

Current Issues in Sports Medicine



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**MAINE INTERSCHOLASTIC ATHLETIC ADMINISTRATOR'S ASSOCIATION
FALL CONFERENCE
OCTOBER 22, 2012**

**AN EXAMINATION OF THE MEDICAL
CARE FOR HIGH SCHOOL ATHLETES IN
MAINE**

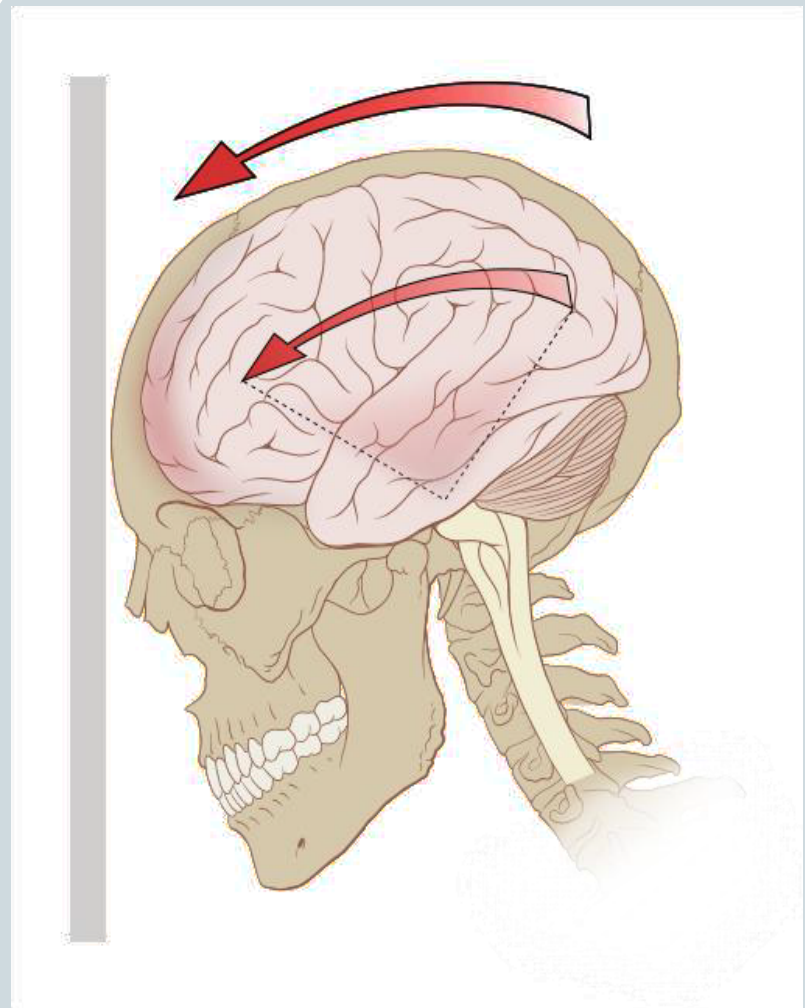
Concussion: A Review

Concussion may be caused either...

by a ***direct blow*** to the head, face, neck

or

Indirectly elsewhere on the body with an “***impulsive***” ***force*** transmitted to the head (whiplash, blast, etc.)



- Concussion typically results in *impaired brain function*
- Not structural (MRI, CT normal)
- Results in a set of clinical symptoms
- Rapid onset (<24 hrs.)
- May or may not involve loss of consciousness
- Symptoms resolve spontaneously and sequentially
- A process, not an event



Patrice Bergeron

Journal of the American Academy of Pediatrics



Are number of concussions increasing?

- ER visits for concussion, 2001-2006:
 - For ages **8-13**, number ***doubled***
 - For ages **14-19**, number ***increased >200%***

Or are we just diagnosing more?

- Increased general awareness
- Clinicians up-to-date

(Pediatrics, June 2010)

Not Just Football !!

- **Injury rate per 1000 exposures**
- **Football (0.60)**
- **Girls soccer (0.35)**
- **Boys lacrosse (0.30)**
- **Girls lacrosse (0.20)**
- **Boys soccer, wrestling (0.22)**
- **Girls basketball (0.16)** *Lincoln, et al. AJSM. Jan 2011*
- **Ice hockey** – highest rate boys (3.6/1000 AE's)
- **Tae Kwon Do** – highest rate girls (8.8/1000 AE's)

- ***Tommasone and Valovich, Journal Athletic Training, 2006***



Taylor Littlefield

Numbers at South Portland



- 16 concussions as of October 22, 2012.

Football - 9 (56%)

Girls soccer 4 (25%)

Boys soccer 3 (19%) **

Field Hockey – 0 (0%)

XC – 0 (0%)

Golf – 0 (0%)

Cheering – 0 (0%)

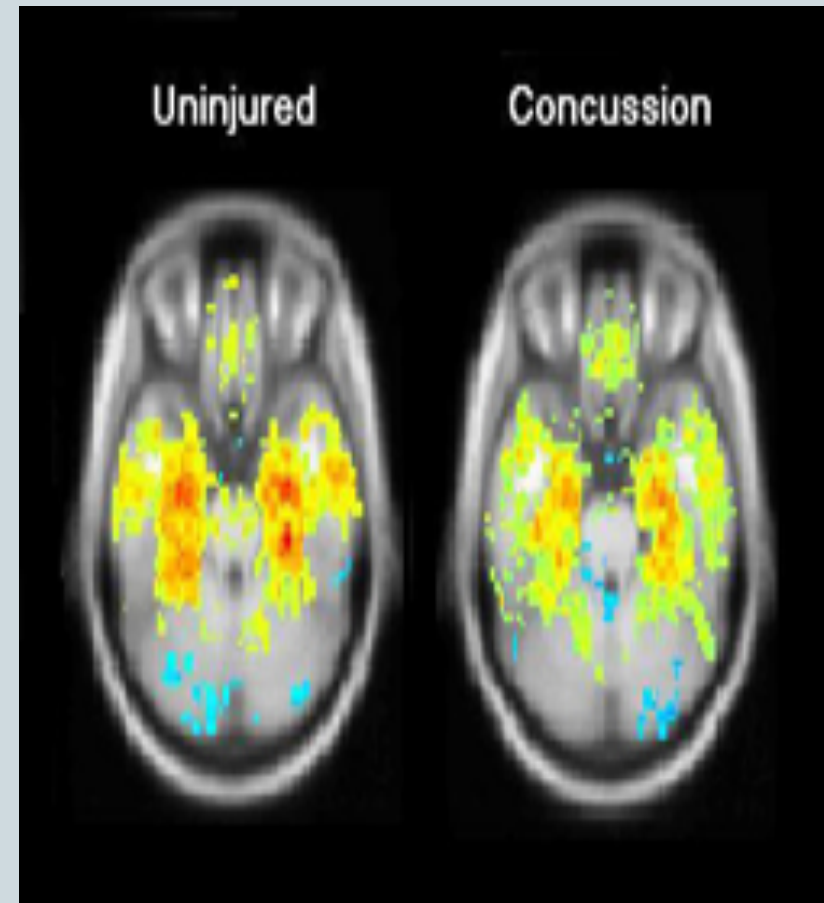
Concussion Cases



- (2) 14 yr./o f soccer players: Above average students. One back for the last week of season; One cleared to return to a normal academic work load as tolerated, no soccer/physical activity
- 14 yr./o f soccer player: ADHD/Hyperthyroidism
- 18 yr./o m football player: Delays assessment, winds up in nurse's office
- 14 yr./o m soccer player: Meds – failure to tell AT

Resting State Functional MRI (rsfMRI) Image of the Brain

- rsfMRI brain scans revealed altered patterns of brain activity in the athletes who had suffered a concussion. Much of the activity representing the strength of connections between the left and right halves of the brain was lower, or weaker, than in the uninjured athletes.



Concussion Update



What is new?

The symptoms of a concussion may not always be clear-cut, but their consequences on brain development, including cognitive and emotional impairments, can last a lifetime.

A normal CT scan may not necessarily reveal non-structural changes from a concussion, such as chemical imbalances.

A concussion that does not render a patient unconscious is still serious.

Both males and females sustain concussions at a similar rate.

How hard someone is hit does not necessarily determine how severe the concussion will be. In fact, a series of low impacts may be more serious than a single heavy impact.

Athletes cannot "tough out" concussions and keep playing.

Concussions may have more deleterious effects on growing adolescent brains than they would on adults.

Helmets are not designed to prevent concussion. Companies are building good helmets that can prevent structural head injuries, but concussion is a functional, not a structural, injury.

After an individual sustains a concussion, the threshold for experiencing another one becomes smaller.

Concussions should be treated on an individual basis.

If an athlete is experiencing dizziness, headache or problems with memory or balance, it should be assumed he or she has a concussion until stated otherwise by an athletic trainer or doctor.

More than 4 million sports and recreation-related concussions (also known as mild traumatic brain injury, or mTBI) occur each year each year in the US and more than half of those occur in football. Concussions in adults result mainly from motor vehicle accidents or falls. While most people recover from concussions with no lasting ill effects, as many as 30 percent suffer permanent impairment – undergoing a personality change or being unable to plan an event. A 2003 federal study called concussions “a serious public health problem” that costs the U.S. an estimated \$80 billion a year.

In April 2012, veteran journalist and former *Dateline* co-anchor, [Stone Phillips](#) produced a report entitled, "[Hard Hits, Hard Numbers,](#)" detailing a Virginia Tech study on head impacts in youth football. Accelerometers placed inside 7- and 8-year-old players' helmets recorded hits from 15g-100g, surprising researchers. Previously, many believed that players that age did not have the speed or strength to deliver hits of those magnitudes.

Starting in August many teams practice nine hours a week until Labor Day when most are then shortened to six hours. Research has shown that some of the hardest hits and many concussions occur during practice, not games. New rules prohibit head-to-head hits and limit contact in practices to 40 minutes a day. Full-speed head-on blocking and tackling drills where players line up more than three feet apart are no longer allowed.
(Pop Warner)

- New high school and college rule requiring any player who loses his helmet on the field when the ball is live to sit out the next play.
- NFL and US Army working to equip players' helmets with the kind of blast sensors used in soldier's helmets in an attempt to gather new data on head injuries. \$31 million research grant.

- 11 year study by the MedStar Health research Institute and published in the American Journal of Sports Medicine, reported that concussions in high school sports are increasing at a 15% annual rate; football tops the list with the highest rates, and girls' soccer is a distant second of the 12 sports studied.
- Girls' soccer players suffer 68% more concussions than their male counterparts (Journal of Athletic Training, 2003).
- Girls lacrosse and basketball: 3x higher than boys.
- Brown University orthopedics professors are currently studying whether helmets and what kind, help shield female lacrosse players from concussions caused by stick-to-head contact.

Wait until age 14 to play football?

Age when teenagers are attending high school. It is also the age at which athletes should start tackling in football, checking in hockey and heading in soccer.

“Bobble-Head Effect”

At age 14, the skull of a child is 90% the size of an adult's, and the neck is strong enough to support the head when struck. As the neck muscles develop, the head will snap less dramatically.

Myelin, a protein, acts as padding for brain nerve fibers, is also better developed by age 14, and this makes the brain less susceptible to injury.

Age 14 not set in stone: skeletal maturity.

Tom Brady



Dr. Robert Cantu
Chief of Neurosurgery at Emerson
Hospital and Co-Director of BU's Center
for the Study of Traumatic
Encephalopathy

As of Aug. 16, 2012, 40 states and Washington, D.C., have passed laws protecting student-athletes from returning to play too soon after suffering the effects of a concussion. Twelve more states have legislation pending in the 2012 session.

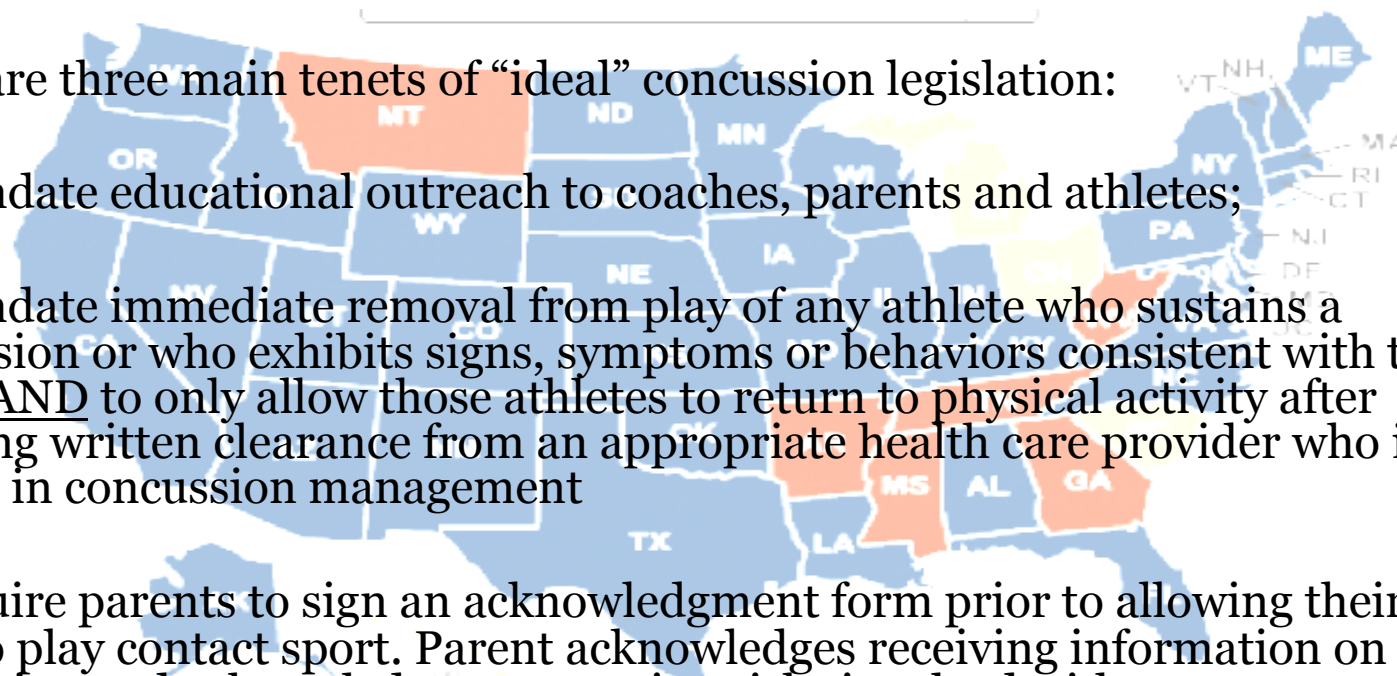
There are three main tenets of “ideal” concussion legislation:

To mandate educational outreach to coaches, parents and athletes;

To mandate immediate removal from play of any athlete who sustains a concussion or who exhibits signs, symptoms or behaviors consistent with the injury AND to only allow those athletes to return to physical activity after receiving written clearance from an appropriate health care provider who is trained in concussion management

To require parents to sign an acknowledgment form prior to allowing their child to play contact sport. Parent acknowledges receiving information on concussion and acknowledges concussion risks involved with sport.

LEGISLATION STATUS:  PASSED  PENDING PASSAGE  NONE



What are we doing in Maine?



- Education, Education, Education – MCMI
- ImPACT testing – 73 high schools
- NFHS Concussion Video
- LD 1873

**L.D. 1873: An Act to Direct the Commissioner
of Education to Adopt a Model Policy
Regarding Management of Head Injuries in
School Activities and Athletics.**

LD 1873



- Beginning ***January 1, 2013***, the school board of each public school and the governing body of each private school enrolling more than 60% of its students at public expense in this State shall adopt and implement a policy on the management of concussive and other head injuries in school activities and athletics that is consistent with the model policy developed by the commissioner in accordance with section 254, subsection 17.

MODEL POLICY



The model policy proposed by the commissioner must include, but is not limited to, the following provisions:

- 1. Training.** A requirement that athletic directors, coaches and other school personnel involved with school activities and athletics must be trained in the identification and management of concussive and other head injuries.
- 2. Student and parental acknowledgment.** A requirement that prior to each school year, each student participating in a school athletic activity and the student's parent or legal guardian must review the school's policy for the management of concussive and other head injuries and sign a statement acknowledging that review.

MODEL POLICY



3. **Protocols and forms.** A requirement that the Department of Education must create protocols and forms that must be used by schools in the implementation of the policy on the management of concussive or other head injuries.
4. **Immediate removal and evaluation.** A requirement that a student suspected of having sustained a concussive or other head injury in any school activity or athletic practice or game must be removed from the activity, practice or game immediately and evaluated for brain injury prior to returning to the activity or practices and games.

MODEL POLICY



- 5. Medical clearance.** A requirement that a student suspected of having sustained a concussion after an evaluation under subsection 4 must be banned from the school activity or athletic practices and games until the student has received written medical clearance from a licensed health care provider trained in concussion management for the student to begin the gradual resumption of participation in the activity or practices and games based on the current standards of care. **

ZURICH GUIDELINES



- No activity
- Light aerobic exercise: Intensity below 70%; **No** resistance training.
- Sport-specific exercise: **No** head impact drills.
- Non-contact training drills: Progression to more complex training drills; may start resistance training.
- Full-contact practice: Following physician clearance, participate in normal training.
- Return to play: Game time.

If at any time post-concussion symptoms occur during the graduated return, there will be a minimum 24 hour rest period. Once asymptomatic following the rest period the athlete will drop back to the previous asymptomatic level and the progression will resume.

Consensus Statement on Concussion in Sport: The 3rd International Conference on Concussion in Sport – Zurich Switzerland, November 2008.

School/Academic Expectations During Post Concussion Recovery
Guidelines: unless otherwise directed by treating healthcare professional

| Stage | Goals/Key Ideas | Typical Duration** | Teacher/Guidance Actions | Student Actions |
|-------|--|--|---|---|
| I | Complete Rest | 2-6 days | <ul style="list-style-type: none"> • Contacted by school nurse • Explanation of injury and current plan of care | <ul style="list-style-type: none"> • Out of school. No schoolwork. • Strict limits re: use of electronics • No physical/Sports activity |
| II | <p>Significant deficits in processing speed and other cognitive functions.</p> <p>Cognitive activity as tolerated*</p> | 2-14 days | <p>Develop list of three categories of assignments:</p> <ol style="list-style-type: none"> 1. Excused: Not to be made up 2. Accountable: Responsible for content, not necessarily, process- may have accommodations or alternate form. 3. Responsible: Student will complete and be graded, when able. <p>Goal is to help student keep up with learning as much as possible but not necessarily to be completing assignments that are non-essential to acquisition and basic demonstration of knowledge. The longer the recovery process, the more that should be eliminated or altered.</p> | <ul style="list-style-type: none"> • In school as tolerated* • Homework as tolerated* • Get copies of notes, handouts... • Communicate with teachers about progress and plans • Be patient with slow recovery. Do not push so much that symptoms occur or increase. Rest eyes and just listen, or see nurse to rest if feeling worse. Go home if symptoms still worsen. • No physical/Sports activity- including gym/PE/recess. No playing wind instrument-music class as tolerated* |
| III | Gradual increase of time and energy, slowly resuming workload | Highly variable. Hopefully no more than 7 days | <ul style="list-style-type: none"> • Prioritize assignments with student, taking into account make-up work and new work. Assist with timelines • Continue to use above categories. • Provide extra help as needed regarding missed material and mastery of concepts | <ul style="list-style-type: none"> • Full classroom attendance as tolerated* • Progress back to homework completion- then tests as tolerated*- if memory is okay • Coordinate with teachers about catching up, keeping up • No Physical/Sports activity as above |
| IV | Resumption of normal activities | | <ul style="list-style-type: none"> • Monitor completion of assignments • Communication between teachers, parents, and guidance re: assignment completion, student's ability to work at pace of peers, and grades. | <ul style="list-style-type: none"> • Resume normal academic activities • Communicate with teachers/guidance re: progress toward being caught up • Start graduated return to play with guidance from healthcare professional |

- "as tolerated" means as long as the activity does not produce or increase the concussion symptoms
- ** Duration varies greatly from one student to another. The stage a student is at is determined by the health care professional managing the student's concussion.

Chronic Traumatic Encephalopathy



Chronic Traumatic Encephalopathy (CTE) is a progressive degenerative disease of the brain found in athletes (and others) with a history of repetitive brain trauma, including symptomatic concussions as well as asymptomatic subconcussive hits to the head. CTE has been known to affect boxers since the 1920s. However, recent reports have been published of neuropathologically confirmed CTE in retired professional football players and other athletes who have a history of repetitive brain trauma. This trauma triggers progressive degeneration of the brain tissue, including the build-up of an abnormal protein called tau. These changes in the brain can begin months, years, or even decades after the last brain trauma or end of active athletic involvement. The brain degeneration is associated with memory loss, confusion, impaired judgment, impulse control problems, aggression, depression, and, eventually, progressive dementia.

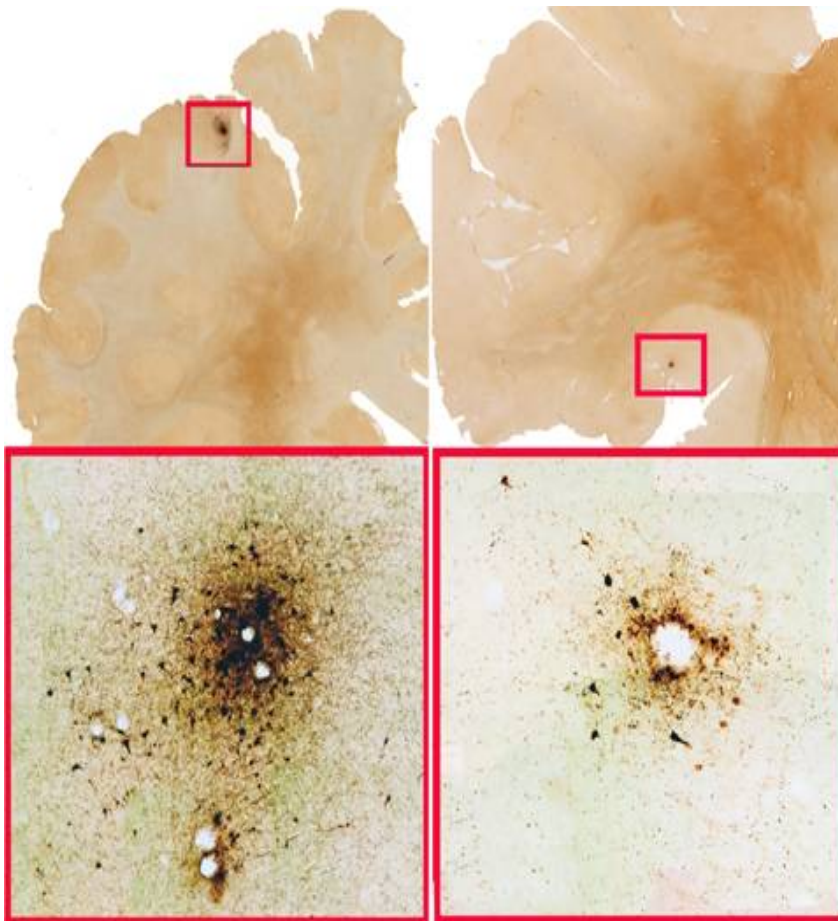
BU Center for Chronic Traumatic Encephalopathy



John Grimsley **Former NFL player** **Died at age 45**

- The first deceased athlete examined by the CSTE researchers was John Grimsley, former linebacker for the Houston Oilers and Miami Dolphins, who died in February 2008 at the age of 45 from an accidental gunshot wound. Examination of Mr. Grimsley's brain confirmed extensive CTE. In both sets of photographs, below, the brain tissue has been immunostained for tau protein, which appears as a dark brown color.

Chronic Traumatic Encephalopathy



Top left: Whole mount section of frontal cortex showing very focal deposition of tau protein around small blood vessels (red box)

Bottom left: High magnification shows dense tau immunoreactive NFTs around small blood vessels (holes) and extensive tau immunoreactive neurites in the neuropil immediately surrounding the area

Top right: Another whole mount section of frontal and insular cortex showing very focal deposition of tau protein around a small blood vessel in insulara cortex (red box)

Bottom right: High magnification shows dense tau immunoreactive NFTs around a small blood vessel (hole) and tau immunoreactive neurites in the neuropil immediately surrounding the area

18 year old multiple sport athlete

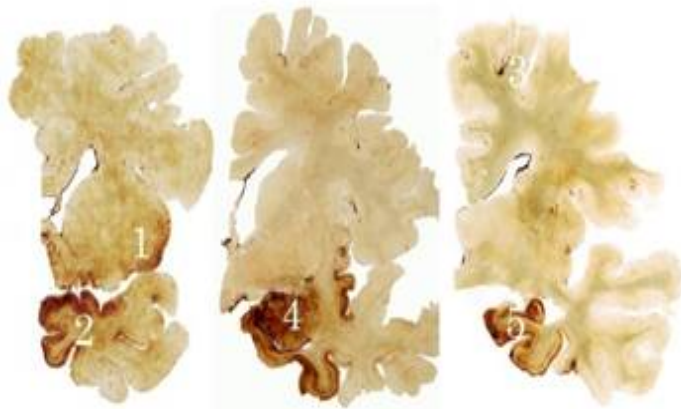
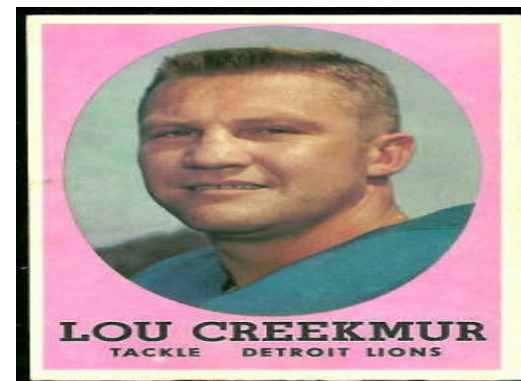
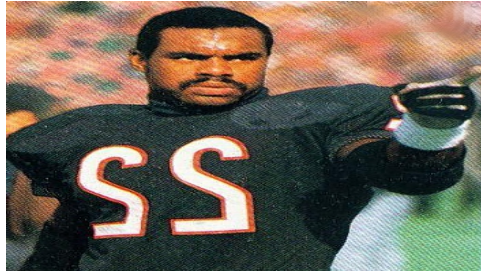


Figure 7 shows dense tau deposits (brown) in the insula (1), temporal (2) and frontal (3) cortices, amygdala (4) and hippocampus (5) in the absence of beta amyloid plaques. A normal control brain would not show any brown discoloration.

Lou Creekmur, a former Detroit Lions lineman and eight-time Pro Bowl player, died in 2009 from dementia. The CSTE examined Mr. Creekmur's brain and found substantial evidence of CTE. There was no evidence of Alzheimer's disease or of any other neurodegenerative disease. Mr. Creekmur was the tenth former NFL player diagnosed with CTE and the most advanced case of CTE found in a football player to date at the CSTE.





Dave Deurson



Mike Borich



Alex Karras



Junior Seau



Tom McHale

Helmet Technology



- **ForceCap Technologies:** testing patent-pending air-filled sack inside hockey helmets.
- **Impact Machine Design:** based on 14th Century Italian Armet, which completely encloses the head, called **the Vault**. Concept for a better fit and a face guard that does not come into contact with the jaw.
- **Unequal Technologies** in Philadelphia: using kevlar in helmets and pads. EXO CRT (Concussion Reduction Technology). Supplemental helmet pads reduce the possibility of head injuries. 20 NFL and NHL teams are using kevlar gear in their equipment, and 2 dozen pros are using CRT pads in their helmets.
- **Cascade Sports** w/ Mark Messier: M11 designed to absorb more high impact linear forces than other premium helmets do.
- **Battle Sports Science** in Omaha Nebraska is looking at the chin strap with a patent-pending microsensor that triggers a small, flashing red light when the athlete has sustained a hit capable of causing a concussion.

Summary



- Need to have a policy and procedures in place !
- Coaches, parents, students, administrators, teachers and school nurses need to be educated and trained. Important to have school physicians and PCPs trained as well.
- Emphasis needs to be on properly fitting protective equipment and teaching of sport-specific skills.
- Sideline Assessment: SAC or SCAT 2
- Neurocognitive Testing: ImPACT
- RTP/F protocols
- Hire an ATC
- When In Doubt...Sit Them Out !!

Standardized Assessment of Concussion (SAC) Form



FIGURE 1 **Standard Assessment of Concussion-SAC** **FORM A**

Name: _____
 Team: _____ Examiner: _____
 Date of Exam: _____ Time: _____
 Exam (Circle One): BLine Injury Post-Px/Game
 Day 1 Day 2 Day 3 Day 5 Day 7 Day 90

Introduction:
 I am going to ask you some questions. Please listen carefully and give your best effort.

Orientation:

| | | |
|---|---|---|
| What Month is it? _____ | 0 | 1 |
| What's the Date Today? _____ | 0 | 1 |
| What's the Day of the Week? _____ | 0 | 1 |
| What Year is it? _____ | 0 | 1 |
| What Time is it right now? (within 1 hr.) _____ | 0 | 1 |

Award 1 point for each correct answer.

ORIENTATION TOTAL SCORE _____

Immediate Memory:
 I am going to test your memory. I will read you a list of words and when I am done, repeat back as many words as you can remember, in any order.

| LIST | TRIAL 1 | TRIAL 2 | TRIAL 3 |
|--------------|---------|---------|---------|
| Elbow | 0 1 | 0 1 | 0 1 |
| Apple | 0 1 | 0 1 | 0 1 |
| Carpet | 0 1 | 0 1 | 0 1 |
| Saddle | 0 1 | 0 1 | 0 1 |
| Bubble | 0 1 | 0 1 | 0 1 |
| TOTAL | | | |

Trials 2 & 3: I am going to repeat that list again. Repeat back as many words as you can remember in any order, even if I said the word before.
 Complete all 3 trials regardless of score on trial 1 & 2. Score 1 pt. for each correct response.
 Total score equals sum across all 3 trials.
 Do not inform the subject that delayed recall will be tested.

IMMEDIATE MEMORY TOTAL SCORE _____

Exertional Maneuvers:
 If subject is not displaying or reporting symptoms, conduct the following maneuvers to create conditions under which symptoms are likely to be elicited and detected. **These measures need not be conducted if a subject is already displaying or reporting any symptoms.** If not conducted allow 2 minutes to keep time delay constant before testing Delayed Recall. These methods should be administered for baseline testing of normal subjects.

| | |
|-----------------------------|--------------|
| Exertional Maneuvers | |
| 5 Jumping Jacks | 5 Push-Ups |
| 5 Sit ups | 5 Knee Bends |

Neurologic Screening:

| | | |
|---|------------|-----|
| Loss of Consciousness/ Witnessed Unresponsiveness | No Length: | Yes |
| Post-Traumatic Amnesia? Poor recall of events after injury | No Length: | Yes |
| Retrograde Amnesia? Poor recall of events before injury | No Length: | Yes |

Strength

| | | |
|-----------------------|--------|----------|
| Right Upper Extremity | Normal | Abnormal |
| Left Upper Extremity | | |
| Right Lower Extremity | | |
| Left Lower Extremity | | |

Sensation - examples:
 Finger-to-Nose/Romberg

Coordination - examples:
 Tandem Walk/Finger-Nose-Finger

Concentration:
Digits Backward: I am going to read you a string of numbers and when I am done, you repeat them back to me backwards, in reverse order of how I read them to you. For example, if I say 7-1-9, you would say 9-1-7.
 If correct, go to next string length. If incorrect, read trial 2. Score 1 pt. for each string length. Stop after incorrect on both trials.

| | | | |
|-------------|-------------|---|---|
| 4-9-3 | 6-2-9 | 0 | 1 |
| 3-8-1-4 | 3-2-7-9 | 0 | 1 |
| 6-2-9-7-1 | 1-5-2-8-6 | 0 | 1 |
| 7-1-8-4-6-2 | 5-3-9-1-4-8 | 0 | 1 |

Months in Reverse Order: Now tell me the months of the year in reverse order. Start with the last month and go backward. So you'll say December, November...Go ahead.
 1 pt. for entire sequence correct.

Dec-Nov-Oct-Sept-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan 0 1

CONCENTRATION TOTAL SCORE _____

Delayed Recall:
 Do you remember that list of words I read a few times earlier? Tell me as many words from the list as you can remember in any order. Circle each word correctly recalled. Total score equals number of words recalled.

| | | | | |
|-------|-------|--------|--------|--------|
| Elbow | Apple | Carpet | Saddle | Bubble |
|-------|-------|--------|--------|--------|

DELAYED RECALL TOTAL SCORE _____

SAC Scoring Summary:
 Exertional Maneuvers & Neurologic Screening are important for examination, but not incorporated into SAC Total Score.

| | |
|------------------------|------------|
| Orientation | /5 |
| Immediate Memory | /15 |
| Concentration | /5 |
| Delayed Recall | /5 |
| SAC Total Score | /30 |

SCAT 2



A

This tool represents a standardized method of evaluating people after concussion in sport. This Tool has been produced as part of the Summary and Agreement Statement of the Second International Symposium on Concussion in Sport, Prague 2004

Sports concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces. Several common features that incorporate clinical, pathological and biomechanical injury constructs that may be utilized in defining the nature of a concussive head injury include:

1. Concussion may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an 'impulsive' force transmitted to the head.
2. Concussion typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously.
3. Concussion may result in neuropathological changes but the acute clinical symptoms largely reflect a functional disturbance rather than structural injury.
4. Concussion results in a graded set of clinical syndromes that may or may not involve loss of consciousness. Resolution of the clinical and cognitive symptoms typically follows a sequential course.
5. Concussion is typically associated with grossly normal structural neuroimaging studies.

Post Concussion Symptoms

Ask the athlete to score themselves based on how they feel now. It is recognized that a low score may be normal for some athletes, but clinical judgment should be exercised to determine if a change in symptoms has occurred following the suspected concussion event.

It should be recognized that the reporting of symptoms may not be entirely reliable. This may be due to the effects of a concussion or because the athlete's passionate desire to return to competition outweighs their natural inclination to give an honest response.

If possible, ask someone who knows the athlete well about changes in affect, personality, behavior, etc.

Remember, concussion should be suspected in the presence of ANY ONE or more of the following:

- Symptoms (such as headache), or
- Signs (such as loss of consciousness), or
- Memory problems

Any athlete with a suspected concussion should be monitored for deterioration (i.e., should not be left alone) and should not drive a motor vehicle.

For more information see the "Summary and Agreement Statement of the Second International Symposium on Concussion in Sport" in the: Clinical Journal of Sport Medicine 2005; xx(xx): xxx-x British Journal of Sports Medicine 2005; xx(xx): xxx-x Neurosurgery 2005; ; xx(xx): xxx-x Physician and Sportsmedicine 2005; xx(xx): xxx-x This tool may be copied for distribution to teams, groups and organizations.

B

The SCAT Card
(Sport Concussion Assessment Tool)
Athlete Information

What is a concussion? A concussion is a disturbance in the function of the brain caused by a direct or indirect force to the head. It results in a variety of symptoms (like those listed below) and may, or may not, involve memory problems or loss of consciousness.

How do you feel? You should score yourself on the following symptoms, based on how you feel now.

| Post Concussion Symptom Scale | | | | |
|-------------------------------|------|----------|--------|---------|
| | None | Moderate | Severe | |
| Headache | 0 | 1 | 2 | 3 4 5 6 |
| "Pressure in head" | 0 | 1 | 2 | 3 4 5 6 |
| Neck Pain | 0 | 1 | 2 | 3 4 5 6 |
| Balance problems or dizzy | 0 | 1 | 2 | 3 4 5 6 |
| Nausea or vomiting | 0 | 1 | 2 | 3 4 5 6 |
| Vision problems | 0 | 1 | 2 | 3 4 5 6 |
| Hearing problems / ringing | 0 | 1 | 2 | 3 4 5 6 |
| "Don't feel right" | 0 | 1 | 2 | 3 4 5 6 |
| Feeling "dinged" or "dazed" | 0 | 1 | 2 | 3 4 5 6 |
| Confusion | 0 | 1 | 2 | 3 4 5 6 |
| Feeling slowed down | 0 | 1 | 2 | 3 4 5 6 |
| Feeling like "in a fog" | 0 | 1 | 2 | 3 4 5 6 |
| Drowsiness | 0 | 1 | 2 | 3 4 5 6 |
| Fatigue or low energy | 0 | 1 | 2 | 3 4 5 6 |
| More emotional than usual | 0 | 1 | 2 | 3 4 5 6 |
| Irritability | 0 | 1 | 2 | 3 4 5 6 |
| Difficulty concentrating | 0 | 1 | 2 | 3 4 5 6 |
| Difficulty remembering | 0 | 1 | 2 | 3 4 5 6 |

(follow up symptoms only)

| | | | | | | | |
|--------------------------|---|---|---|---|---|---|---|
| Sadness | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Nervous or Anxious | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Trouble falling asleep | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Sleeping more than usual | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Sensitivity to light | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Sensitivity to noise | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Other: _____ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |

What should I do?

Any athlete suspected of having a concussion should be removed from play, and then seek medical evaluation.

Signs to watch for:

Problems could arise over the first 24-48 hours. You should not be left alone and must go to a hospital at once if you:

- Have a headache that gets worse
- Are very drowsy or can't be awakened (woken up)
- Can't recognize people or places
- Have repeated vomiting
- Behave unusually or seem confused; are very irritable
- Have seizures (arms and legs jerk uncontrollably)
- Have weak or numb arms or legs
- Are unsteady on your feet; have slurred speech

Remember, it is better to be safe. Consult your doctor after a suspected concussion.

What can I expect?

Concussion typically results in the rapid onset of short-lived impairment that resolves spontaneously over time. You can expect that you will be told to rest until you are fully recovered (that means resting your body and your mind). Then, your doctor will likely advise that you go through a gradual increase in exercise over several days (or longer) before returning to sport.

The SCAT Card
(Sport Concussion Assessment Tool)
Medical Evaluation

Name: _____ Date: _____
Sport/Team: _____ Mouth guard? Y N

1) SIGNS

Was there loss of consciousness or unresponsiveness? Y N
Was there seizure or convulsive activity? Y N
Was there a balance problem / unsteadiness? Y N

2) MEMORY

Modified Maddocks questions (check correct)

At what venue are we? ____; Which half is it? ____; Who scored last? ____
What team did we play last? ____; Did we win last game? ____?

3) SYMPTOM SCALE

Total number of positive symptoms (from reverse side of the card) = _____

4) COGNITIVE ASSESSMENT

| 5 word recall | Immediate | Delayed |
|---------------|------------|-----------------------------|
| | (Examples) | (after concentration tasks) |
| Word 1 _____ | cat | _____ |
| Word 2 _____ | pen | _____ |
| Word 3 _____ | shoe | _____ |
| Word 4 _____ | book | _____ |
| Word 5 _____ | car | _____ |

Months in reverse order:

Jun-May-Apr-Mar-Feb-Jan-Dec-Nov-Oct-Sep-Aug-Jul _____ (circle incorrect)
or

Digits backwards (check correct)

5-2-8 _____ 3-9-1 _____
6-2-9-4 _____ 4-3-7-1 _____
8-3-2-7-9 _____ 1-4-9-3-6 _____
7-3-9-1-4-2 _____ 5-1-8-4-6-8 _____

Ask delayed 5-word recall now

5) NEUROLOGIC SCREENING

| | Pass | Fail |
|-----------------------|-------|-------|
| Speech | _____ | _____ |
| Eye Motion and Pupils | _____ | _____ |
| Pronator Drift | _____ | _____ |
| Gait Assessment | _____ | _____ |

Any neurologic screening abnormality necessitates formal neurologic or hospital assessment

6) RETURN TO PLAY

Athletes should not be returned to play the same day of injury. When returning athletes to play, they should follow a stepwise symptom-limited program, with stages of progression. For example:

1. rest until asymptomatic (physical and mental rest)
2. light aerobic exercise (e.g. stationary cycle)
3. sport-specific training
4. non-contact training drills (start light resistance training)
5. full contact training after medical clearance
6. return to competition (game play)

There should be approximately 24 hours (or longer) for each stage and the athlete should return to stage 1 if symptoms recur. Resistance training should only be added in the later stages. Medical clearance should be given before return to play.

Instructions:

This side of the card is for the use of medical doctors, physiotherapists or athletic therapists. In order to maximize the information gathered from the card, it is strongly suggested that all athletes participating in contact sports complete a baseline evaluation prior to the beginning of their competitive season. This card is a suggested guide only for sports concussion and is not meant to assess more severe forms of brain injury. **Please give a COPY of this card to the athlete for their information and to guide follow-up assessment.**

Signs:

Assess for each of these items and circle Y (yes) or N (no).

Memory:

Select any 5 words (an example is given). Avoid choosing related words such as "dark" and "moon" which can be recalled by means of word association. Read each word at a rate of one word per second. The athlete should not be informed of the delayed testing of memory (to be done after the reverse months and/or digits). Choose a different set of words each time you perform a follow-up exam with the same candidate.

Concentration / Attention:

Ask the athlete to recite the months of the year in reverse order, starting with a random month. Do not start with December or January. Circle any months not recited in the correct sequence.

For digits backwards, if correct, go to the next string length. If incorrect, read trial 2. Stop after incorrect on both trials.

Neurologic Screening:

Trained medical personnel must administer this examination. These individuals might include medical doctors, physiotherapists or athletic therapists. Speech should be assessed for fluency and lack of slurring. Eye motion should reveal no diplopia in any of the 4 planes of movement (vertical, horizontal and both diagonal planes). The pronator drift is performed by asking the patient to hold both arms in front of them, palms up, with eyes closed. A positive test is pronating the forearm, dropping the arm, or drift away from midline. For gait assessment, ask the patient to walk away from you, turn and walk back.

Return to Play:

A structured, graded exertion protocol should be developed; individualized on the basis of sport, age and the concussion history of the athlete. Exercise or training should be commenced only after the athlete is clearly asymptomatic with physical and cognitive rest. Final decision for clearance to return to competition should ideally be made by a medical doctor.

For more information see the "Summary and Agreement Statement of the Second International Symposium on Concussion in Sport" in the: Clinical Journal of Sport Medicine 2005; xx(xx): xxx-x British Journal of Sports Medicine 2005; xx(xx): xxx-x Neurosurgery 2005; ; xx(xx): xxx-x Physician in Sportsmedicine 2005; xx(xx): xxx-x

ALI



2012 Summer Olympic Games

Heat-related Illness



- Evidence shows that exertional heat stroke is on the rise and is a real threat to the lives of athletes. It is currently among the top three reasons athletes die during sport. Having mandatory state guidelines for heat acclimatization provides a critical standard to protect athletes against exertional heat illnesses.
- The majority of exertional heat stroke cases occur during the initial summer workouts when athletes are neither prepared to cope with the environmental conditions nor the new physiological demands placed upon them during workout sessions. Heat acclimatization guidelines mandate that athletes be introduced slowly to environmental stressors during practice sessions, resulting in lowering the risk for exertional heat stroke.
- The body of evidence supporting heat acclimatization is large. By not mandating heat acclimatization guidelines, states are failing to protect their athletes; and, in fact, are placing them at greater risk for exertional heat stroke and other heat-related illnesses. Coaches, school leadership, parents and legislators must push their states to establish guidelines or have inadequate guidelines revised

Exertional Heatstroke (EHS) is the leading cause of preventable death in high school athletics.

Students participating in high-intensity, long-duration or repeated same-day sports practices and training activities during the summer months or other hot-weather days are at greatest risk. Football has received the most attention because of the number and severity of exertional heat illnesses. Notably, the National Center for Catastrophic Sports Injury Research reports that **35 high school football players died of EHS between 1995 and 2010.** EHS also results in thousands of emergency room visits and hospitalizations throughout the nation each year.

Heat Stroke Fatalities 1975-2009



| YEAR | TOTAL |
|------------------|--------------|
| 1975-1979 | 8 |
| 1980-1984 | 9 |
| 1985-1989 | 5 |
| 1990-1994 | 2 |
| 1995-1999 | 13 |
| 2000-2004 | 11 |
| 2005-2009 | 18 |

Other Types of Heat-related Illness



Heat Cramps

Heat Exhaustion

Heat Syncope

Exertional Sickling

Exertional Sickling: Exertional sickling is a medical emergency occurring in athletes carrying the sickle cell trait. When the red blood cells (RBC) change shape or “sickle” this causes a build up of RBCs in small blood vessels, leading to decreased blood flow. The drop in blood flow leads to a breakdown of muscle tissue and cell death, known as fulminant rhabdomyolysis.

* 1 in 12 African-Americans

** 1 in 2000 to 1 in 10,000 white Americans

*** Mediterranean, Middle eastern, Indian, Caribbean, and South and Central American Ancestry.

- In the past 7 years, 9 athletes, ages 12-19 have died.
 - 5 college football players in training
 - 2 high school athletes (1 a 14 yr./ old female basketball player)
 - 2 12 yr. old boys training for football
- It is required screening of all newborns in the US

Prevention

- Screen all athletes for sickle cell trait
- Mandate PPE's to ensure athletes are healthy for activity
- Acclimatize all athletes by slowly increasing intensity when conditioning or lifting
- Modify drills for sickle cell trait athletes by avoiding timed runs and implementing breaks between runs
- Have water readily available during all activity
- Limit activity if any type of illness is present
- Educate athletes, parents, and coaches about the signs, symptoms, and treatment of exertional sickling
- Be aware of predisposing factors:
 - Sickle cell trait
 - Heat
 - Dehydration
 - High altitude
 - Asthma
 - Illness
 - Unacclimatized
 - High intensity exercise with short rest intervals

Common Signs and Symptoms

- Cramping
- Muscle weakness exceeds muscle pain
- Athlete slumps to the ground rather than a sudden collapse (rules out cardiac)
- Able to speak
- Muscles look and feel normal (rules out heat cramps)
- Rapid breathing, but pulmonary exam reveals normal air movement
- Rectal temperature <103F (rules out heat stroke)

Sports settings common for exertional sickling collapse:

- Football conditioning
- Basketball training
- Cross country racing
- University track tryouts
- Golden Gloves boxing bout

Differential Diagnosis

- **Exertional heat illness**
- **Dehydration**
- **Heat Syncope**
- **Asthma**
- **Cardiac conditions**

Treatment

- **Cease activity**
- **Check vital signs**
- **Activate EMS**
- **Administer high flow O₂ (15L/min)**
- **Cool athlete if necessary**
- **Call ahead to hospital and tell staff to expect explosive rhabdomyolysis**
- **Extended care will be needed to assess body damage (kidneys, liver, etc.)**

Return to Play

- Physician clearance
- Gradual return to play based on level of sickling and severity of symptoms.

Recommended equipment list

- Emergency action plan
- Cell phone
- Supplemental oxygen
- Rectal thermometer
- Blood pressure cuff and stethoscope
- Wrist watch

- July 26 to August 2, 2011: 5 heat-related high school football deaths in an 8 day period. Worst day in 35 years in terms of athlete deaths according Dr. Doug CASA, a leading expert on exertional heat illness, and CEO of UConn's **Korey Stringer Institute**.
- 16 year old senior in FLA; 14 year old freshman in SC; 55 year old coach in TX; and 2 players in GA.
- 4 in ARK were hospitalized on August 3rd as temperatures reached 114 degrees

What is being done to prevent heat-related deaths?



- May 2011, NJ State Interscholastic Athletic Association became the first state organization to adopt heat-acclimatization guidelines established by the NATA in 2009.
- The University Interscholastic League in TX followed suit in October 2011, banning two-a-days for the first four days of training camp and on consecutive days thereafter.
- CT, NC, and GA took action next, and KSI is working with several other states to develop or improve their own heat acclimatization policies

The **Georgia High School Association's** new heat acclimatization policy adopted in March, requires: FB players in helmet and shorts first 5 days; banned three-a-days; and two-a-days cannot take place on consecutive days or exceed 5 hours in a single day; a 3 hour rest period between the two sessions, and a single practice may last no longer than 3 hours. Schools found to be in violation of the new mandates face fines up to \$1000.

Maine and New England



- **Maine:** Currently meets 1 of the 7 heat acclimatization guidelines. Total practice time should not exceed 3 hours in any 1 day. Not currently working with KSI.
- **MA:** Meets non of the guidelines and is working with KSI.
- **NH:** Meets none of the guidelines and is not working with KSI.
- **VT:** Meets none of the guidelines and is not working with KSI.
- **RI:** Meets one of the guidelines and is working with KSI.
- **CT:** Meets 3 of the guidelines and is working with KSI

NATA PRE-SEASON HEAT ACCLIMATIATION GUIDELINES FOR SECONDARY SCHOOL ATHLETES



- All student-athletes should undergo a pre-participation medical exam administered by a physician (MD or DO) or as required/approved by state law. The exam can identify predisposing factors related to a number of safety concerns, including the identification of youths at particular risk for exertional heat illness.

NATA PRE-SEASON HEAT ACCLIMATIATION GUIDELINES FOR SECONDARY SCHOOL ATHLETES



- **Heat Acclimatization Period:** the initial 14 consecutive days of preseason practice for all student-athletes. The goal of the acclimatization period is to enhance exercise heat tolerance and the ability to exercise safely and effectively in warm to hot conditions. During this period, if practice occurs on 6 consecutive days, student-athletes should have 1 day of complete rest (no conditioning, walk-throughs, practices, etc.).
- Days on which athletes do not practice, due to a scheduled rest day, injury or illness do not count toward the heat acclimatization period. For example, an athlete who sits out the third and fourth days of practice during this time, will resume practice as if on day 3.

NATA PRE-SEASON HEAT ACCLIMATIATION GUIDELINES FOR SECONDARY SCHOOL ATHLETES



- **Practice:** is defined as the period of time an athlete engages in a coach-supervised, school approved, sport- or conditioning-related physical activity. Each individual practice should last no more than 3 hours. Warm-up, stretching and cool-down activities are included as part of the 3-hour practice time. Regardless of ambient temperature conditions, all conditioning and weight-room activities should be considered part of practice.

NATA PRE-SEASON HEAT ACCLIMATIATION GUIDELINES FOR SECONDARY SCHOOL ATHLETES



- **Walk-through:** defined as a teaching opportunity with athletes not wearing protective equipment (eg, helmets, shoulder pads, catcher's gear, shin guards) or using sport-related equipment (eg, footballs, lacrosse sticks, blocking sleds, pitching machines, soccer balls, marker cones). The walk through is not part of the 3-hour practice period, can last no more than 1 hour per day, and does not include conditioning or weight-room activities.

NATA PRE-SEASON HEAT ACCLIMATATION GUIDELINES FOR SECONDARY SCHOOL ATHLETES



- **Recovery period:** defined as the time between the end of 1 practice or walk-through and the beginning of the next practice or walk-through. During this time, athletes should rest in a cool environment, with no sport- or conditioning-related activity permitted *eg, speed or agility drills, strength training, conditioning or walk-through). Treatment with the athletic trainer is permissible.

RECOMMENDATIONS FOR THE 14-DAY HEAT ACCLIMATIZATION PERIOD



Core Principles:

1. Days 1-5 of the heat acclimatization period consist of the first 5 days of formal practice. During this time, athletes may not participate in more than 1 practice per day.
2. If a practice is interrupted by inclement weather or heat restrictions, the practice should recommence once conditions are deemed safe. Total practice time should not exceed 3 hours in any 1 day.
3. A 1 hour maximum walk through is permitted during days 1-5 of the heat acclimatization period. However, a 3-hour rest period should be inserted between the practice and walk-through (or vice versa).

RECOMMENDATIONS FOR THE 14-DAY HEAT ACCLIMATIZATION PERIOD



Core Principles (continued)

4. During days 1-2 of the heat acclimatization period, in sports requiring helmets or shoulder pads, a helmet should be the only protective equipment permitted (goalies, as in the case of field hockey and related sports, should not wear full protective gear or perform activities that would require protective equipment. During days 3-5, only helmets and shoulder pads should be worn. Beginning on day 6, all protective equipment may be worn and full contact may begin.
 - A. Football only: On days 3-5, contact with blocking sleds and tackling dummies may be initiated.
 - B. Full-contact sports: 100% live contact drills should begin no earlier than day 6.

RECOMMENDATIONS FOR THE 14-DAY HEAT ACCLIMATIZATION PERIOD



Core Principles (continued):

5. Beginning no earlier than day 6 and continuing through day 14, double practice days must be followed by a single practice day. On single-practice days, 1-walk through is permitted, separated from the practice by at least 3 hours of continuous rest. When a double practice day is followed by a rest day, another double practice day is permitted after the rest day.

RECOMMENDATIONS FOR THE 14-DAY HEAT ACCLIMATIZATION PERIOD



Core Principles (continued):

6. On a double-practice day, neither practice should exceed 3 hours in duration, and student-athletes should not participate in more than 5 total hours of practice. Warm-up, stretching, cool-down, walk-through, conditioning and weight-room activities are included as part of the practice time. The two practices should be separated by at least 3 continuous hours in a cool environment.
7. Because the risk of **exertional heat illness** during the preseason heat-acclimatization period is high, we strongly recommend an athletic trainer be onsite before, during and after all practices.

What should we be doing?



- Adopt all 7 Guidelines for Heat Acclimatization now!
- Failure to do so places schools at greater risk for liability in the event of an athlete's death due to exertional heat illness and lack of a policy and procedures to prevent these deaths from happening.
- Education: NFHS video on Heat-Related Illnesses; Parents and athletes.
- Utilize the Wet Bulb Globe Temperature (WBGT) index instead of the heat index when assessing whether practice conditions are safe.

WBGT

- WBGT is the most widely used and accepted way to assess heat stress.
- A composite temperature used to estimate the effect of actual temperature, humidity, wind speed and radiant heat on players. <\$50



Kestrel 4400 Heat Stress Tracker

