

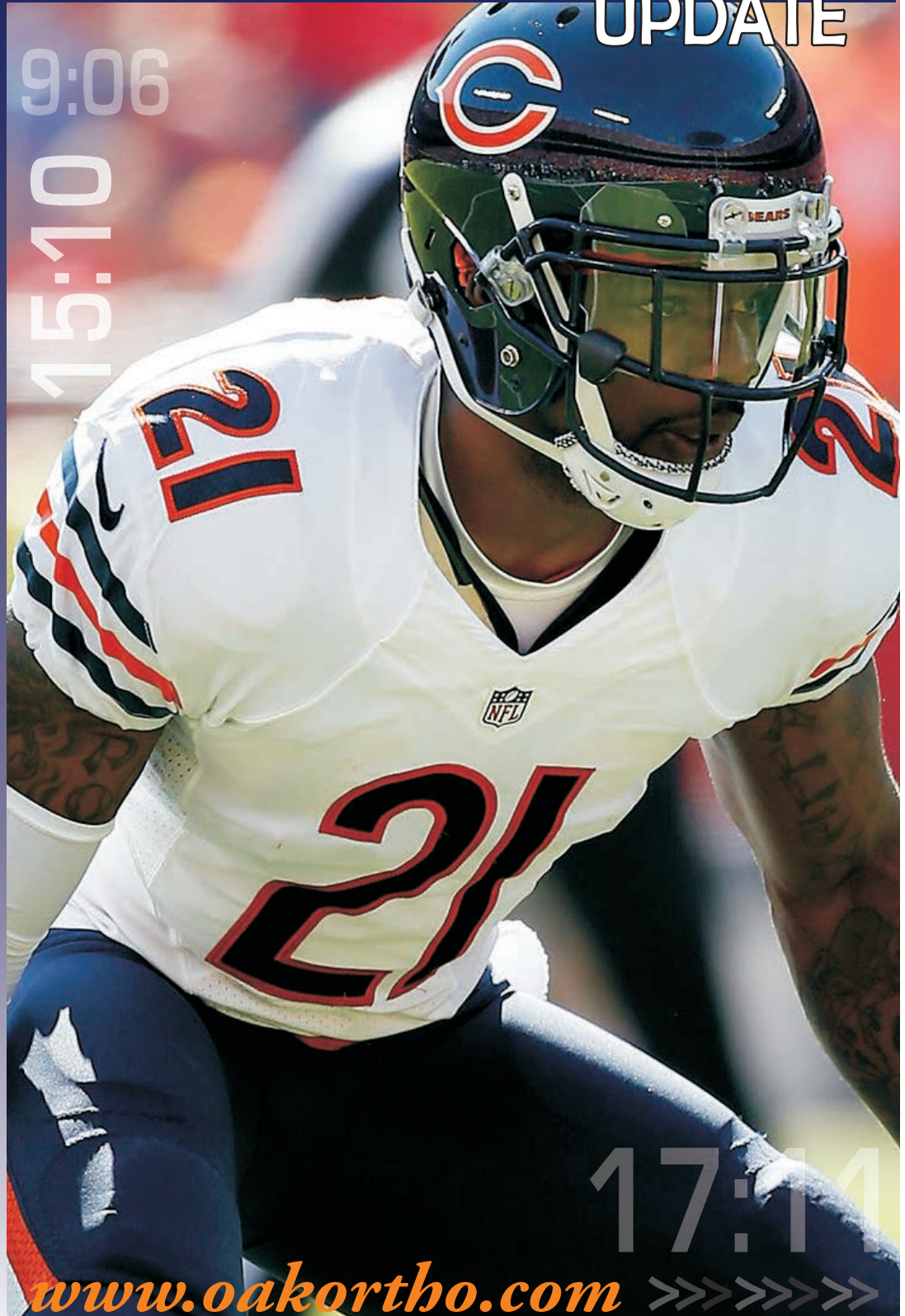
# OAK 12:03 Sports Medicine

UPDATE

## INSIDE THIS ISSUE:

9:06  
15:10

- Saturday Sports Injury Clinic..... p. 2
- Low Back Pain in Athletes..... p. 3
- Congratulations Donovan Jones.. p. 5
- School Athletic Fundraiser..... p. 5
- Dr. Corcoran's Clinic Welcomes  
Kristen Connors..... p. 6
- David Fritz Joins Dr. Eric  
Varboncouer's Practice..... p. 6
- Clinic Spotlight..... p. 6
- One Way To Decrease Youth  
Athlete's Injury Rates ..... p. 7
- Hydration In Athletes: Oral Versus  
Intravenous ..... p. 8
- Bradley-Bourbonnais Athletics Utilizing  
Cutting Edge Technology..... p. 9



17:14





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OAK Sports Medicine Update is a publication of OAK Orthopedics. This newsletter is intended for those healthcare professionals, coaches, and athletic directors who are interested in the diagnosis, prevention, treatment and rehabilitation of sports injuries.

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## Saturday Sports Injury Clinics

OAK ORTHOPEDICS will once again offer its Saturday morning Sports Clinic to area athletes. The Bradley and Frankfort will be staffed by an orthopedic physician, medical assistant and x-ray technician. We will be able to do x-rays, braces, MRI, physical therapy and other tests that may be rendered by the physician.

The sports clinic is offered to all athletes, all ages. It begins at 9:00 a.m. on Saturday mornings. The clinic in Bradley will run year round and the clinic in Frankfort will run through the fall sports season.

The clinic will be held at the Bradley and Frankfort offices listed below.



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# LOW BACK PAIN IN ATHLETES

by Alexander Michalow, M.D.

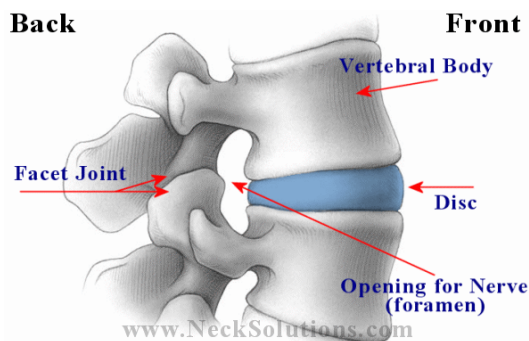
## GENERAL ISSUES AND ANATOMY

Low back pain (LBP) is commonplace in the general as well as in the athletic population. Although it is more common with aging, LBP is not unusual in the young and teenage athlete. It is largely due to structural injuries, including ligament sprains, muscle strains, joint sprains and/ or fractures.

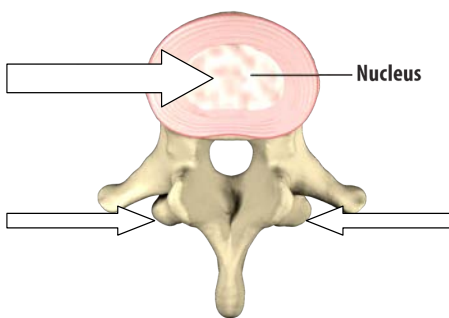
The spine is made up of a series of vertebral bodies connected by the inter-vertebral discs, along with bilateral facet joints at each level.



Alexander Michalow, M.D.



In this way the structure of the spine is a tripod at each articulating level, consisting of the inter-vertebral disc as one leg of the tripod (wide arrow), and the associated facet joints (narrow arrows) as the other two legs of the tripod.



The diagram at the left is a rather simplistic view of the spine. There are, in addition, several other ligaments which attach from one level to the next, including supraspinous, interspinous, inter-transverse ligaments, etc. Furthermore, due

to such a complex structural interaction, back pain is, more often than not, not the result of simply an isolated muscle or ligament injury but rather, back injuries are multi-factorial.

Imagine a 3-dimensional structure such as a simple pretzel. It would be difficult to break one part of the pretzel, while keeping the rest intact. In a similar way, an injury to one part of the “tripod” at a certain spinal level is generally associated with an injury to another structure at that level. For example, an isolated facet joint sprain would be difficult to imagine in such a scenario. Moreover, a twisting/ pivoting/ sheering mechanism which could “sprain” a facet joint ligament, would also have to cause some physical stress to the adjacent disc and its annular ligament, along with the adjacent muscles. Thus, an isolated injury such as a facet joint sprain is not likely.

## Muscle Anatomy

Briefly, the spine is controlled by extensor and flexor muscle groups. Extensor muscles consist of multiple layers of superficial to deep muscles. Flexor muscles for the spine are the trunk/ “core: abdominal muscles, including the anterior and oblique abdominals.

## LOW BACK INJURY

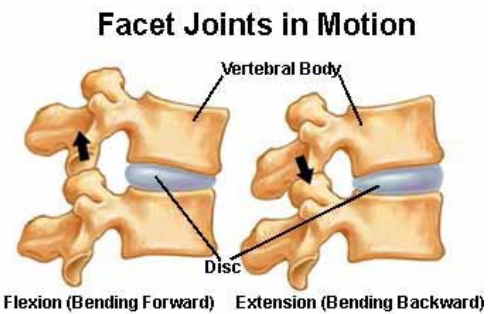
In a simplistic analysis, any one of three structures can potentially be injured in weight lifting: 1) disc, 2) joint 3) muscle.

### 1) Disc injury.

With respect to disc related pain and weight lifting injury, in many circumstances there may have been a prior injury or multiple small “injuries”, resulting in wear and tear of the annular ligament, which weakens it. Or, there may be a congenital weakness of the annular ligament. With heavy intense weight lifting the forces in the disc are increased. During a weight lifting maneuver, the disc is compressed downward, absorbing the vertical force on the spine. This results in high strains in the surrounding annular ligament. A prior injury or congenital weakness could then predispose to more extensive tearing of the annular ligament. When the tear is large enough the result is that the central nucleus pulposus is pushed through that defect, resulting in a herniated disc.

### 2) Facet Joint injury

Weight lifting generally, does not cause facet joint injuries. This is due to the fact that the lumbar facets, except to some extent, L5-S1, allow for forward flexion and extension. Moreover, they resist rotational forces.



In this respect, rotational/twisting injuries are more likely to cause facet joint injuries,

than simple forward flexion – extension mechanisms. Indeed, a study done many years ago in Sweden indicated that, in a comparison of a group of weight lifters to wrestlers, it was found that both groups had a high incidence of degenerative disc changes on their MRI scans. However, the weight lifters had a much lower incidence of LBP. This is consistent with the concept that weight lifters do not subject the spine to excessive torsional forces, as occurs in wrestling. Moreover, it is those torsional forces that are surmised to cause more stress on the adjacent facet joints, as well as other structures, resulting in LBP.

### 3) Muscle Injuries

With respect to muscle injuries, they generally occur due to eccentric forces (i.e., the muscle is extending/ lengthening while at the same time it is contracting, causing a shortening force). Such opposing “push-pull” mechanics results in excessive strain and thus injury. Moreover, eccentric forces are not hard to imagine in sport competition. In fact, they are common. This may occur as in a tackle in football, a wrestling maneuver, weight lifting, bending and extending for a volleyball, etc.

Weight lifting and injury/ LBP

Proper technique in weight training is of concern, as it is known

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## LOW BACK PAIN IN ATHLETES

*continued*

that poor technique may lead to injuries. For the competitive athlete, high intensity training is utilized in order to maximize strength and performance. High intensity alone does not result in injury and LBP. Injury in most instances is associated with poor technique. Furthermore, fatigue plays a role in injury. The fatigued athlete may not be able to put up the high force that the athlete requires for a certain competitive maneuver and may be injured in this way. In addition, in a fatigued state, the potential for poor technique is increased.

Low back injuries with weight lifting may lead to muscle strains and / or disc related pain and / or both.



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These pictures demonstrate potential lumbar injury mechanisms. In a hunched position the tendency is that the spine is extending at the onset of the lift, as depicted in the first 2 pictures above. Again, this causes an eccentric force, with the

potential for a significant muscle injury. The hunched forward position should also be avoided while doing any squat thrust training maneuvers, for the same reasons.

Furthermore, in addition to excessive muscle strain, there may be excessive stress on the lower discs as the forces with such improper technique, are concentrated in those levels, rather than being dissipated throughout the spine.

In the third pic, the use of the kettlebell, with improper use, results in excessive eccentric strain. One must not allow the kettlebell to get out away from the body, as this moves the body forward even as the weight is felt moving onto the toes, then yanking it up out of the back swing, which can cause considerable stress on the lower back. The swing should be kept low. It should get a natural lean back of your torso as the Kettlebell swings up from the force of your leg drive, and your arm is relaxed and long. As the bell begins to drop, one should move the body with the kettlebell absorbing the weight with the body, dissipating stresses to the lower back.

The inverted leg press device is not uncommonly associated with poor form, which has the head forward and the buttocks off the seat. This places excessive stress on the neck and lower back.



These are merely a few examples as to how improper technique may lead to back injury and LBP. The take home message is

that proper technique is mandatory, and if not sure, assistance by trained exercise personnel is recommended.

### Myofascial pain

Myofascial pain (MP) syndrome is not an uncommon term used for individuals with LBP. MP is generally thought of as a non-articular musculoskeletal pain syndrome associated with localized myofascial trigger points. These are located at muscle, fascia or tendon insertions, such as at the posterior iliac crest. The posterior iliac crest is where the lumbar muscle fascia attaches to the pelvis. Such MP is generally associated with chronic pain disorders. It is less often associated with the athlete, who more often has acute injury and acute pain. The underlying cause is often related to muscular imbalance, not uncommonly associated with degenerative issues, and is treated with a comprehensive rehabilitation program.

### Hamstrings

Another key structure in low back pain affecting up to 95% of people with chronic pain disorders are the hamstring muscles, the large muscles in the back of the thighs. Patients with tight hamstrings tend to develop low back pain, and those with lower back pain tend to develop tight hamstrings.

### TREATMENT for LBP

#### LBP AND DISC RUPTURE

First, it is necessary to distinguish between pure LBP and LBP that is associated with leg pain/ sciatica. In addition, it is important to realize the difference between true sciatica, which is the result of a pinched nerve in the lumbar spine (n athletes this is virtually always due to a ruptured/ herniated disc), and “referred” pain. Referred pain is pain that generally begins in the lower lumbar spine and radiates into both buttocks, and into both posterior thighs, but does not radiate down into the leg or foot. At times there may only be unilateral, rather than bilateral, posterior thigh pain.

With respect to disc rupture, most are typically associated with a period of time where there is only LBP, and no leg symptoms. This may be as short as a few days or weeks, or even months to years before true sciatica develops. True sciatica pain begins either in the lower spine or in buttocks. It radiates down into the lower leg/ ankle/ foot. Also, it is not unusual that when the actual disc ruptures through the annular ligament, the LBP lessens and the leg/ sciatica pain becomes the primary issue. In other words, LBP may reduce, be over-shadowed by the leg pain, or even disappear in some cases.

In addition, one should be aware of a condition known as piriform syndrome. This is a not too common diagnosis, wherein the piriformis muscle, with is located deep to the gluteus muscle, puts pressure on the adjacent sciatic nerve. The result is buttock pain with pain radiating down into the ankle and foot, thus mimicking a true sciatica pain. Treatment for this condition is therapy, with or without a cortisone injection. Surgery is rare.

In conclusion, if a true sciatica is suspected, then it is recommended that the patient is referred to a medical specialist for further evaluation in order to obtain specific testing, such as Xrays and an MRI.

### TREATMENT FOR SCIATICA

If there is a true pinched nerve due to a presumed herniated disc, then it is recommended that Xrays and an MRI are obtained. Further treatment includes either conservative means or surgery.

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# LOW BACK PAIN IN ATHLETES

*continued*

Conservative means include rest, modification of activity, therapy, medications and potentially cortisone injections. Surgery is generally indicated for those discs that are unresponsive to conservative care, or more urgent surgery for those with neurologic issues.

## TREATMENT LBP ONLY

Conservative means are the rule of thumb for the great majority of acute back injuries. These include rest at the onset. Rest generally means a significant reduction of activity and / or laying down a good part of the day, if possible, but for no more than 3 days. This is followed by therapy and exercises.

Therapy includes strength & conditioning exercises. These should not only focus on the spine but also the abdominal muscles, along with general cardio-vascular conditioning, and stretching exercises. Therapy protocols may include chiropractics for those patients inclined to visit a chiropractor.

Additional modalities include ice and heat. Ice is generally best applied after some bout of activity, or later in the day, or after exercising, and when there is muscle tightness with muscle knots. Heat is generally indicated to “loosen up” the back, such as in the morning after awakening, after use of ice, prior to bedtime, or any time during the day if it soothes the ache. Heat generally is effective only while it is being applied, the symptoms tend to recur, at least partially, after the heat is withdrawn

Medications include anti-inflammatory medications. In many instances over the counter anti-inflammatory medications (NSAID’s), such as ibuprofen, or a myriad of other NSAID’s may be used. For the more severe cases a short term of cortisone pills (eg., Medrol dosepak) may be prescribed by the medical personnel. Temporary narcotics may be used, but only for the severe cases. Muscle relaxants may be considered, however the response is highly variable. In many instances they also cause sedation and a tired feeling, thus, when utilized, may be best tried at night time. **SIMPLE LBP NOT RESPONSIVE TO CONSERVATIVE MODALITIES**

If the back pain persists then further evaluation may be necessary. Although every low back injury does not require medical imaging such as Xrays, if initial treatment is not working, or if there is progression, then Xrays are indicated. This is necessary in order to make sure there is no fracture, specifically a stress fracture. Stress fractures occur in what is called the “pars”. Most pars fractures are treated with conservative means. A small percent of these stress fractures result in the gradual slippage of one vertebral body forward relative to the one below it. Most commonly, in the young and middle age athlete, this occurs at the L5-S1 level. Referral for surgery is indicated for the more severe pains and for those noted to have progression.

## VERTEBRAL FRACTURES

These are not common in athletes but may occur in sports such as motorcycle racing, rugby, horseback riding and falling off, or a fall from a gymnastic or cheerleading maneuver. Such fractures are associated with quite significant pain and are generally transferred to the E.R. After the fracture has healed it is not uncommon to have some LBP for many weeks, or months afterwards. Treatment for chronic LBP following a fracture generally consists of similar treatment protocols not unlike that used for back sprains/ strains, as briefly discussed above.

# Congratulations Donovan and Proud Father Dr. Eddie Jones



Dr. Eddie Jones, proud father of Donovan Peoples-Jones has signed his letter of intent to continue his football career at the University of Michigan. Donovan a Five-Star recruit and the nation’s top wideout was recruited nationally by the biggest and best, but chose Michigan. No matter what Donovan’s decision would have been Dr. Jones would have been totally supportive, but it certainly was a relief to Dr. Jones as he played football at Michigan during his collegiate days. We look forward to following Donovan’s career. Congratulations to both, “Michigan Men & Go Blue”.

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## Dr. Corcoran's Clinic Welcomes Physician Assistant Kristen Connors

Michael J. Corcoran's, M.D. is pleased to announce and welcome Kristen Connors, PA-C to his clinic staff. Kristen has a strong connection to the area as she is a graduate of Kankakee High School and had the proud distinction of being named valedictorian following her senior year.

Then it was on to Northwestern University, but that strong connection brought Kristen back to Olivet Nazarene University where she earned a Bachelors of Science degree in Biology. At ONU Kristen served as a teaching assistant in Chemistry and Human Anatomy while earning the distinction of being named to the Phi Delta Lambda Honor Society.

Following graduation from Olivet Nazarene University Kristen was accepted into Midwestern University in Downers Grove to pursue her Physician Assistant post-graduate degree. Kristen always had a strong interest in science that dates back to her freshmen year in high school and became fascinated with how the body works. She loved the path that the physician assistant program took her, with the versatility and experiences she acquired during her studies. Kristen is certified Basic Life Support and well as Advanced Life Support.

Kristen connection to OAK is further strengthened by the fact that her mother works here as well. In her spare time Kristen loves to read, cook and bake as well as watch movies and documentaries. Of course she is a Chicago sports fan supporting the Bears, Bulls and Blackhawks, but she also has strong connection to the Packers (we'll working on that). With Kristen's strong interest in sports, she has become an important part of OAK's Sports Medicine program and game coverage.

Kristen also has a passion for helping find rescue animal's homes and conservatively has found about 10-15 cats and dog's placement over the past several years.

OAK Orthopedics, Dr. Corcoran and his staff welcome Kristen and look forward to a strong and productive relationship with Kristen Connors, PA-C.



*Kristen Connors, PA-C*

## David Fritz Nurse Practitioner Joins Dr. Eric Varboncouer's Practice

Nurse Practitioner David Fritz has joined orthopedic surgeon Eric Varboncouer's, M.D. practice and OAK Orthopedics. David comes to OAK with a wealth of experience having spent 20 years employed at St. Mary's Hospital. The vast majority of David's time at St. Mary's was in and around the operating room so he became a natural fit for a Dr. Varboncouer's busy orthopedic practice.

David was born and raised in Bradley and upon graduating from Bradley Bourbonnais High School entered and served our country in the U.S. Navy from 1983 – 1991. Following his honorable discharge David continued serving in the U.S. Army National Guard from 1992 – 1996. During his National Guard duties entered and graduated from Kankakee Community College in 1997 with an Associate's Degree in Nursing. After working for several years as a nurse David then pursued his Bachelor of Science degree in Nursing from Olivet Nazarene University which was granted in 2015. Propelled by his B.S. degree David then continued his education and was awarded his Masters in Nursing and Family Nurse Practitioner degree from ONU.

Married since 1998 David is a devoted father of 3 energetic boys and lives in the Clifton area. David in his spare time enjoys woodworking and most certainly spending time with his wife and boys. Upon joining OAK David certainly got involved quickly volunteering to help cover the array of Friday night football games OAK covers.

OAK Orthopedics and Dr. Eric Varboncouer welcomes David Fritz who certainly has become a vital member of our team.



*David Fritz, FNP-BC*

## Clinic Spotlight - Dr. Eric Varboncouer

Dr. Eric Varboncouer and his clinical staff are always on the go as doctor's practice continues to grow and expand. Helping manage these demands is clinical coordinator Sue P. who helps organize Dr. Varboncouer's day to day within the clinic setting and his surgical schedule. Assisting Sue in clinic is Tina A. who is the medical assistant coordinating the medical services and needs for the patient within the clinic setting. With the growth of Dr. V's practice a welcome addition to his staff is David Fritz, FNP-BC who brings a wealth of experience from his previous work at Presence St. Mary's Hospital.

Although Dr. Varboncouer's Fellowship training focused on the shoulder doctor and his staff see a wide array of orthopedic conditions and problems. Meeting these demands takes a special and positive approach. Dr. Varboncouer and his staff certainly do their very best to communicate and explain to their patient's the path of care they will receive. In addition, Dr. Varboncouer and David Fritz are actively involved with the OAK Sports Medicine program covering Friday night football games and assuring the athletes from the area receiving the best care possible.

OAK Orthopedics feels very fortunate to have Dr. Varboncouer and his staff providing remarkable service and care to the patients they serve.



*Lt. to Rt.: Tina A., Dr. Varboncouer, Sue P., David Fritz*



# One Way to Decrease Youth Athlete's Injury Rates

by Jeff Weber, MS, CSCS

As coaches and players all of the hype and publicity is given to an athlete's speed, or ability to produce force. But realistically, for the majority of athletes out there their ability to stop and restart is going to have a bigger overall impact on performance and injury prevention. In this article we are going to touch on how poor stopping or deceleration ability leads to more injuries, and ways to improve your athlete's ability to stop. First of all, in my direct experience it is an error on a coaches or parent's part to assume an athlete knows how to stop or even less common, stop well. Yes they can slow themselves down to a stop eventually, but to assume they can efficiently and safely stop going in multiple directions and at high speeds is a massive oversight.



Jeff Weber, MS, CSCS  
Director OAK Athletic  
Development

## Consider this...

Approximately 70% of ACL injuries are non-contact in nature, meaning there is no direct contact to the knee from another player. These types of injuries are associated with decelerating, pivoting and awkward landings.

Ankle sprains, one of the most common lower body musculoskeletal injuries in athletes most commonly occurs with lateral deceleration or landing.

When the body is not developed enough to control the forces acting on it, injuries occur. In addition, even if the body is strong enough to control these forces, but isn't in the right position to control these forces, injuries occur.

### So this tells us two things...

- 1) The athlete must be strong enough to decelerate
- 2) The athlete must have the body awareness and movement skill to put themselves in the right position to control the forces acting on them.

### So how do we develop these two needs?

- 1) Develop yielding strength.

What is yielding strength? Instead of getting hard into the science think of it this way. Yielding strength would be my ability to control my body as I lower into a weighted squat. Yielding strength would be the ability to control myself as I lower into a pushup. Yielding strength would be my ability to control myself when I land from a jump.

So why is yielding strength so important? Think of it this way. If I want to make a sharp cut to my left but I'm moving to my right then I will need to quickly lower my center of gravity, take a lateral step with my right foot and drive it as forcefully as possible into the ground. If I do not have adequate strength or force production ability I will not change direction very fast and certainly will not be very explosive reaccelerating. In addition, if I don't have yielding strength, the momentum already taking me to the right will continue to take me the right because I lack the ability to control momentum. Or at least lack the ability to quickly control

momentum. So I will stop at some point but it will be much slower if I had the ability to "load" the system and explode. Or in other words the hard and fast cut is the action (deceleration) and the foot into the ground (reacceleration) is the reaction. Without an initial high force action the reaction on the opposite end will be equal. Weak and limited.

So yes, an athlete absolutely must be explosive, propulsive, accelerative, and powerful. But before any of that they must be able to absorb, and transfer force. Think of it this way, you want your athlete or player to be explosive, well Newton tells us for every action there is an equal and opposite reaction. This is absolutely critical to understand if you want 1) healthy athletes, 2) athletes that can change direction quickly and have an awesome first step.

### So how do you train yielding or eccentric strength?

Tempo training. For our junior high athletes we divide their strength programs into 3-phases: green, yellow and red. During the green workouts they have the green light and perform the exercises like, squats, lunges and pushups at regular speed. During the yellow workouts they "yield," for this we utilize a 5-count slow lowering. So instead of simply dropping into the bottom of a squat they slowly descend into the squat for a full 5-count, focusing on controlling themselves. Once they reach the bottom they accelerate back to the top. During the red workouts they pause or stop at the bottom for a full 5-count. We love this type of training with our young athletes and it helps them really develop stopping strength.

With tempo or yielding strength training the emphasis should be placed on controlling every inch, every second of the entire movement. This will build stopping strength throughout the entire range of motion. This type of training is also great for developing body awareness as it makes the athlete slow down and focus on what they are doing and controlling their entire body while they're doing it.

- 2) Stopping skill.

As mentioned, assuming athletes know how to put their bodies in the right position to stop well is an oversight. It is something that must be coached, especially at a youth level. We use a simple but highly effective checklist for cuing stopping or deceleration.

- 1) Stay inside the tunnel- This simply means stay low. We are looking for triple bend (hips, knees, ankles), but none in the back. If the athlete is high, so is their center of gravity which easily predicts they will have poor leverage when it comes to high forces acting on their bodies during stopping and landing.
- 2) Foot outside the box- We imagine our shoulders and hips make up a box. When we stop the brake foot must step directly outside the box to create an effective braking angle.
- 3) Foot flat- The brake foot must be flat on the ground. If the any part of the foot is off the ground this limits the ability to completely control momentum and in turn, limits are ability to push back to reaccelerate. In addition, trying to stop on the balls of your feet is a recipe for a rolled ankle.
- 4) Knees and feet aligned- This one is a big deal. For a large portion of youth athletes knee stability (really hip stability) is a big limiting factor. We commonly see athletes land and stop with knees turned in (valgus), this is a big no-no and is a direct mechanism of ACL injuries. Therefore, we want the knee to be

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## One Way to Decrease Youth Athlete's Injury Rates *continued*

aligned with the middle toe of the foot or even pushed out side of the foot, every time we stop. Whatever it takes, we never want to see the knees buckle, so this must be coached and trained with consistency and with the proper exercise progression.

So putting it all together, stopping, or better put, putting yourself in the best position to reaccelerate is developed by developing the physical capacity to actually control the forces at play and then build the movement skill to utilize the strength in a functional and athletic way yielding high performance and most importantly healthy athletes.

## Hydration in Athletes: Oral versus Intravenous A Spotlight on Professional Football Players

by Kristen Connors, PA-C

On average, the human body requires between 1,500 and 2,500 milliliters of water daily in order to support basic bodily functions. With increased activity, there is an increased demand of water to meet the requirements for more respiration, perspiration, transportation of nutrients, regulation of body temperature, and much more. Athletes require substantial amounts of water in order to remain adequately hydrated, which is crucial to their performance.

Professional football players, for example, report that they perspire on average between two and three liters per hour of intense exercise. During training season, it is not uncommon for players to practice two to three hours at a time and often twice daily. If they are perspiring at a rate of two to three liters per hour, it follows that they may need between eight and eighteen liters of fluid per day to replace the water deficit caused by perspiration alone. Considering that any loss of body mass greater than two percent due to loss of water correlates with reduction of athletic performance and impaired aerobic respiration, athletes must hydrate during exercise to maintain their body mass, or their performance endurance may suffer.

Two types of hydration are oral hydration and intravenous hydration. Oral hydration simply requires drinking adequate amounts of fluid. Intravenous hydration requires the assistance of a medical professional to insert an intravenous catheter for infusion of fluid directly into the blood stream. Most athletes do not have access to intravenous hydration, with the exception of professional athletes. For athletes who do not have access to intravenous hydration, oral hydration is sufficient to prevent dehydration during and after play if the athlete is conscientious regarding oral intake of fluid. There is debate, therefore, whether intravenous hydration is necessary even for professional athletes.

A study was conducted to determine how many professional

football teams use intravenous hydration on a regular basis. It was found that seventy-five percent of National Football League teams (twenty-four out of thirty-two) regularly use intravenous hydration on at least a portion of players. Of the multiple reasons for doing so, player request was the most common reason that intravenous hydration was administered. Other reasons were to prevent muscle cramps, to prevent dehydration, to prevent heat illness, and to increase exercise tolerance. Of the eight out of thirty-two National Football League teams that do not use intravenous hydration, the head athletic trainers reported that they felt their players maintained adequate hydration through oral administration alone. Some of the trainers even reported that they were hesitant to initiate intravenous hydration therapy because it may encourage players to rely on intravenous administration of fluid and neglect to maintain adequate oral hydration. It is important to note that fifteen out of thirty-two (forty-seven percent) head athletic trainers in the National Football League reported that they do not believe that intravenous hydration has a significant advantage over oral hydration when considering athletic performance, even though seventy-five percent of teams regularly use intravenous hydration.

When determining whether to utilize intravenous or oral hydration, it is imperative to consider both the benefits and risks of either modality. Some of the benefits of both oral and intravenous hydration include maintaining adequate fluid volume and body mass which support maximum physical endurance and performance, maintaining adequate blood volume which can prevent elevated blood pressure, transporting essential substances throughout the body, and maintaining an appropriate body temperature. When excessive hydration occurs, both oral and intravenous hydration can be dangerous. Similar to how a decrease of body mass by two percent due to water loss can be damaging, an increase of body mass over two and a half percent can be damaging to the body as well. Typically when hydrating, athletes are utilizing solutions that are low in electrolytes, such as pure water. Because of this, hyponatremia may result, which means that the body has sub-adequate levels of sodium. Hyponatremia can wreak havoc on the body and can even cause coma and death if severe. If hyponatremia is caused by excessive oral hydration, it is termed exercise associated hyponatremia (EAH). If hyponatremia is caused by excessive intravenous hydration, it is termed iatrogenic hyponatremia.

The benefits provided by oral hydration and not intravenous hydration include that it is the normal physiologic way to maintain adequate hydration and therefore follows natural body processes. Oral hydration utilizes the digestive track and is absorbed through the intestines. It therefore can increase metabolism and follows a normal physiologic route. The risks of oral hydration are only typically seen with over-hydration and are described above.

Benefits of intravenous hydration include the rapid nature of this modality. Because intravenous fluids can be infused directly into the blood stream, there is no absorption process and therefore the effects can be appreciated promptly. Plasma volume can be restored more rapidly with intravenous hydration, which allows an almost immediate increase of circulating blood and therefore maintenance of blood pressure levels. One of the risks of intravenous hydration is that it is not a normal physiologic process and therefore can



Kristen Connors, PA-C

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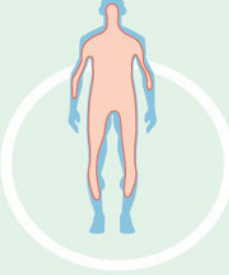
# Hydration in Athletes: Oral versus Intravenous

*continued*


alter chemicals and hormones. For example, antidiuretic hormone (ADH) is released in the body during times of dehydration to signal the body to retain fluid. Because intravenous hydration is infused directly into the blood stream, ADH may be released unnecessarily and the body may retain excess fluid. Other common risks of intravenous hydration regarding intravenous catheter placement and administration include superficial venous clot, venous air embolism, arterial puncture and provider needle stick.

Regardless of the method of hydration chosen, it is imperative to consider the amount of fluid replacement that is required. In the case of under-hydration, full potential of endurance and performance may not be achieved and severe cases of dehydration may result in dangerous consequences. Conversely, excessive hydration has the potential to cause potentially life-threatening complications as well. Intravenous hydration and its effects can be achieved and appreciated rapidly, but it also presents more risks than oral hydration. Intravenous hydration is certainly not required for appropriate hydration, but may be considered when accessible to athletes.

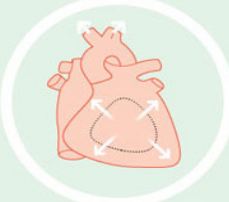
## THE EFFECTS OF DEHYDRATION



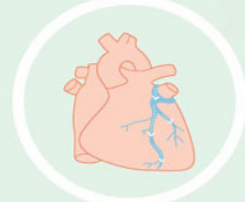
Body core temperature increases for every 1% loss in weight due to sweating, an effect caused by the decrease of available water for sweating.



Decrease in physical work capacity of 35 to 48% for extended exercise with 2.5% loss in water weight.



Decrease in amount of blood pumping and increase in the resistance of blood flow in the blood vessels which will all strain the heart.



Decrease in blood delivery to the capillaries which can lead to high lactate levels, in turn decreases the performance.

Apple, C. Charles Apple. 2012. <http://www.charlesapple.com/uploads/2012/07/120730RamadanOlympicsDetail07.jpg>. Accessed March 9, 2017. (<http://www.charlesapple.com/uploads/2012/07/120730RamadanOlympicsDetail07.jpg>)  
 Sources: Fitzsimmons S, Tucker A, Martins D. Seventy-five percent of national football league teams use pregame hyperhydration with intravenous fluid. *Clin J Sport Med.* 2011;21(3): 192-195.  
 Piet van Rosendal S, Osborne MA, Fassett RG, Lancashire B, Coombes JS. Intravenous versus oral rehydration in athletes. *Sports Med.* 2010;40(4): 327-346.

# Bradley-Bourbonnais Athletics Utilizing Cutting Edge Technology

Adam Vogel, Strength and Conditioning  
 Jason Lisko, ATC/L  
 Mike Kohl, Assistant Athletic Director/Head Football Coach

Catapult is a company that was founded in Australia in 2006 that was designed and brought to life out of the Cooperative Research Centers (CRC) and the Australian Institute of Sport (AIS). The organizations were created after Australia failed to capture a single medal at the 1976 Olympic Games in Montreal. Two men from the CRC developed the wearable technology that was used prior to the 2004 Olympic Games in Athens. After the success of the Australian Olympic teams Catapult was later formed in 2006. The technology allowed them to receive data from how their athletes were performing when they were actually doing their specific activity. A novel concept since most testing is completed in a controlled environment like a laboratory. Catapult is currently being worn by 22,000 athletes, 1,100 teams with 35 sports in 57 countries. Until recently GPS technology was only available to Professional Teams and elite NCAA teams. Bradley-Bourbonnais Community



High School was the first High School to acquire Catapult Sports GPS last year in April. Currently there are over 30 High Schools in the country also using Catapult.



How does Catapult work? An athlete wears two pieces of equipment while he or she is competing. The first piece of equipment is a standard heart rate monitor that they place across their

chest. The second piece of equipment is a device that is similar in appearance and size of a pager. The pager looking device is placed either in a garment similar to a sports bra or a compression shirt that has a neoprene sleeve attached to back of the shirt where the pager device sits between the superior portion of the athlete's

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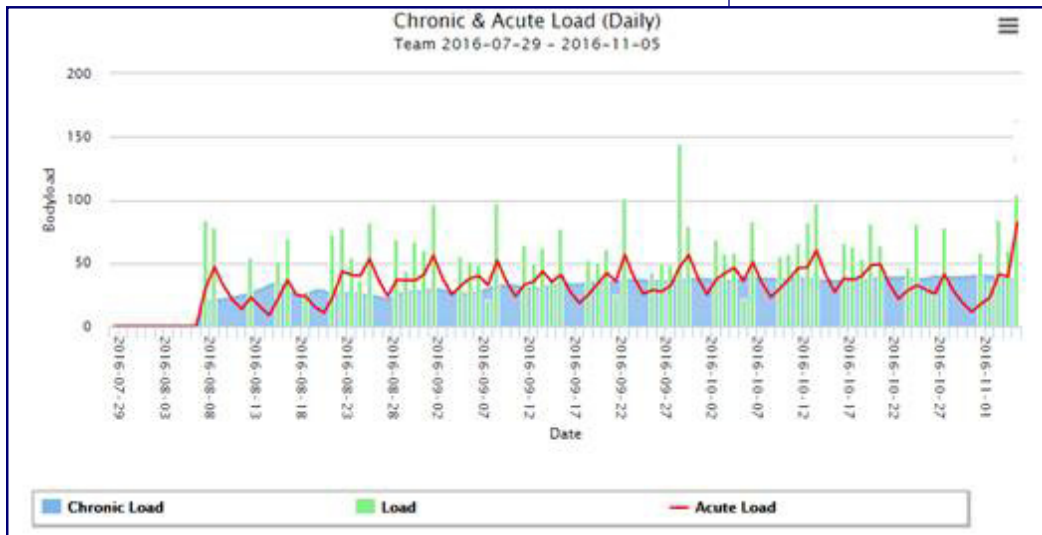
# Bradley-Bourbonnais Athletics Utilizing Cutting Edge Technology

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shoulder blades. Once the device is turned on it uses several technologies to record data of how the athlete is moving during competition. It contains GPS technology to that locates an athlete's movements and distance traveled. The other part of the technology is inertial sensors which include accelerometers, magnetometers, and gyroscopes which measure the small movements of an athlete while competing. All of this data is captured on the device that the athlete is wearing on their back including their heartrate and is saved to said device. This



Florida State won their football national championship a few years ago. He approached Mike Kohl assistant athletic director and head football coach and our athletic director Mike Lehning about this technology. Bradley-Bourbonnais Community High School decided to invest in Catapult Sports Technology after Coach Kohl and Coach Vogel met with Notre Dame's Soccer Strength and Conditioning Coach Matt Howley an Aussie native who had been using Catapult for six years. The data helps answer questions we otherwise could not answer. Our top priority is our student-athlete's safety. With Catapult we can see an athlete's run symmetry which helps with mitigating lower limb soft tissue injuries. With the combinations of the metrics we can make sure that we do not over train and expose athletes to injuries related to fatigue. We also do not want to under develop our athletes where they are not prepared for the demands needed for given competitions. Coach Kohl, "If we are looking at our athletes as a 100 dollar bill every time we take the field, we want to spend exactly 100 dollars. We don't only want to spend 60 but we don't want to over spend at a 120." Catapult allows us to periodize their training.



could include up to 800 or 900 data points per second. Once the data has been collected it is downloaded to a server to which these data points are placed into algorithms to provide quantifiable data on what the athlete did while competing. Catapult has the ability to do what they call live capture during a practice or a game. Live capturing is the ability to see in real time how many yards an athlete has ran already halfway through practice or how many times they changed directions. Once you have all of this information on what your athlete's demands are in games and practices it allows you develop you training accordingly.

Catapult was brought to Bradley-Bourbonnais Community High School (BBCHS) by our strength and conditioning coordinator Adam Vogel. Coach Vogel first heard about the technology after

Currently we are using the technology with our boys and girls soccer, football, cheerleading, and track programs. Catapult allows us to go back and review the data of how we practiced compared to how we played in a competition. From there we can strategically plan our training sessions prior to our next competition. After using this technology, we have been able to make some small changes to our training sessions. This past season our boys soccer and football had a combined record of 34-2 with the soccer team finishing 3rd in the state. While the cheerleading team again qualified for state. Catapult

has validated how we have been training our student-athletes with quantifiable data. With the programs that use this technology we have seen a significant decrease in soft tissue injury and an overall decrease in student-athletes complaints of general soreness.

Catapult has been a tremendous asset to the athletic department here at BBCHS. It is allowing our athletes to maximize their athletic potential while protecting our athletes' safety.





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**ABOUT 28,000 ANKLE INJURIES** occur in the United States each day.

**IT'S BELIEVED 45% OF ALL ATHLETIC INJURIES ARE ANKLE SPRAINS,** making it the most common sports injury.

## DON'T STRAIN YOUR BRAIN WHEN CARING FOR AN ANKLE SPRAIN

- Field hockey has the highest rate of ankle injuries and sprains, followed by volleyball, football, basketball, cheerleading, ice hockey, lacrosse, soccer, rugby, track and field, gymnastics and softball.
- An ankle sprain occurs when there is a tear in the ligament, while an ankle strain occurs when there is a tear in the muscle.
- Ankle sprains are graded on severity and range from grade 1 (mild; no significant structural injury) to grade 3 (severe; complete rupture of the ligamentous structures).
- After an ankle is sprained, it has a greater chance of becoming sprained again. Repeating ankle sprains put an individual at risk for ankle osteoarthritis.

### KNOWING THE PHASES

**ACUTE PHASE:** Usually the first two weeks of injury. The ankle will have pain, heat, swelling, redness and/or bruising and loss of function.

**SUBACUTE PHASE:** After the first two weeks of injury. During this phase, the body begins to heal the damaged tissues of the ankle. By now, the ankle should have regained its range of motion, and should begin to improve in balance and strength.

### TREATMENT OPTIONS



REST



ICE



COMPRESSION



ELEVATION

Not all ankle sprains are alike, so be sure to consult a health care provider, such as an athletic trainer or physician, for an individualized treatment plan.

### HOW TO PREVENT AN ANKLE SPRAIN



1 Have a prevention program created by an athletic trainer or qualified medical provider that focuses on ankle strength, balance and motor control for a minimum of three months. This is best for someone who has already sprained their ankle.



3 Tape or brace ankles during sport activities, such as games and practices. Athletes with previous ankle sprains who wore a brace or tape following injury had approximately 70 percent fewer ankle injuries than athletes who did not.



2 Participate in a lower body strength training program.



4 Consider your footwear—high-top shoes offer more ankle support than low-top shoes.



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## HEAT SAFETY PLEDGE CHECKLIST



### Pillar One: Thermometer

Schools need to be able to measure the temperature of their exact location.  
 ★ **GOLD STANDARD: Wet bulb globe thermometer**

- Hygrometer, heat index meter or other devices that give on-site temperature and humidity are also acceptable.



### Pillar Two: Certification

All coaching staff should be educated in lifesaving measures.  
 ★ **GOLD STANDARD: Certifications in first aid, CPR and use of an AED, and education on preventing sudden death in sports**

- Education can be on topics such as head and neck injury, cardiac emergencies, heat illness or other potentially catastrophic issues.



### Pillar Three: Athletic Trainer

An athletic trainer should be on site during practices and events.  
 ★ **GOLD STANDARD: Employ an athletic trainer**

- AT can be either full or part time, and there can be multiple ATs.



### Pillar Four: Emergency Action Plan

Schools need to have venue-specific emergency action plans in place for each athletic facility where a game or practice occurs.  
 ★ **GOLD STANDARD: Posted, venue-specific emergency action plans**

- Emergency action plans should be easy to access, usable by anyone and follow the NATA position statement guidelines.



### Pillar Five: Heat Acclimatization Guidelines

Schools need to adopt the nationwide high school heat acclimatization guidelines.  
 ★ **GOLD STANDARD: The NATA heat acclimatization guidelines**

- State guidelines may not be strict enough.



### Pillar Six: Water Stations/ Body Cooling

Athletes must have access to drinking water as well as cooling stations during exercise in the heat.  
 ★ **GOLD STANDARD: Water and cooling stations placed around the field**

- Encourage players to remove equipment during rest breaks; provide easy or portable cooling such as ice towels, misting fans, shaded areas, etc.; and plan for each team to have access to unlimited fluid during exercise.

## LIGHTNING DO'S & DON'TS

Late spring through early fall is a prime time for outdoor sports—it's also when lightning is most prevalent. Each year, an average of 25 million lightning flashes strike the ground in the United States, making lightning the most dangerous and frequently encountered thunderstorm hazard. Stay safe and active outdoors by following these lightning do's and don'ts.

- ✓ **DO** establish a chain of command and identify who makes the call to remove players from the field.
- ✓ **DO** designate a weather watcher to monitor the local weather.
- ✗ **DON'T** forget that lightning is most common from afternoon to early evening.
- ✓ **DO** postpone outdoor activities if a thunderstorm is imminent.
- ✓ **DO** identify a safe, fully enclosed building—such as a school, field house, library or other habitable building—to use if lightning begins.
- ✓ **DO** seek shelter in a fully enclosed metal vehicle, such as a school bus, car or van.
- ✗ **DON'T** evacuate to open structures including picnic, park, sun, bus, rain and shelters as well as storage sheds, tents, dugouts, refreshment stands, screened porches, press boxes and open garages.
- ✓ **DO** stand away from showers, sinks, locker rooms, indoor pools, appliances and electronics.
- ✗ **DON'T** stand near open water, on elevated areas or under tall objects, such as trees, poles and towers.
- ✓ **DO** allow individuals to head indoors to wait out the storm if they feel in danger.
- ✗ **DON'T** resume activities until 30 minutes after the last strike of lightning is seen and the last sound of thunder is heard.
- ✓ **DO** call EMS if someone suffers a lightning-related injury.
- ✓ **DO** move the victim with care indoors, if necessary.
- ✗ **DON'T** believe myths—lightning victims don't carry a charge; they're safe to touch.
- ✓ **DO** evaluate the airway breathing and circulation, and begin CPR, if necessary.



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