior tibial pulses are _ and _ respectively. Skin temperature and turgor are within normal limits. Normal temperature gradient. Capillary fill time is instantaneous bilaterally and symmetrically. No evidence of Raynaud's.

- ***Neurological:*** sharp/dull, light touch, vibratory, protective sensations as per 5.07 S-W monofilament and vibratory intact bilaterally and symmetrically.

- ***Orthopedically:*** Pain is notable to the right ankle lateral anterior talofibular ligament upon manipulation. Forced inversion produces discomfort. No fibular discomfort is notable to the remaining lateral ankle ligaments. To the left foot, lateral to medial calcaneal discomfort is notable upon manipulation with no plantar discomfort appreciated. No swelling or break in the skin.

- ***X-ray:*** weight bearing films were taken as follows *(Figure 1)*:

  1. Left lateral axial calcaneal

  2. Right AP ankle, medial oblique.

  AP view reveals open apophysis noted to the left calcaneus. On the right foot the apophysis of both the tibia and distal fibula are free of any breaks or dislocations. They appear to be within normal limits as well as the ankle mortise.

- ***Impressions:***
  1. Open apophysis left foot;
  2. Negative for fracture of dislocation right ankle.

  Impressions:

  1. Sever's disease left foot

  2. Ankle sprain right foot

- ***Treatment recommendations:***
  1. Heel cups for shoes
  2. Continued crutch use for ankle
  3. Physical therapy recommended
  4. Stretching exercises dispensed
  5. Limited activity for 3 weeks
  6. Follow up in one month

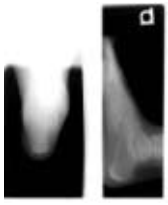

Figure 1

Discussion

It has been this author's clinical experience that calcaneal apophysitis represents a self limiting inflammatory condition rather than an injury. There is a relationship to the sequence of growth among bones, muscles and tendinous structures in children that may indirectly cause a traction phenomenon of the Achilles tendon. Calcaneal apophysitis is not the result of a singular traumatic incident, but may be the result of the aforementioned growth of the child or conditions in which the bone undergoes repetitive microtrauma (i.e. practicing ballistic jumping in gymnastics several times a week).

The major contributing factor to the inflammation within this condition is Achilles tendon tightness and its direct pull on the insertion to the growth plate. This produces a true 'traction' pulling the growth plate with the Achilles tendon and away from the body of the calcaneus. The inflammation that results causes pain. Often, an equinus deformity which is limitation of dorsiflexion at the ankle with the knee extended or flexed is also noted. This can be noted in hyperpronation and is more of a secondary reactive phenomenon. This, in turn, will produce more strain, pulling and traction at the insertion area of the calcaneal growth plate.

In general, treatment of this condition is straight for-

ward and aimed at addressing all contributing factors.

- Rest, ice and elevation to reduce inflammation.
- Limiting activity that is directly contributing to the pain
- Gastrocnemius and soleal complex stretching program to address equinus.
- Temporary heel lifts to address equinus.
- Night splinting to address equinus
- Orthotic management to address biomechanics and hyperpronation.
- Professional therapeutic regimen for restoration of normal gait and the reduction of inflammation.

Reference

• Simon RR. Koenigsknecht SJ. *Emergency Orthopedics: The Extremities,* Ed 4. New York: McGraw Hill, 2001:564.

DISCUSSANT 1

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More than 4.3 million sports and recreational injuries occur annually, in children between the ages of 5 and 17 and 1.9 million injuries are classified as serious injuries. In this classification, serious includes, time lost from the sport or school or requiring a physician's evaluation. The distribution of these injuries is equal across both sexes and the knee and ankle are most commonly affected. Sprains and strains occur most commonly, followed by fractures and/or dislocations. The most common causes of injury are found to be overexertion and strenuous movements, generally caused by overuse.[1]

Overtraining and excessive levels of physical activity can present an increased risk for injury. If not managed properly and efficiently, overuse injuries can affect normal physical growth and maturation. Prevention is the key and gradual increases in stresses and intensity can usually avoid physical breakdown. Early identification and modification of the training program can ensure successful return to sport and minimize time lost from sport.[2]

Other intrinsic factors that predispose young athletes to overuse injuries include the following: anatomic malalignments leading to abnormal stresses, motor strength imbalances resulting in muscular strain and overuse, rapid skeletal growth leading to tight musculotendinous units and associated muscle strain, active bone growth preceding muscle and tendon lengthening and active growth changing the overall alignment of the lower extremities. These factors most often disappear with approaching adulthood.

Calcaneal Apophysitis, better known as Sever's Disease is a growth plate injury of the calcaneus. Commonly caused by overuse and repetitive microtrauma to the growth plates of the calcaneus, according to some sources it is also a representation of a classic case of bones growing more rapidly than the surrounding muscle and tendons.[3] Excessive traction with weight bearing activity places an unwarranted amount of strain on the Achilles tendon insertion of the calcaneus causing microtrauma and pain. Historically it is seen in children between the ages of 7 and 15, with the majority being in the age range of 10-12. Sever's affects both boys and girls and is often seen in those that overpronate.[4] Overpronation causes an uneven weight bearing distribution on the back of the calcaneus making it more susceptible to a strain or pull on the tendinous insertion area. There is a dominance of this injury in those who regularly participate in activities involving running, jumping or both. It has been suggested by some that a correlation may exist in those children who are heavier than their peers. The patient may report they have just started in the new sport, or that it is the start of the season for their particular sport. Sever's involves both heels in more than 50% of the patients,[5] and it is rarely seen in teens since the growth plate is more than likely closed at this age. According to some, Sever's disease cannot be seen radiographically.[6] However, if you see this presentation in a teen 16 years or older, and do not suspect Sever's disease, rule out a stress fracture of the calcaneus and treat accordingly.

Signs and symptoms that may present in the patient can include some or all of the following: heel pain that increases with running or jumping upon examination. Pain over the calcaneus that increases with heel walking and decreases with toe walking, evidence of an awkward gait or limp presentation, a positive squeeze test over the medial and lateral boarders of the os calsis, hypertonic gastrocnemius, soleus and hamstring muscles and a tenderness to palpation of the Achilles tendon.[7] If a severe case is noted, there may be evidence of increased swelling or discoloration in the Achilles calcaneus insertion region.

Treatment for Sever's Disease is relatively simple in that you must assist recovery through proactive preventative techniques. Rest or pulling the child out of the offending activity may be required but is only necessary in severe or chronic repetitive cases. In the meantime, allow the pa-

tient to continue in their sport of choice, providing they follow the home exercise plan as advised by you. Send the patient home with appropriate gastrocnemius, soleus and hamstring stretches asking them to hold the stretches for a minimum of 1 minute and perform them three times per day. Give the patient toe tapping exercises to strengthen the tibialis anterior muscles and provide those with chronic repetitive Sever's disease soft heel lifts bilaterally to take tension off of the Achilles tendon and help reduce the offending symptoms. Suggest to the patient Vitamin C, EFA's, bromelain and other non prescription natural anti-inflammatories that can be used as well as the importance of a good supportive shoe. Recommend to the patient to avoid barefoot and shoes that will cause oversupination or overpronation. Have the patient bring in their shoes for a gait assessment within the office. Also advise the patient to ice the area of the Achilles and calcaneus for 10 minutes daily and a second time that day post activity if warranted to reverse the effects of the causative process. Be very specific to patients about location and duration for ice. Most patients are unaware of the area that truly needs cryotherapy and will often, if not always ice for too long a duration (sometimes more than 20 minutes) creating a Hunting's Response. Having the patients use an ice bath is a very effective way to ice extremities. This technique involves a bucket of cold water and a few ice cubes until the area progresses through the CBAN (cold, burning, aching and numb) process. At which point, usually 5-7 minutes the process of icing is complete. In terms of therapy provided by the physician, work on returning the hypertonic muscles to a state of normalcy. Myofascial release, ART, whatever your choice of techniques may be, reducing the hypertonicity will allow for relaxation of the Achilles tendon and less pull on the calcaneus. Invest in a rocker board and have the patient use this during the treatment plan for a ballistic type stretch of the gastrocnemius-soleus complex. Keep the motion of dorsiflexion or heel to floor action at a smooth pace with a hold of 2-3 seconds at the bottom or stretch range. Use therabands to strengthen the tibialis anterior muscle, meanwhile providing and inhibitory or stretch effect to the posterior lower leg muscles. Provide anti-inflammatory relief with the use of modalities that are in the office or cryoderm or other topical natural analgesics. Examine the patient's gait. Assess whether the foot moves in a complete cycle from heel strike (in dorsiflexion) to toe off (in plantar flexion) which, in normal gait, strengthens the anterior leg muscles and stretches the posterior leg muscles overall helping to reduce the strain that the Achilles is placing on the calcaneus, the root cause of the Sever's disease. Is the foot straight when seeing the gait cycle or does the patient display a foot flare or inward toeing? Either of these quite possibly could lead to an imbalance in the force being applied to the calcaneus. Work on straightening out the foot with gait corrective exercises. If the strain on the calcaneus is due to an over pronation issue, then consider recommending orthotics. And finally, last but certainly not least, assess the feet for any restrictions that may need to be adjusted. Restoring the natural biomechanics of the joints will allow for proper gait cycle and hence less overall pressure or strain on the calcaneus.

In this author's opinion, taping/strapping for this injury is contraindicated. It may limit the dorsiflexion and plantarflexion range of motion. This limited range may in turn not allow the gastrocnemius-soleus complex to stretch to its full capacity and can lead to muscle hypertonicity. This may in turn affect the gait cycle, causing it to become forced or improper, resulting in slowing of the injury recovery process.

With respect to the ankle sprain injury diagnosed, this author feels that a more specific diagnosis in terms of the grading level is indicated. If the patient is suffering from a grade one ankle sprain, she should immediately initiate weight-bearing exercises for proprioception and range of motion. In fact, she should start ROM exercises, including alphabet writing and towel crunches, as soon as possible with all ankle injury gradings. Increased motion in non weightbearing fashion is important speed patient recovery. It can also be suggested that perhaps a change in gait biomechanics from the Sever's disease led to the patient's ankle sprain. The patient may have been displaying more supination in the gait cycle with heel strike and follow through, trying to avoid full contact of the calcaneus due to pain. This is another reason to evaluate gait with all lower extremity injuries, including those of the hip, in order to avoid secondary complaints leading to injury.

References

1. Bijur PE, Trumble A, Harel Y, et al. Sports and recreational injuries in US children and adolescents. *Arch Pediatr Adolesc Med* 1995;149:1009-1016.
2. Hutchinson M, Nasser R. Common sports injuries in children and adolescents. *Medscape General Medicine* 2(4), 2000.
3. Atkins J. Calcaneal apophysitis (Sever's Disease). Sports Link, Information for Athletes and Coaches, 2008, University of Wisconsin Sports Medicine, Madison, WI. *http://www.uwhealth.org/files/uwhealth/docs/pdf/SportsLink_Calcaneal.pdf*
4. Micheli LJ, Ireland ML. Prevention and management of calcaneal apophysitis in children: an overuse syndrome. *J Pediatr Orthop* 1987; 7(1): 34-38.
5. Sever JW: Apophysitis of the os calcis. *NY Med J* 1912; 95: 1025-1029.
6. Madden CC, Mellion MB. Sever's disease and other causes of heel pain in adolescents. *American Family Physician* 1996;54 (6): 1995–2000.
7. Hendrix CL (2005). Calcaneal apophysitis (Sever disease). *Clin Podiatr Med Surg* 2005;22 (1): 55–62.

DISCUSSANT 2

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In high impact sports like gymnastics, rehabilitation should focus on the eccentric phase of muscle contraction, to emphasize stability on landing movements to prevent or at least reduce excessive impact on the growth plate. Using jumping as an example, during the take off phase of the jump, the quadriceps, gluteals, and gastrocnemius contract concentrically to produce the power to take off from the ground. On the landing phase, the same three muscle groups contract eccentrically (while they shorten) to provide the "brakes" on the landing, hopefully reducing the amount of compression on the joints when landing. Without proper recruitment of muscles during the eccentric phase of the movement, in the patient with Sever's disease, there will be continuous increased load on the ankle joint and calcaneal growth plate upon landing since the muscles of the calf remain chronically short. In addition to causing pain in the affected area, it also reduces the power available for the athlete during the takeoff phase of the subsequent jump.

Since the athlete may be in considerable pain when seeking treatment, it is important that the exercise protocol progress slowly within the athlete's tolerance level and in an attempt to prevent any further inflammation. In Pilates, a method of conditioning and rehabilitation, by using the equipment such as the reformer and stability chair, we are able to begin rehabilitation of the joint in non-weight bearing positions, using spring resistance to provide challenge for the muscles, before progressing to traditional weight bearing calf strengthening exercises.

The protocol would begin with dorsiflexion and plantarflexion of ankles on the reformer foot bar, first bilaterally, then progressing to unilaterally with the affected ankle. This should be done with the knees straight, to focus on the gastrocnemius. (If you are unfamiliar with the reformer, the movement will look similar to doing heel drops off the edge of a stair, but with the exerciser working in a supine position on the machine). To focus on the soleus, the exerciser can also mobilize the ankle through the same range of motion while supporting the weight of the leg against the side of the stability chair, while the ankle moves the pedal up and down. In both movements, the spring tension can be varied to the athlete's tolerance, and the cadence of the exercise can be paced to emphasize controlling the eccentric phase of the movement. (Usually in Pilates, the rhythm of the movement follows the breathing pattern of the exerciser, but in this case, one could use a slower count to control the eccentric portion). The supervising practitioner should correct for proper mechanics throughout the rest of the body, making sure the exerciser is not pronating or supinating the foot while moving through the range of motion, and aligning the trunk in a neutral position to help rebalance the muscles throughout the trunk, reminding the exerciser to focus on core stabilization.

Upon mastering the work on the Pilates equipment, and once the athlete is pain free (in full function) and has been cleared for exercise by their physician, they could progress to more functional exercises, involving weight bearing. It is conceivable that a young athlete will not progress to this stage if continued participation in sports perpetuates inflammation of the growth plate. Although Pilates equipment can still be used, this is also a good time to reintroduce traditional strengthening exercises, which can be completed by the athlete at home as well.

References

1. Alfredson H, Pietila T, Jonsson P, et al. Heavy-load eccentric calf muscle training for the treatment of chronic Achilles tendinosis. *Am J Sports Med* 1998; 26: 360–6.
2. Brukner P. Khan K. Chapter 28 Pain in the Achilles Region in Clinical Sports Medicine, 3rd Ed.
3. Mac B. © Sports Coach , March 2010. *http://www.brianmac.co.uk/mustrain.htm*
4. Niesen-Vertommen SL, Taunton JE, Clement DB, et al. The effect of eccentric versus concentric exercise in the management of Achilles tendonitis. *Clin J Sport Med* 1992; 2: 109–13.

Grand Rounds Case #2: Adolescent Pitcher with Elbow Pain

PRESENTER

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Chief Complaint

Right handed pitcher, embarking on his college baseball career, presents complaining of right sided lower triceps pain extending to medial/posterior shoulder and neck pain/stiffness. He explains he has been unable to throw for the past 8 months due to the pain and restriction in motion of his shoulder and arm. The pain started shortly after he had elbow surgery and became significantly worse after he was hit by a line drive in the same arm. Patient further explains his pain is 3 out of 5, but worse when he pitches.

History

The patient has been playing competitive baseball since early youth. Approximately 1 _ years ago, at 18 years of age, the patient had arthroscopic surgery for removal of loose cartilaginous bodies from his elbow (osteochondritis dissecans) by an orthopedic surgeon. Then approximately 8 months later, after finally being cleared to pitch, he was hit in the arm by a line drive (February 2008). Since then he has received numerous treatments at the college consisting of moist heat, ultrasound, electric muscle stimulation, and stretching with only temporary relief. He presented to the chiropractic office 8 months later (October 2008). The patient is a strong, athletically built pitcher who would like to become a pro pitcher. No known medical problems, congenital anomalies or systemic diseases.

Physical Exam

Patient has multiple, palpable adhesions in right trapezious, rhomboid and a palpable thick band of scar tissue near elbow extending through the triceps muscle to the shoulder. His mid thoracic spine and lower cervical spine were locked and painful to manual mobilization. When the patient demonstrated his pitch, his shoulder was noticeably higher and motion was restricted in the cocking phase.

Impressions

- 729.1 Myofascitis
- 739.2 Thoracic spine intersegmental dysfunction
- 739.1 Cervical spine intersegmental dysfunction
- 847.1 Thoracic spine sprain strain
- 719.4 Shoulder pain

Treatment

Active release therapy (ART) was started immediately to the triceps, latisimus dorsi, and subscapularis muscles. On subsequent visits ART was done to cervical spine muscles, bicep, forearm extensors and flexors. Chiropractic manipulative therapy (CMT) focused on freeing up scapula, thoracic spine, and lower cervical spine.

Results

The patient responded extremely well and extremely quickly to the combination of ART and CMT. After approximately 4 weeks and three times/week sessions, he was encouraged to start pitching with his private coach to correct and relearn biomechanics of his pitch. Based on his pitching coach's very specific comments with regards to his form, future sessions were devoted to working out the specifically tight muscles and joints.

In addition, 12 additional treatments were devoted to removing adhesions and restoring motion to the lumbar spine, pelvis, and legs, especially the left leg. Patient was put on a stretching program and encouraged to work on building core stability which is key to preventing injury in overhead sports.

DISCUSSANT 1

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Elbow injuries are common in throwing athletes. The most common pediatric elbow injury seen in the United States is in baseball pitchers.[1] These injuries are often soft

tissue and typically involve the medial collateral ligament of the dominant throwing arm. This is due to overuse and is often preventable by teaching proper pitching techniques and counting the number of pitches thrown to prevent overuse.

A second type of elbow injury in throwers is bony which could either be a stress injury of the growth plate or an osteochondritis dissecans (OCD). Both of these are also due to overuse.[2]

These elbow injuries are best evaluated by physical exam and suspicion of bony injury should be further investigated with x-ray and MRI. Osteochondritis dissecans typically presents as lateral elbow pain, loss of extension, loss of pitching accuracy and/or speed, and often with swelling of the elbow joint. As the name applies, there is an injury of the bone and the overlying cartilage. The initial injury is to the subchondral bone, an avascular necrosis. This is typically seen in 10-15 year old male baseball pitchers.[3] If the bony fragment becomes loose, surgical intervention is required. Typically this is excision of the fragment. If the fragment is large, fixation may be attempted but this often fails to heal and requires further surgery. Most pitchers after surgery will have loss of extension, but will return to throwing. After surgery, it is often 6 months before the athlete can return to pitching.

Throwing is broken into 5 phases.[4] The first phase is wind-up which initiates when the lead foot is off the ground. The second phase is the early cocking phase where the deltoid and rotator cuff are active and initiates shoulder external rotation and arm in 90 degrees abduction. In late cocking, the third stage, the lead foot makes contact with the ground and there is maximal shoulder abduction and external rotation. This is a very high stress position for the shoulder and can lead to anterior instability with muscle overuse or poor throwing mechanics. Also in this phase pectoralis major, subscapularis, latisimus dorsi, and teres major are placed under eccentric stress. In the fourth phase, acceleration, glenohumeral forces are estimated to be 860 N with a velocity approaching 7,500 degrees/second.[5] The final stage, follow-through, begins with ball release and is the most violent phase and stresses the posterior capsule.[7]

Stretching and warm-up are extremely important in preventing shoulder injuries in throwers. Cool down afterwards is also important. A pitch count should be tracked for the athlete and the specific recommendations for young athletes are a maximum of:[6]

- 8-10 years old 52+/-15
- 11-12 years old 68+/-18
- 13-14 years old 76+/-16
- 15-16 years old 91+/-16
- 17-18 years old 106+/-16

Identifying problems early is the key to preventing long term problems. Monitor all pitchers for loss of pitch speed, loss of accuracy or early fatigue. Stretching should include the lower extremities as well as the spine and shoulder and elbow.

References

1. Axe MJ, Wickham R, & Snyder-Mackler L (2001). Data-based interval throwing programs for Little League, high school, college, and professional baseball players. *Sports Medicine and Arthroscopy Review,* 9, 24-34.
2. Stubbs MJ, Field LD, Savoie FH. Osteochondritis dissecans of the elbow. *Clin Sports Med.* 2001;20(1):1–9.
3. Osteochondritis Dissecans of the Elbow. CORR 284: 156-160, 1992.
4. Miller MD, Cooper DE, & Warner JJP: Review of Sports Medicine and Arthroscopy, p. 123. Philadelphia, WB Saunders, 1995.
5. Butters KP. The Scapula. In: Rockwood CA Jr, Matsen F III eds. The Shoulder. 2nd ed. Philadelphia, PA: WB Saunders; 1998:391-427.
6. Andrews J & Fleisig G. American Sports Medicine Institute. *How Many Pitches Should I Allow My Child to Throw?* USA Baseball News, April 1996.

DISCUSSANT 2

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In treating the aforementioned athlete, there are several factors to consider. First, the rehabilitation post-surgery should return the athlete to full and painless participation in pitching by focusing on ROM, shoulder and scapular stabilization exercises, and a progressive throwing program that incorporates proper technique and biomechanics. Second, after the contusion from the line drive, the tendency to compensate for the new injury could cause muscle tightness and corresponding improper firing of the rotator cuff during the pitching motion. Third, communication with the athlete and the coach is crucial in assuring the athlete does not return to participation before he has the proper chance to heal. If any of these factors are not given the proper consideration, the athlete's recovery could be prolonged and further injury could occur.

Treatment of the athlete in the Athletic Training Room would generally consist of thermotherapy, phonotherapy, light therapy, pain reduction through electrical stimulation,

flexibility, and rehabilitation. If dysfunction continues after treatment in the ATR, we would refer the athlete to our team physician and/or chiropractor for further evaluation. Once the athlete is ready to progress to throwing, we would need to keep in mind the fact that biomechanics can be affected by style of pitching, pitch count, and type of pitch. A side-arm throwing motion causes increased valgus torque at the elbow, relating to the increased moment arm that is produced by elbow extension.[1] The timing of the rotation of the pitcher's trunk can also affect torque at the elbow, as subjects who began the motion before their stride foot made contact had significantly higher torque values than those who rotated after foot-strike.[1] Other studies have shown that higher pitch counts can lead to overuse type injuries that build over time, and that different types of pitches can cause more pain that others in both the shoulder and the elbow.[2]

A progressive throwing program, beginning with increasing distance and then pitch speed, would allow an athletic trainer or coach to monitor the athlete's health and technique at a rate that could be tweaked for each athlete's needs. Once the athlete has returned to competition, it is also important to note that ROM in the shoulder can experience changes immediately following pitching, which can linger for more than 24 hours post-exercise, and can contribute to compensation in biomechanics of the pitch.[3]

As mentioned above, communication with both the athlete and coach is critical. If the athlete pushes his body beyond the limits set by the athletic trainer, as competitive athletes are know to do, he could regress in his recovery. A coach who believes an athlete is ready before he actually is can put the athlete in a situation where he is forced to participate at a higher level than he should. By ensuring all parties involved have adequate information and a sense of the athlete's status as regards competition, the athletic trainer can aid in preventing any reactive injury.

References

1. Aguinaldo AL, Chambers H. Correlation of Throwing Mechanics with Elbow Valgus Load in Adult Baseball Pitchers. *Am J Sports Med.* 2009; 37(10):2043-2048.
2. Lyman S, Fleisig GS, Andrews JR, Osiniski ED. Effect of Pitch Type, Pitch Count, and Pitching Mechanics on Risk of Elbow and Shoulder Pain in Youth Baseball Pitchers. *Am J Sports Med.* 2002; 30(4); 463-468.
3. Reinold MM, Wilk KE, Macrina LC, Sheheane C, Dun S, Fleisig GS, Crenshaw K, Andrews JR. Changes in Shoulder and Elbow Passive Range of Motion After Pitching in Professional Baseball Players. *Am J Sports Med.* 2008; 36(3): 523-527.

DISCUSSANT 3

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This case is an excellent example of current injuries seen in youth sports. Even though this case focuses on a specific sport — baseball, and a specific injury — the elbow, many principles apply to pediatric athletes as a whole.

Children who demonstrate athletic ability are being recruited at younger and younger ages. In some cases, they are being ruthlessly driven to achieve athletic feats and world class performances.[1] Parents are taking coaches' advice and hiring private pros to work with their child to "perfect" that pitch, tennis serve or jump shot. They are involved in rigorous practice schedules, often multiple days a week and at times daily double sessions. School vacations and summer breaks are no longer "relaxing" times to be spent with family and friends but are spent on a bus, in a car or on a plain traveling to tournaments across the country.

These young athletes no longer play multiple sports. Rather they play the same sport on multiple teams (for example a school team and travel team) and no longer cross train. This lack of cross training and ultimately time to rest between seasons can lead to injuries and overuse syndromes.

Training guidelines are published and promoted that if followed will help to prevent overtraining. Are parents and coaches following these recommendations? Children's Hospital of Boston, Division of Sports Medicine, recommends children train for a no more than 18-20 hours a week and that any increases in training should follow the 10% rule.[2] Contrary to these guidelines, there are frequently circumstances that increase the child's weekly training hours above the maximum recommended such as when the athlete is on summer break and goes to intensive sports camps or increases their training schedule. Most athletes also increase their practice schedule the week before a competition. What happens when the athlete shows one of the signs of overtraining such as "deterioration in execution of sports plays, decreased ability to achieve training goals, or exhibits signs of fatigue?"[3] Unfortunately, the parents or coaches will often simply encourage more training, misinterpreting the child's signs or symptoms as disinterest, laziness or lack of doing enough conditioning.

Overuse injuries are a result of repetitive stress to muscles, tendons, and connective tissue that does not have time to heal and results in micro-tears to the connective tissue.[4] Soft tissue work is vital in preventing and treating these types of injuries. Active Release Techniques® (ART®) a combination of examination and treatment. The ART® practitioner uses his or her hands to evaluate the texture, tightness and movement of muscles, fascia, tendons, ligaments and nerves. Abnormal tissues are treated by combining precisely directed tension with very specific patient movements. While passive therapies such as ultrasound and electic muscle stimulation may help in acute injuries, faster results can be obtained once active care like ART® is introduced.

It is my professional opinion that it is critical that pediatricians and chiropractors who are working with young athletes should ask more detailed questions about sports activities during yearly physicals or during a pre-participation physical. Upon finding out that their young athlete trains 6 days a week on 2 teams, he or she can educate their parents on the signs and symptoms or overtraining as well as the importance of working with a qualified soft tissue therapist such as a chiropractor, physical therapist, or massage therapist.

References

1. Stricker PR. Sports Success Rx! Your Child's Prescription for the Best Experience. American Academy of Pediatrics, 2006. *http://www.healthychildren.org/English/health-issues/injuries-emergencies/sports-injuries/Pages/Overuse-and-Overtraining.aspx*
2. Micheli L. Overtraniing in Youth Sports. Children's Hospital Boston, Division of Sports Medicine, 2002. *http://www.childrenshospital.org/clinicalservices/Site1172/Documents/overtraining%20042507.pdf*
3. Rainey A. Learn to Avoid Overtaining and Overuse Injuries, Sports Medicine, Sept 6, 2009. *http://sportsinjuries.suite101.com/article.cfm/learn_to_avoid_overtraining_and_overuse_injuries*
4. Active Release Techniques® home page. *http://www.activerelease.com/what_patients.asp*

Grand Rounds Case #3: Two-Year-Old Twins with Pes Planus

PRESENTER

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History

After participating in a "Babes, Beams and Balance" class held by a recreational therapist (to promote gait in children demonstrating delayed standing, walking, running)and at the recommendation of their chiropractor and occupational therapist, two 2-year-old Caucasian females (identical twins) present with their mother regarding the possibility of a significant pes planus deformity and the structural abnormality that is occurring as a result of this. The twins were born slightly premature and mom has noted an abnormality of gait as well as some other sensory and motor dysfunctions. The latter are currently being treated through early childhood development support, a chiropractor and a naturopath. Mom has brought the twins for evaluation and to discuss possible treatment plans that may be available especially noting the significant flatfoot present.

Chief Complaint

Gait abnormality with respect to walking via the inability to walk in a normal manner and a delayed onset of walking.

Observation

Upon watching the twins walk: For both Twin A and Twin B, collapse at the medial longitudinal arch is significant. They both have a short extension of the hips. They both have early flexion of the knees but overall are quite active and mobile. They are both able to walk on their toes and are able to walk backwards. Examination of the foot nonweightbearing demonstrates full, hypermobile range of motion of the subtalar joint, and slightly restricted gastrocnemius and soleus complex and a very flexible flatfoot.

- Twin A has a much more deliberate steppage-type gait noted today.
- Twin B has a more "loose" starting and initiation of gait.

Impressions

1. Flatfoot deformity bilaterally with mild equines
2. Plantar fasciitis

Treatment Recommendations

Once shoes become more of a regular mainstay a Robert's plate is recommended until more aggressive intervention via a subtalar joint arthroereisis procedure can be performed.

Discussion

There is no universally accepted definition of pediatric flatfoot.[1] American College of Foot and Ankle Surgeons (ACFAS) guidelines say that flatfoot may exist as an isolated pathology or as part of other clinical entities that include generalized ligamentous laxity, neurologic and muscular abnormalities, genetic conditions and syndromes, and collagen disorders.[2]

A further distinction is drawn by the ACFAS between rigid flatfoot, typically associated with underlying pathology, and flexible flatfoot, characterized by an arch that appears normal when non-weight bearing but that flattens on stance.

For many foot specialists who see the damaging effects of excessive pronation among adults, the realization is all too obvious that much of this pathology can be curbed if it is addressed in childhood. Etiological factors of flexible pes planovalgus ("pediatric flatfoot") fall into two broad categories: pediatric and adult. Pediatric flexible pes planovalgus is typically congenital. Torsional abnormalities, muscular imbalance, ligamentous laxity, neuropathy, obesity, agenesis of the sustentaculum tali, calcaneovalgus, equinus, varus or valgus tibia, compensated forefoot varus, limb length discrepancy and os tibiale externum are just some of the possible causes.[3]

Although there is a dearth of long-term longitudinal studies of orthotic intervention in pediatric flatfoot, one study of 1,181 schoolchildren showed both significant undertreatment and overtreatment of flatfoot in the same cohort.[4] Another study of 835 children between ages three and six found that flatfoot prevalence was 44%, decreased naturally with age, and was more common in overweight

children and in boys. The investigators concluded that more than 90% of treatments were unnecessary in the children studied.[5] Several studies contribute to the opinion that "flatfoot" is normal for infants and toddlers[6,7] and that hyperpronation (present in 78% of five year olds) was normal for the age.[8]

When discussing flexible flatfoot there is a consensus that symptomatic children should be treated. The controversy relates to those who are asymptomatic. The ACFAS states that "periodic observation is indicated in non-physiologic flexible flatfoot," and that "children with asymptomatic flexible flatfoot should be monitored clinically for onset of symptoms and signs of progression."[2]

Field clinicians, basing their decisions on evidence based practices as well as practice based experience differ in their opinion. D'Amico editorialized that pronation is a poor postural position that sets the stage for future dysfunction, deformity, and disability. Children have structural imperfections present at birth, including loose ligaments and both osseous and neuromotor immaturity, so that malpositioned bones are subject to the deforming effects of gravity. The keystone of the longitudinal arch is the navicular, and that doesn't even begin to ossify until three and a half years of age. The problem with the developing foot is that it is too mobile. The calcaneus is everted and it is not an efficient lever for support, stability, or propulsion.[9]

In a recent study from Taiwan, researchers performed gait analysis on 377 preschool children aged two to six years and found that those with flexible flatfoot performed physical tasks poorly and walked more slowly versus their non-flatfooted peers.[10] This study supports that the consequences of the flexible flat foot might prove more complex than simply the presence of pain or discomfort.

It is this author's choice to, as recommended, wait until the children are more regularly wearing shoes and then utilize conservative treatments, including orthotics or shoe modifications like a Robert's plate, which is a pediatric orthotic which has a high medical phalange and a deep heel cup. Little rear foot posting in applied and is usually used for the 3-6 year old age group. The high medial phlange allows for maintenance of the longitudinal arch while the deep heel cup controls calcaneal eversion. Good quality shoes must be worn for this device to be effective. More aggressive intervention would involve a subtalar joint arthroereisis procedure.

Operative intervention, particularly for juvenile flexible flatfoot, is considered only after a protracted course of orthotics and shoe modifications and modifications in activity have failed to improve function or in symptomatic cases, relieve associated symptoms. Subtalar arthroereisis (also referred to as arthroereisis) has been performed for some 40 years with a variety of implant designs and compositions. This procedure is most often performed on youn g children and is designed to correct excessive talar displacement and calcaneal eversion by placing an implant in the sinus tarsi, a canal located between the talus and the calcaneus. The subtalar implant acts as a spacer to block the anterior and inferior displacement of the talus, thus allowing normal subtalar joint motion but blocking excessive pronation and the resulting sequela. In young children, insertion of the implant is frequently offered as a stand alone procedure.[3,11]

Once again, clinical opinion is based on practice based evidence and preventive protocols.

References

1. Evans AM. The flat-footed child — to treat or not to treat: what is the clinician to do? *J Am Podiatr Med Assoc* 2008;98(5):386–393.
2. Harris EJ, Vanore JV, Thomas JL, et al. Diagnosis and treatment of pediatric flatfoot. *J Foot Ankle Surg* 2004;43(6):341–373.
3. Lundeen RO. Offutt SM. Essential treatment tips for flexible flatfoot. Podiatry Today, April 01, 2003, 15(4), [http://www.podiatrytoday.com/article/1406].
4. Staheli LT, Chew DE, Corbett M. The longitudinal arch. A survey of 882 feet in normal children and adults. *J Bone Joint Surg Am* 1987;69(3):426–428.
5. Garcia-Rodriguez A, Martin-Jimenez F, Carnero-Varo M, et al. Flexible flat feet in children: a real problem? *Pediatrics* 1999;103(6):e84.
6. Pfeiffer M, Kotz R, Ledl T, et al. Prevalence of flat foot in preschool-aged children. *Pediatrics* 2006;118(2):634–639.
7. El O, Akcali O, Kosay C, et al. Flexible flatfoot and related factors in primary school children: a report of a screening study. *Rheumatol Int* 2006;26(11):1050–1053.
8. Gould N, Moreland M, Alvarez R, et al. Development of the child's arch. *Foot Ankle* 1989;9(5):241–245.
9. D'Amico JC. Letter to the Editor, *J Am Podiatr Med Assoc* 2009 99: 267-268.
10. Lin CJ, Lai KA, Kuan TS, Chou YL. Correlating factors and clinical significance of flexible flatfoot in preschool children. *J Pediatr Orthop* 2001;21(3):378–382.
11. Athem Blue Cross and Blue Shield/Regence. *http://blue.regence.com/trgmedpol/surgery/sur144.html*

DISCUSSANT 1

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The goal of the therapeutic treatment plan would be to

restore function. This would be accomplished by employing a variety of methods to assess and correct imbalance in multiple interconnected systems including nervous, muscular, fascial and skeletal systems. Clinical focus begins with the area of chief complaint, the plantar fascia, but the observer's vision should extend to the entire kinematic chain from feet to head. If correction is limited to feet and ankles, we then increase the potential that the observer might miss an essential part of the solution to the twins' problem of bilateral pes planus.

History taking in this case would start with information about the mother's pregnancy and delivery. With multiple gestation (in this case twins), there is a higher probability of in-utero constraint and that if this mother did not receive proper care during her pregnancy, she may be at greater risk for pelvic distortion, thus creating an environment of potential constraint for fetal dyad. Clinically, in-utero constraint may manifest in spinal subluxation, restrictions in the cranio-sacral system[1] as well as some acquired foot abnormalities that correct themselves after birth (including calcaneovalgus and mild metatarsus adductus).[2]

Initial assessment of these girls would include postural analysis, looking for asymmetry from both posterior and lateral perspectives. Next would be observation of movement and gait. The visual analysis begins with the feet in gait; watching from the ground up on multiple passes of movement. Observation progresses cranially inclusive of the knee, hip and pelvis motion as well as trunk, upper extremity and head balance. Often, afflictions of the feet can result in abnormal trunk on pelvis motion as well as full body distortions.[3] Observation should be done with shoes on and off. Although orthotics or corrective shoes (more frequently at this age) are a frequently employed, but possibly outdated protocol,[4,5] it is important to evaluate and correct biomechanical dysfunction before artificially supporting the foot to prevent perpetuation of that dysfunction.

As noted in previous exam findings on both of these girls, there is apparent 'short extension of hips' as well as pes planus. Several factors could be at play here. One is a restriction of pelvic motion. Another is hypertonicity of the hamstring group. These areas should be assessed with static and motion palpation and conservative, low force manual adjustments to the SI and pubic joints applied as needed. Therapeutically, a progression to higher intensity manual input would be appropriate should other methods not provide desired results of improved joint play. In addition, the analysis should include palpation and muscle testing as applicable of the hamstring, gluteal, guadricep and peroneus (fibularis) soleus muscle groups.[6,7] Fascial tone of the plantar fascia and Achilles tendons should also be assessed.

Along with standard chiropractic techniques of hands-on adjusting and instrument (Activator) assisted adjusting, a variety of myofascial release techniques can be applied.[8] Teaching parents and children to move and stretch certain muscle groups as needed is the first and sometimes the most important step. Manual fascial techniques can be used by the practitioner as well as passive stretching techniques.

The KinesioTaping method can also be applied in varied ways. In this case, a likely scenario for KinesioTaping applications would involve taping the hamstrings and gastrocnemius/soleus group to inhibit spasm, possibly facilitating guadriceps function and using fascial release KinesioTaping techniques to facilitate movement in the plantar fascia. It is important to note that the fascial system does not stop at the calcaneous but instead moves into the posterior Achilles, up the gastrocnemius group and into hamstring musculature. Much like a pair of coveralls surrounds our body when worn, the fascial system encloses muscle, nerve and skeletal system and creates an interconnected sheath of material that binds plantar fascia to trunk, upper extremity and head. To fully treat an individual, the entire system must be addressed.[9,10]

It is outside the scope of this discussion to detail analysis and correction using chiropractic techniques to remove spinal subluxation at all areas needed for these girls. Suffice to say that full spinal joint motion from sacrum to cranium is essential for optimal neurologic function and communication within the body and for this reason, as a chiropractor, one should assess and correct any areas of spinal subluxations found on full exam of these patients each time they are evaluated. Also, it is outside the scope of this paper to detail specifics of the KinesioTaping method. However, it can be an essential component of the treatment approach and can be used to facilitate proprioceptive input from the feet on both these girls as well as restore joint motion, reduce hypermobile subtalar joints, release plantar fasicial restrictions and restore balance to multiple muscle groups including gastroc/soleus and hamstrings.[11,12]

References

1. Littlefield TR, Kelly KM, Pomatto JK, Beals SP.. Multiple-birth infants at higher risk for development of deformational plagiocephaly: II. Is one twin at greater risk? *Pediatrics* 2002;109(1):19-25.
2. Jackson JF. Stricker SJ. Pediatric foot notes: A review of common congenital foot deformities. *International Pediatrics* 2003;18(3):133-140.
3. Anderson FC, Pandy MG: Individual muscle contributions to support in

normal walking. *Gait and Posture* 2003;17:159-169.

4. Bleck EE; Berzins UJ. Conservation management of pes valgus with plantarflexed talus flexible. *Clin Orthop Relat Res*1977;122:85-94.
5. Bordelon RL. Correction of hypermobile flatfoot in children by molded insert. *Foot and Ankle* 1980;13):143-150.
6. Zajac FE, Neptune RR, Kautz SA: Biomechanics and muscle contraction of human walking: Part I: Introduction to concepts, power transfer, dynamics and simulations. *Gait and Posture* 2002;16:215-232.
7. Zajac FE, Neptune RR, Kautz SA:Biomechanics and muscle co-ordination of human walking: Part II: Lessons from dynamical simulations and clinical implications. *Gait and Posture* 2003, 17:1-17.
8. Barnes JF. Myofascial release technics. *Pediatric Myofascial Release Seminar Workbook,* 1991.
9. Myers TW. Anatomy Trains, *Myofascial Meridians for Manual and Movement Therapists.* London: Churchill Livingston/Elsevier, 2009.
10. Murray H. The effects of Kinesio Taping® on proprioception in the ankle and in the knee. *J Orthop Sports Physical Ther* 2001;31:1.
11. Stahl A. Clinician's overview and case study: Post operative neuroma and RSD. *15th Annual Kinesio Taping International Symposium Review.* Tokyo, Japan: Kinesio Taping Association, 1999: 99-102.
12. Kase K, Wallis J, Kase T. *Clinical therapeutic applications of the Kinesio Taping® method.* Albuquerque, New Mexico: Kinesio Taping Association, 2003.

DISCUSSANT 2

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As a recreational therapist, one would approach this case utilizing an adaptive play strategy for the twins or any very young child diagnosed with flatfoot deformity and plantar fasciitis. The focus of services would be to provide a variety of play activities which would improve dorsiflexion of the ankle, increase ROM of ankle and increase the flexibility of both the gastrocnemius muscle and hip flexor muscle groups.

Parent education would be a major component of this treatment plan. Daily execution of the aforementioned activities will produce positive and long lasting effects. This can be most efficiently accomplished by encouraging the parents to incorporate fun (yet therapeutic) activities into the child's daily routine.

For supervision and continued guidance and fine tuning of their program, the children would be placed in a motor skills group that would include Brain Gym exercises,[1] yoga,[2] massage, games, dances and a variety of activities which will be described below. These activities can then be offered frequently at home or in school on a weekly basis. All of these activities, whether in class, at home or at school, should be performed ideally in bare feet allowing optimal movement and flexibility as well as sensory input.

Each week class begins with Brain Gym exercises to prepare the body to receive neurological input for new learning. Specifically the learning readiness exercises would be performed. This would be followed by massage and foot lengthening to both feet and passive ROM to ankle, foot and gastrocnemius. Foot lengthening is an exercise in movement based learning which helps to stimulate proprioreceptors in the foot.[3]

The focus of the class would then shift to more playful activities. Yoga poses are incorporated into music or storybook formats. This encourages children to begin using their feet to jump, hop, walk, tip toe, to squat, walk on balance beams or air filled cushions and to bounce on cushions and mats. The theory employed would be to encourage the children to follow directions and challenge the use of their feet in a controlled manner on a variety of different surfaces. This helps the children to naturally strengthen the muscles and mobilize the tendons of the foot, leg and ultimately the core muscle group important for weight bearing stabilization.

Unstructured time for children would be incorporated in the class, allowing them to simply play freely and safely on these different surfaces. The children would participate in obstacle course activities including but not limited to walking and running on bean bags, disc cushions, jumping on bosu (half of a therapy ball with a hard plastic base), walking in the sand or dirt, uneven surfaces, on foam pillows, balance beams, on air mattresses and on bilibos (plastic toy turtle shells). These activities provide vestibular stimulation, promote core stability and allow children to explore how to manipulate their feet in response to the different input they are receiving from the proprioceptors/mechanoreceptors in the muscles, tendons and ligaments as well as joints and joint capsules of the foot. It also strengthens the intrinsic muscles of the foot and larger muscles of the foot and lower leg.

In addition the children would spend time learning to jump and balance on a hoppy ball. The natural jumping and springing motion that would happen as the child rebounds from the floor provides a great deal of proprioreceptive input as well as encouraging the development of core stability, muscular strength/endurance and motor planning as it pertains to (among many things) the foot.

Ideally, as the class progresses, we would expect to see increased stability and muscular control develop. In

some cases, especially when working with children who demonstrate low muscle tone, delayed motor planning or previous delay in motor milestone attainment, a referral is made to a pediatric chiropractor. That chiropractor would then assess the integrity of the foot, ankle and entire kinetic chain and make recommendations for appropriate treatment. These may range from chiropractic adjustments to the temporary use of kinesiotape [4] to promote consistent neurologic input to the brain while the child continues to activate those same muscles during daily play. In this author's experience, this has often resulted in a child being able to successfully achieve the next level of stability in pedal function.

References

1. Koester CE. Interfacing Brain Gym with Children with Special Needs. Reno, Nevada, Cecilia E. Koester Publishing, 2004.
2. Khalsa SK. Kundalini Yoga. New York: Dorling Kindersley Publishing, 2000.
3. Kranowitz CK. The Out Of Sync Child Has Fun. CS. New York: Penguin Group, 2006.
4. Kase K, Wallis J, Kase T. Clinical therapeutic applications of the Kinesio Taping® method. Albuquerque, New Mexico: Kinesio Taping Association, 2003.

DISCUSSANT 3

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During the initial pediatric evaluation, the history should direct the clinician toward specific neurological indicators confirming a probable diagnosis. The history is the blueprint of how the child has developed. In this case, the first "red flag" is that the twins were born prematurely. Preterm infants may remain qualitatively different from term infants of equal post-natal age. Preterm infants typically are associated with low birth weight and have an expected mean of 14 months in attaining the skill of walking compared to 12 months for the full term infant.[1]

The second "red flag" is the delayed onset of walking. "Developmental milestones are age-appropriate skills which are seen in the normally developing child."[2] Other authors estimate a 97% increase of risk of developmental delay if the child is not walking by 18 months.[3] As chiropractors caring for pediatric patients, it is absolutely necessary that we are aware of such milestones.[4]

The developmental milestone outcome assessment is divided into five categories: gross motor, fine motor, communication, social and adaptation.[2] In this case, the history of the delayed milestones along with pes planus suggests that the children will demonstrate an altered or skewed structural adaptation to gravity. Using a developmental milestone outcome assessment early on would have revealed delayed in gross motor acquisition at 10 months to 12 months.

The adaptive skill category includes gross and fine motor skills, as well as those that may be interpreted as activities of daily living for an adult patient. Adaptive skills of daily living include the ability to drink from a cup, draw a circle, and move upright in gravity. Structural alterations in children represent an altered adaptation to being upright in gravity. The postural reflexes are responsible for human physiology to adapt in gravity. The postural reflexes consist of eight anti-gravity muscles that can torque, twist, and translate the frame in multiple directions in order to maintain the eyes on the horizon. In this case, in order to activate locomotion, muscle and joints have consciously or reflexively adapted through facilitation or inhibition to keep the structure upright in gravity.[5]

At various stages in development children's feet show a pattern appropriate for their age. Children typically have fat ,flat feet until the age of 2 years. The shape of the foot provides increased proprioceptive information with more surface area in contact with the ground. As toddlers progressively re-calibrate their posture in gravity, they should demonstrate steadiness and balance in their gait by age three.[2]

The lower kinetic chain is influenced by the developmental knee patterns as the child grows from birth to 6 years. Normally, an infant is born with genu varus. Over time, the leg alignment will correct and usually straightens out by about eighteen months of age. By the time the child is three to four years old, he or she will normally develop genu valgus. The progressive change to the long bones is necessary to minimize the elongation of the muscles in the lower limbs.

In this case, both Twin A and B present with a collapsed medial longitudinal arch. A collapsed arch or a kinematic altered progression in arch development is the most common postural distortion seen in children with developmental delay. In the upright posture, both girls are not able to hold themselves up in gravity. Pronating the feet increases the surface area contact of the pressoreceptor of the feet for greater proprioceptive feedback into the central nervous system (CNS).

During acquisition of gait children stand with a wide base, presenting the broadest surface of the foot in contact with the ground. The feet are a forced dependent receptor which signals the position of the body's center of gravity relative to the surface.[6] This response is a reflexive response known as central pattern generators, which means that it does not need afferent information to perform the motor outcome.[7] When a child is unable to perform a task appropriate for their age, they can only use previous acquired skill to navigate. The previous skills at this age would be primitive postures, which are the only ones available to pull motor cues from in order to "adapt".[8] The adaptation is further illustrated with altered gait patterns in toe off with shorten extensors of the hips. In addition, there is a combination of hypomobility and hypermobility which is also common is children with altered biomechanical progression. Tonal imbalances suggest a weakened proprioceptive system's poor response to gravity.[9]

The key difference between Twin A and B as noted is Twin B has low tone or "loose" initiation of gait. Children with low tone are not integrating the pull-of-gravity in their vestibular system. Proprioceptive challenges are another "most common" finding in children with developmental delay. Any dysfunction or unwanted proprioception perceived from the periphery will result in functional adaptive processes of the entire central nervous system.[9]

The management plan prepared by the certified recreational therapist includes foundation for optimal neurological activation. The plan includes vestibular input facilitating neurological activity for coordination of afferent input. Multiple movement strategies performed in gravity and in gravity neutral. Altering sensory input for the pressorecptors of the feet to communicate and integrate into the postural reflexive system.

Pediatric chiropractic care is not limited to the biomechanics of the feet but complete integration of the nervous system from the feet to the cortex. This author, as well as Drs. Fysh, Anrig and Plaugher have published articles on the correlation between adjustments and the developing cortex.[2,10] Moving our analysis forward, approaching the nervous system from a hemispheric analysis would alert the clinician to any asymmetrical cortical outflow.[11] This is a critical period in the girls' development known as lateralization. Lateralization externally is the dominant side for eye, ear, hand and foot preference. Internal lateralization is the connection from one hemisphere to other and its ability to function smoothly. For example, eye gaze has a center in each hemisphere, through lateralization organization is development for those centers and integration is established for normal use when looking right and left. The eyes are an integral part of the postural reflexive system. If postural abnormalities exist, ocular function is skewed. Identifying a weakened or dampened hemisphere through cranial nerve assessment is one tool in hemispheric analysis. The chiropractic adjustment would increase afferent input to the asymmetrical cortical outflow and enhance integration. A probable diagnosis for the twins is a lack of coordination between the two hemispheres interrupting their ability to adapt and mature as expected in gravity.

Evaluating the nervous system for any asymmetries would guide the chiropractor to adjusting the child on one side as opposed to both. Approaching the adjustment from this strategy is not technique driven but analysis driven. Incorporating the use of Kinesio Tape.[12] is imperative. Kinesio Tape will keep the arches in the desired position as the children have time for their system to integrate. If the arches are not corrected by age 5 years, I would strongly encourage the use of stabilizers for their feet.

References

1. Mandich MB, Simons CJR, Rilchie S, Schmidt D, Miclett M. Motor development, infantile reactions, and postural responses of preterm, at-risk infants. *Develop Med Child Neurol* 1994: 36:397-405.
2. Fysh P. *Chiropractic Care for the Pediatric Patient.* Arlington, VA: International Chiropractors Association Council on Chiropractic Pediatrics, 2002.
3. Egy J. The need for knowledge of child development. *Ped Neurosci* 2004; 1(1):1-6.
4. Pistolas PJ. Growth and development in the pediatric patient. *Funct Orthodontics* 2004;22(1):12-22.
5. Liebenson C. *Rehabilitation of the Spine.* Baltimore, MD: Williams & Wilkens, 1996.
6. Horstmann GA, Dietz V. A basic posture control mechanism: the stabilization of the centre of gravity. *Electroencephalogr Clin Neurophysiol* 1990,;76(2):165-76.
7. Lyons M. Central pattern generation of locomotion: a review of the evidence. *Phys Ther* 2002; 82:687-717.
8. Goddard S. *Reflexes, Learning and Behavior: A Window into a Child's Mind.* Eugene, Oregon: Fern Ridge Press, 2002.
9. Fisher AE, Murray E, Bundy A. *Sensory Integration: Theory and Practice.* Philadelphia, PA: F.A. Davis, 2002.
10. Anrig C, Plaugher G. *Pediatric Chiropractic.* Williams & Wilkins, Baltimore, MD 1998.
11. Iturria-Medina Y, Fernández AP, Morris DM, Canales-Rodríguez EJ, Haroon HA, Pentón LG, Augath M, García LG, Logothetis N, Parker GJ, Melie-García L. Brain hemispheric structural efficiency and interconnectivity rightward asymmetry in human and nonhuman primates. *Cereb Cortex* 2010 Apr 9. [Epub ahead of print] *http://www.ncbi.nlm.nih.gov/pubmed/20382642*
12. Kase K, Wallis J, Kase T. *Clinical Therapeutic Applications of the Kinesio Taping® Method.* Albuquerque, New Mexico: Kinesio Taping Association, 2003.

Abstracts of Interest

Cheung CH, Shum ST, Tang SF, Yau PC, Chiu TT. The correlation between craniovertebral angle, backpack weights, and disability due to neck pain in adolescents. *J Back Musculoskelet Rehabil.* 2009;22(4):197-203.

PURPOSES: To investigate the responses of the craniovertebral (CV) angle to backpack loadings in adolescents with and without neck pain and to explore the relationships between CV angle, relative backpack weight, neck pain and disability. **METHODS:** A cross-sectional single-blinded study was conducted on 60 adolescents (30 neck pain and 30 non-neck pain) aged from 13 to 18 years old. The verbal analog scale (VAS) and Chinese version of Northwick Park Neck Pain Questionnaire (NPQ) were used to assess neck pain severity and disability respectively. CV angle was measured in neutral and with backpack loadings of 5% to 30% of subject's body weight by using the Head Posture Spinal Curvature Instrument (HPSCI). **RESULTS:** In both groups, CV angles gradually decreased with increment of backpack loadings and the amount of decreases became significant from 10% body weight onwards ($P < 0.05$). Although the changes of CV angles did not show any significant differences at any point of comparison between the groups, the neck pain group showed a clinically significant decrease of CV angle (approximately 5 degrees) at 10% relative loading whereas non-neck pain group did it at 15% relative loading. Change of CV angles did not show significant correlations with relative backpack weight, cervical pain and disability ($P > 0.05$). **CONCLUSIONS:** Our findings suggested a safety limit of 10% relative backpack load for adolescents. The results showed the tendency that the ability of maintaining good head posture in response to backpack loadings by non-neck pain subjects might be better than those with neck pain. PMID: 20023350

Cohen E, Sala DA. Rehabilitation of pediatric musculoskeletal sport-related injuries: a review of the literature. *Eur J Phys Rehabil Med.* 2010 Feb 18.

AIM: The recent increase in sports participation in children and adolescents has resulted in the increase of sport-related injuries and the need for rehabilitation. The purposes of this study were to review studies involving rehabilitation of pediatric musculoskeletal sport-related injuries to determine the study design (level of evidence), inclusion of a reference to skeletal immaturity, adequacy of the description of the rehabilitation program and treatment outcome. **METHODS:** Medline(1950-June 2009), CINAHL(1982-June 2009), Cochrane and journals (sports, physical therapy, pediatric orthopedic) were searched using the terms: physical therapy or rehabilitation plus sports/athletic injuries or individual sports plus pediatrics, adolescent, children, youth and young. Inclusion criteria were: published in English peer-reviewed journal, examined rehabilitation/management, subjects </=18 years of age, and sport-related musculoskeletal injury/diagnosis. Study design (level of evidence), injury/diagnosis, sport involved, information regarding skeletal maturity, description of rehabilitation program and treatment outcome were extracted. **RESULTS:** Fifty-seven studies met the criteria: 75% were case reports, 21% case series, 4% retrospective comparative studies and no randomized-controlled trials. Forty-seven different diagnoses were investigated. Fifty-four percent did not address skeletal immaturity; 26% involved injuries/diagnoses unique to skeletally immature. Components and parameters of each study's rehabilitation program and outcome are reported. **CONCLUSIONS:** Current literature lacks well-designed controlled studies: 1) to address issues relevant to the pediatric injured athlete and 2) to determine the optimum program for each sport-related injury/diagnosis to expedite return to sport. Programs were often inadequately detailed to permit replication. PMID: 20168279

Green BN, Johnson C, Moreau W. Is physical activity contraindicated for individuals with scoliosis? A systematic literature review. *J Chiropr Med* 2009 Mar;8(1):25-37.

OBJECTIVE: The purpose of this study was to perform a systematic review of the literature and other authoritative sources for recommendations regarding the appropriateness of physical and sporting activity for those with scoliosis. **METHODS:** The literature was systematically searched in PubMed, the Cumulative Index to Nursing and Allied Health Literature, the Index to Chiropractic Literature, and the National Guidelines Clearinghouse from the earliest date of each database through July 2008. All languages and research designs were included. Web sites of respected organizations were searched for position/white papers on scoliosis and physical activity. Included articles were rated using the Oxford Centre for Evidence-Based Medicine criteria, and recommendations for physical activity were made using the Oxford Centre's criteria for grades of recommendation. **RESULTS:** Of 42 articles retrieved, 11 met the inclusion criteria. The Internet review of 18 organizations

yielded no previous guidelines or position papers for physical activity and scoliosis. Recommendations were made from 3 level 3b studies and 8 level 5 studies; they include the following: (1) brace-treated and surgically treated scoliosis patients have demonstrated that they can physically participate in physical activities at the same level as nonsurgical patients (grade C recommendation); (2) nonsurgically treated patients are encouraged to participate in sports and physical activity and (3) scoliosis is not a contraindication to participation in most sports (grade D recommendation); (4) brace-treated scoliosis patients are encouraged to exercise with their brace on; however, exercise may also be done outside of the brace (grade D recommendation); and (5) physical activity may be commenced after surgery for scoliosis; however, no high-quality evidence exists that guides the timing of return to physical activity (grade D recommendation). A potential association between elite-level competition in specific sports at an early age and an increased prevalence of scoliosis has been reported (grade C recommendation). **CONCLUSION:** This article offers evidence-based guidance to health care providers and to patients with scoliosis when making decisions to participate in physical and sporting activities. PMID: 19646383

Hawk C, Schneider M, Ferrance RJ, Hewitt E, Van Loon M, Tanis L. Best practices recommendations for chiropractic care for infants, children, and adolescents: results of a consensus process. *J Manipulative Physiol Ther.* 2009;32(8):639-47.

OBJECTIVE: There has been much discussion about the role of chiropractic care in the evaluation, management, and treatment of pediatric patients. To date, no specific guidelines have been adopted that address this issue from an evidence based perspective. Previous systematic reviews of the chiropractic literature concluded that there is not yet a substantial body of high quality evidence from which to develop standard clinical guidelines. The purpose of this project was to develop recommendations on "best practices" related primarily to the evaluation and spinal manipulation aspects of pediatric chiropractic care; nonmanipulative therapies were not addressed in detail. **METHODS:** Based on both clinical experience and the results of an extensive literature search, a set of seed documents was compiled to inform development of the seed statements. These were circulated electronically to the Delphi panel until consensus was reached, which was considered to be present when there was agreement by at least 80% of the panelists. **RESULTS:** A multidisciplinary panel of 37 was made up primarily of doctors of chiropractic with a mean of 18 years in practice, many with post-graduate training in pediatrics. The panel represented 5 countries and 17 states; there were members of the American Chiropractic Association, the International Chiropractors Association, and the International Chiropractic Pediatric Association. The panel reached a minimum of 80% consensus on the 51 seed statements after 4 rounds. **CONCLUSIONS:** A broad-based panel of experienced chiropractors was able to reach a high level (80%) of consensus regarding specific aspects of the chiropractic approach to clinical evaluation, management, and manual treatment for pediatric patients, based on both scientific evidence and clinical experience. PMID: 19836600

Howie LD, Lukacs SL, Pastor PN, Reuben CA, Mendola P. Participation in activities outside of school hours in relation to problem behavior and social skills in middle childhood. *J Sch Health.* 2010 Mar;80(3):119-25.

BACKGROUND: Research has shown that participating in activities outside of school hours is associated with lower dropout rates, enhanced school performance, improved social skills, and reduced problem behaviors. However, most prior studies have been limited to small populations of older children (>12 years). This analysis focuses on children aged 6 to 11 to assess the potential association between participation in activities outside of school hours and behavior in middle childhood in a nationally representative survey. **METHODS:** Estimates were based on 25,797 children from the 2003-2004 National Survey of Children's Health. Outside of school activity was defined as participating in sports teams/lessons, clubs/organizations, or both at least once in the past year. Analysis of variance was used to evaluate the differences in behavior problems and social skills adjusting for sociodemographic factors, among children classified by participation in outside of school activities. **RESULTS:** Seventy-five percent of children participated in outside of school activities: 23% in sports, 16% in clubs, and 36% in both clubs and sports. Activity participation differed by gender, race/ethnicity, type of school, poverty status, family structure, household education, and school and community safety. Children participating in both sports and clubs had higher social skills index scores, but no significant difference in problem behavior scores compared with children who did not participate in any outside of school activity. **CONCLUSION:** Children participating in both sports and clubs had greater social competence during middle childhood compared with children who did not participate in any outside of school activities. PMID: 20236413 [PubMed-in process]

Kaspiris A, Grivas TB, Zafiropoulou C, Vasiliadis E, Tsadira O. Nonspecific low back pain during childhood: a retrospective epidemiological study of risk factors. *J Clin Rheumatol.* 2010 Mar;16(2):55-60.

OBJECTIVES: In contrast to what was believed in the past, nonspecific low back pain is a fairly frequent condition in children, whose pathophysiology remains unclear as yet. Although many factors have been implicated in its development, results are often contradictory. **METHODS:** Our study aims to examine most of the reasons investigated in the international literature, as well as the previously unexamined impact of passive smoking in its clinical appearance. It is a retrospective study that investigates the symptom of nonspecific low back pain during a 12-month period before the visit of children to our department. The research included 692 children aged 7.5 to 14 years. The data were collected using a semi-structured questionnaire, which included a mix of open and closed questions, followed by physical examination during their visit. **RESULTS:** A total of 153 children were considered to present nonspecific low back pain during the previous year. The determinant factors appear to be greater age, the male sex, larger height, increased weight, dissatisfaction with school chairs, the clinical presentation of back pain in at least 1 parent, and coexisting anatomic orthopedic conditions. On the contrary, the weight of the school bag, the way in which it was carried and participation in sports, as well as the time spent by children in front of the TV or PC playing video or play station games, did not appear to have a statistically significant correlation with its appearance. In general, passive smoking does not appear to be a risk factor (P[r] = 0.341), and does not seem to play a leading role in the etiology of the condition. Furthermore, even the heaviness of parental smoking (over 20 cigarettes a day) does not seem to alter the appearance of the disease. The effect of nonspecific low back pain in children's activities was measured using Hannover Functional Ability and Rolland Morris questionnaires, appropriately modified to childhood, where he found a moderate or severe restriction of activity in 23.52% (score >5) and 19.61% (score >6), respectively. **CONCLUSIONS:** The data analysis shows that nonspecific low back pain in children is a benign disorder with an unknown pathophysiological mechanism. Many anthropometric characteristics and environmental factors are implicated, but to a different degree each time. Passive smoking as well as the heaviness thereof does not appeal to play in important role in its clinical presentation. Further investigation is deemed necessary to determine the existence of other risk factors, as well as the level of their participation in the condition's pathophysiology. PMID: 20130481

Leach RA, Yates JM. Nutrition and youth soccer for childhood overweight: a pilot novel chiropractic health education intervention. *J Manipulative Physiol Ther.* 2008;31(6):434-41.

OBJECTIVE: The purpose of this pilot novel chiropractic health education intervention was to gather preliminary evidence regarding possible benefits from recreational youth soccer and nutrition education in overweight women. A secondary purpose was to determine whether some nutrition knowledge is an independent predictor of changes in body mass index (BMI). **METHODS:** A quiz developed and validated on separate age and sex appropriate blinded cohorts was used on study participants — 22 volunteers of 57 eligible fourth-grade, overweight female Mississippi public school students. At the beginning of a 5-month study period, a 15-minute baseline nutrition intervention, grounded in Social Cognitive Theory and based on the United States Department of Agriculture's "My Tips for Families" information, was applied in a chiropractic clinic. Subjects were then randomized to 2 months of recreational soccer (n = 14) or waiting list control (n = 8). **RESULTS:** No preintervention differences were found in height, weight, BMI, or age. Higher follow-up BMI scores were found in both groups, and no significant differences between groups were found, possibly because of the small sample sizes and the short 8-week soccer intervention period. Gains in nutrition knowledge were sustained (P < .002); however, there was no association between nutrition knowledge and follow-up BMI (r = -.185; P < .462). **CONCLUSIONS:** Minimal nutrition education alone may be an ineffective intervention for overweight children. The study provides an example of how youth soccer may benefit overweight children. PMID: 18722198

Li J, Hooker NH. Childhood obesity and schools: evidence from the national survey of children's health. *J Sch Health.* 2010;80(2):96-103.

BACKGROUND: The international prevalence of childhood obesity and obesity-related diseases has received increasing attention. Applying data from the Centers for Disease Control and Prevention, we explore relationships between childhood obesity and school type, National School Lunch Program (NSLP) and School Breakfast Program (SBP) eligibility, membership in sports clubs and other sociodemographic, and household factors. METHODS: Nonlinear regression models with interaction

terms were developed to investigate the effects of school type, physical activity, and NSLP/SBP, etc, on children's body mass index (BMI). Probit models then examine the probability of a child being overweight. **RESULTS:** Though clinically small, statistically significant effects on BMI were found for children from households eligible for the NSLP/SBP, attending public schools. They have a mean BMI value 0.401 higher than counterparts attending private schools ($p < .05$). If the child both attends public school and is eligible for the NSLP/SBP, then his or her BMI is 0.725 higher ($p < .001$). Children taking part in the NSLP or SBP have a 4.5% higher probability of being overweight ($p < .001$). **CONCLUSIONS:** Regardless of household socioeconomic status, children attending public schools have higher BMI than those attending private schools. Eligibility for free or reduced-cost lunch or breakfast programs at public schools is positively correlated with children's BMI. Children attending public schools are more likely to be overweight. In lower socioeconomic status households, school type does not have a significant effect on the probability of being overweight. Policy recommendations for factors to address childhood obesity are discussed. PMID: 20236408

Lopes VP, Rodrigues LP, Maia JA, Malina RM. Motor coordination as predictor of physical activity in childhood. *Scand J Med Sci Sports*. 2010 Mar 11.

This study considers relationships among motor coordination (MC), physical fitness (PF) and physical activity (PA) in children followed longitudinally from 6 to 10 years. It is hypothesized that MC is a significant and primary predictor of PA in children. Subjects were 142 girls and 143 boys. Height, weight and skinfolds; PA (Godin-Shephard questionnaire); MC (Körperkoordination Test für Kinder); and PF (five fitness items) were measured. Hierarchical linear modeling with MC and PF as predictors of PA was used. The retained model indicated that PA at baseline differed significantly between boys (48.3 MET/week) and girls (40.0 MET/week). The interaction of MC and 1 mile run/walk had a positive influence on level of PA. The general trend for a decrease in PA level across years was attenuated or amplified depending on initial level of MC. The estimated rate of decline in PA was negligible for children with higher levels of MC at 6 years, but was augmented by 2.58 and 2.47 units each year, respectively, for children with low and average levels of initial MC. In conclusion MC is an important predictor of PA in children 6-10 years of age. PMID: 20338009

Miller JE, Benfield K. Adverse effects of spinal manipulative therapy in children younger than 3 years: a retrospective study in a chiropractic teaching clinic. *Manipulative Physiol Ther*. 2008;31(6):419-23.

OBJECTIVE: The purpose of this study is to identify any adverse effects to chiropractic care occurring in the pediatric patient and to evaluate the risk of complications arising in the pediatric patient resulting from chiropractic care. **METHODS:** A 3-year retrospective study of pediatric case files from the Anglo-European College of Chiropractic (AECC) (Bournemouth, England) teaching clinic practice in Bournemouth, England. All files (n = 781) of pediatric patients younger than 3 years of age were selected manually in sequential order from current files stored in the AECC clinic presenting to the AECC clinic during a specific period. Most (73.5%) patients presenting were 12 weeks of age or younger (n = 574). **RESULTS:** Six hundred ninety-seven children received a total of 5242 chiropractic treatments, with 85% of parents reporting an improvement. Seven parents reported an adverse effect. There was a reaction rate of approximately 1 child in 100, or one reaction reported for every 749 treatments. There were no serious complications resulting from chiropractic treatment (reactions lasting >24 hours or severe enough to require hospital care). **CONCLUSION:** This study shows that for the population studied, chiropractic manipulation produced very few adverse effects and was a safe form of therapy in the treatment of patients in this age group. PMID: 18722196

Moore MJ, White GL, Moore DL. Association of relative backpack weight with reported pain, pain sites, medical utilization, and lost school time in children and adolescents. *J Sch Health*. 2007;77(5):232-9.

BACKGROUND: There is debate about a 10% versus 15% of body weight cutoff point for safe weight of school backpacks. Estimation of the cutoff may be affected by use of survey methods and failure to assess pain experienced while wearing a backpack. Previous research also suggests that younger students and females are more at risk for developing backpack pain. **METHODS:** Five hundred and thirty-one 5th- to 12th-grade Northern California students and their backpacks were weighed. Students were individually interviewed about how often they experienced pain while carrying a backpack, the site of their pain, and if the pain had interfered with school activities or led to medical care. **RESULTS:** Data support the use of a 10% of body weight cutoff for safe use of backpacks for all grade

levels. Younger students and females are more at risk due to relatively lower body weight while females also carry heavier backpacks than males. Greater relative backpack weight is associated with upper- and mid-back pain reports but not neck or lower back pain; it is also associated with lost school time, lost school sports time, and greater chiropractic utilization. **CONCLUSIONS:** The 10% cutoff is recommended along with a variety of practical methods to help schools achieve that goal for middle and high school students. PMID: 17430435

Neuschwander TB, Cutrone J, Macias BR, Cutrone S, Murthy G, Chambers H, Hargens AR. The effect of backpacks on the lumbar spine in children: a standing magnetic resonance imaging study. *Spine* 2010;35(1):83-8.

STUDY DESIGN: This study is a repeated measures design to measure the lumbar spine response to typical school backpack loads in healthy children. The lumbar spine in this setting was measured for the first time by an upright magnetic resonance imaging (MRI) scanner. **OBJECTIVE:** The purpose of this study is to measure the lumbar spine response to typical school backpack loads in healthy children. We hypothesize that backpack loads significantly increase disc compression and lumbar curvature. **SUMMARY OF BACKGROUND DATA:** Children commonly carry school backpacks of 10% to 22% bodyweight. Despite growing concern among parents about safety, there are no imaging studies which describe the effect of backpack loads on the spine in children. **METHODS:** Three boys and 5 girls, age 11 +/- 2 years (mean +/- SD) underwent T2 weighted sagittal and coronal MRI scans of the lumbar spine while standing. Scans were repeated with 4, 8, and 12 kg backpack loads, which represented approximately 10%, 20%, and 30% body weight for our sample. Main outcome measures were disc compression, defined as post- minus pre-loading disc height, and lumbar asymmetry, defined as the coronal Cobb angle between the superior endplates of S1 and L1. **RESULTS:** Increasing backpack loads significantly compressed lumbar disc heights measured in the midline sagittal plane ($P < 0.05$, repeated-measures analysis of variance [ANOVA]). Lumbar asymmetry was: 2.23 degrees +/- 1.07 degrees standing, 5.46 degrees +/- 2.50 degrees with 4 kg, 9.18 degrees +/- 2.25 degrees with 8 kg, and 5.68 degrees +/- 1.76 degrees with 12 kg (mean +/- SE). Backpack loads significantly increased lumbar asymmetry ($P < 0.03$, one-way ANOVA). Four of the 8 subjects had Cobb angles greater than 10 degrees during 8-kg backpack loads. Using a visual-analogue scale to rate their pain (0-no pain, 10-worst pain imaginable), subjects reported significant increases in back pain associated with backpack loads of 4, 8, and 12 kg ($P < 0.001$, 1-way ANOVA). **CONCLUSION:** Backpack loads are responsible for a significant amount of back pain in children, which in part, may be due to changes in lumbar disc height or curvature. This is the first upright MRI study to document reduced disc height and greater lumbar asymmetry for common backpack loads in children. PMID: 20023607

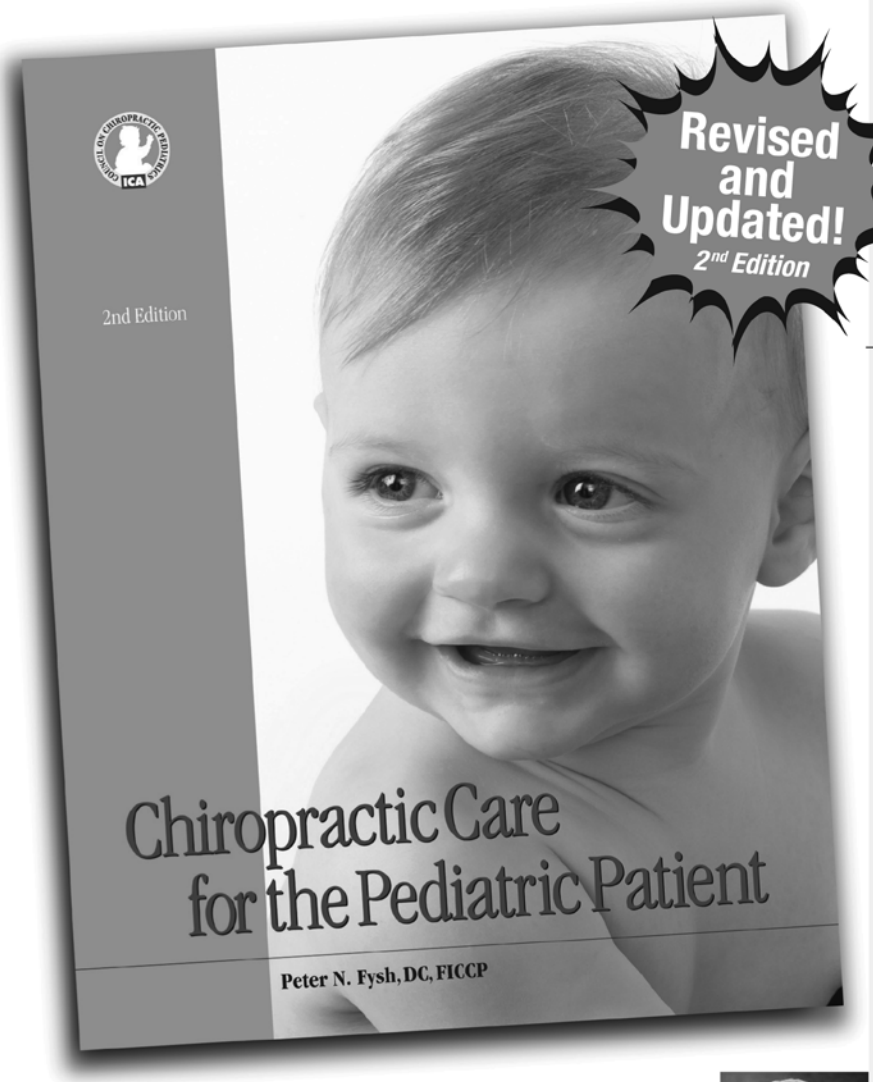
Pelletier JC. Sports related concussion and spinal injuries: the need for changing spearing rules at the National Capital Amateur Football Association (NCAFA). *J Can Chiropr Assoc.* 2006;50(3):195-208.

INTRODUCTION: Returning an athlete to play following a spinal or concussive injury remains a challenge for the health practitioner making the decision. Among the possible mechanisms responsible for such injuries in amateur football, the concept of "spearing" has attracted a great deal of attention in sport medicine. **OBJECTIVE:** The purpose of this paper is to present a review of the diagnosis and treatment of the potentially catastrophic neck and head injuries caused by spearing in Canadian amateur football and to suggest the role the chiropractic profession can have in their prevention. It proposes to follow the recommendations advocated by the National Capital Amateur Football Association (NCAFA) athletic trainers group, led by a chiropractor. **METHODS:** Information regarding the concepts and prevention of "spearing", concussion and spinal injuries at the amateur football level in both the United States and Canada was obtained using the following computerized search methods: PubMed-MeSH (via the National Center for Biotechnology Information (NCBI); The Index to Chiropractic Literature (ICL); Google Scholar Beta. Recent (2005) information on sports related spinal injuries and concussion were obtained by attendance at the 2005 Sports Related Concussion and Spine Injury Conference. Foxborough, Massachusetts. From a total of 698 references, 63 were retained. **CONCLUSION:** Literature search yields very little information regarding Canadian statistics for amateur football neck and head injuries. The author encourages such injury data collecting and proposes that original Canadian studies and statistical analyses be carried out, such as those from diverse sports groups in the United States and abroad. 1, 2, 3 The NCAFA group of trainers recommends a changing of the rules for "spearing" within the league and advocates gathering of Canadian based sports injury statistics. It also recognizes the need for public presentations (of concussion/spinal injuries).5

This paper describes the different interpretations of spearing rules at American and Canadian football associations, both at the amateur and professional levels; it further shows that injury prevention in sports is an absolute necessity and that the chiropractic profession should play a role in its application. It is suggested that chiropractors, who often attend to athletes who sustained sport related neck and head injuries, ought to contribute in their prevention and treatment.

Penko AL, Barkley JE. Motivation and Physiologic Responses of Playing a Physically Interactive Video Game Relative to a Sedentary Alternative in Children. ***Ann Behav Med.*** **2010 Feb 19.**

BACKGROUND: While there is emerging research outlining the physiologic cost of the physically interactive Nintendo Wii, there are no evaluations of the relative reinforcing value (RRV) of the Wii versus a sedentary alternative. **PURPOSE:** The purpose of this study is to evaluate the physiologic cost, RRV, and liking of playing Wii Sports Boxing (Wii) versus a traditional sedentary video game (SVG) in 11 lean and 13 overweight/obese 8- to 12-year-old children. **METHODS:** Heart rate (HR) and VO(2) were assessed during rest, treadmill walking, and playing an SVG and Wii using a counterbalance design. Liking was assessed during treadmill walking and video game play. RRV was assessed for Wii versus SVG. **RESULTS:** Average HR, VO(2), and liking were significantly greater for Nintendo Wii ($p </= 0.001$ for all) than all other conditions. Lean children displayed a greater ($p < 0.001$) peak responding for access to Wii relative to the SVG while overweight/obese children did not ($p >/= 0.16$). **CONCLUSION:** Wii was a well-liked activity of greater physiologic intensity than both the SVG and treadmill walking. Lean children were more motivated while overweight/obese children were equally as motivated to play Wii relative to the SVG. PMID: 20169428



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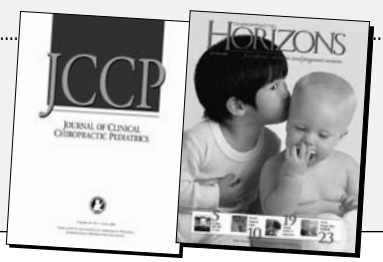

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