

Concussions In School Age Children: The Essentials

Hirsch Handmaker, M.D.

Respectfully Presented to:
2015 Pima County Public Health in
Schools Conference

June 30th, 2015



On November 1st, 2010, Sports Illustrated awakened the world to the issue of sports-related concussions.



CONQUERING
CONCUSSIONS

CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

Since that time, daily headlines and newscasts tell of the complications that can arise from repeat mild Traumatic Brain Injury, or mTBI, as concussions are referred to in the medical world.

Head games: concussion crisis in football

As athletes get bigger, stronger and faster than ever before, concussions - caused by violent collisions - have become a troubling part of football at all levels.

Concussions Can occur when the brain moves inside the skull from an impact or whiplash effect.

Initial impact The force from the impact causes the brain to strike the inner surface of the skull and can rebound against the opposite side.

Some symptoms

- Confusion
- Slurred speech
- Drowsiness
- Memory loss
- Blurred vision
- Bleeding nose or ears
- Seizures
- Nausea



SOURCE: National Institutes of Health AP

4 NEWS Controversy of the week

Football: Is Seau's death 'a tipping point'?

Junior Seau didn't just kill himself last week, said Joel Mathis in *PhiMag.com*. "he probably killed football itself." The NFL legend and future Hall of Famer was found dead at his California home with a gunshot wound—firing to his chest. Though the 43-year-old former linebacker left no suicide note, the speculation is that, like former Chicago Bear Dave Duerson last year, Seau avoided shooting himself in the head so that doctors could study the damage done to his brain by 20 years of high-speed collisions in the NFL. Duerson's brain was found to be ravaged by chronic traumatic encephalopathy, a condition brought on by multiple concussions that causes depression and early-onset dementia. Autopsies on a host of other players who committed suicide we'd died prematurely in recent years have also revealed CTE, with doctors saying that one player, 44-year-old Andre Waters, had the brain of an 85-year-old suffering from Alzheimer's. How does anyone with a conscience continue to watch a sport that turns men's "minds into mush?" The suicide of the charismatic, widely liked Seau may be "a tipping point," said Barbara Bruno in *HuffingtonPost.com*. Fans have been in denial, but it's now obvious that everyone who watches the game is "complicit in these tragedies."



Seau: Famed for his hard hits

conussions on their brains. When both medical science and the courts assess the full human cost of America's favorite spectator sport, football—just like boxing before it—could soon "end up a sport whose best days are past."

I'd hate to see that happen, said Andy Staples in *SportsIllustrated.com*. Football is a wonderful game, not only for spectators but for amateur players, who learn so much about life by testing themselves in that crucible between the end zones. To save the game, the NFL—and college football, too—has to do whatever it takes to make the sport safer. Yes, "it will require something drastic"—perhaps outlawing the helmets that embolden players to use their heads as weapons—but "football is too great a sport to continue under this cloud."

But how do you take the violence out of football? said Buzz Bissinger in *TheDailyBeast.com*. The game is "primal and vicious and visceral," a form of warfare staged on grass. One reason tens of millions of us watch the college game and the NFL is the vicarious thrill we get when one player flattens another with a hit that knocks the snout out of his nose. When autumn rolls around and we're asked, "Are you ready for some football?" we'll say, "Sure am!"—even if we feel slightly guilty about it. The fans may not turn off the game right away, said John Kass in the *Chicago Tribune*, just as it took decades for boxing to wither. But as tragedies like Junior Seau's continue to mount, parents will decide that it's not worth the risks to let their sons play at any level, from Pop Warner to college. When there aren't enough young players to replenish the ranks, we may see the beginning of the end of "the world's most violently glamorous sport."



CONQUERING
CONCUSSIONS

CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

While the topic of the effects of concussions on current and former professional athletes gain most of the media's attention, the frequency and side effects of premature Return to Play decisions are even more serious in the most vulnerable population, young athletes from 6-14 years of age – the incompletely myelinated brain.



CONQUERING
CONCUSSIONS



CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

“If I could tell youth athletes one thing, it would be to take care of your health. If you’re suspected of having a concussion, don’t go back into the game, no matter how you feel when the adrenaline is flowing. It makes me feel proud when I hear about Lystedt Laws being passed in other states. Sharing my story is important—I don’t want anyone else to live through what I’ve had to live through every day. I take it one day at a time and feel better most days. I’m motivated by the friends and family who believe in me.”

- ZACKERY LYSTEDT



CONQUERING
CONCUSSIONS



CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

DEFINITION OF CONCUSSION

- A complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces including:
 - Direct blow to body or head
 - Rapid onset of short lived impairment of neurological function that usually resolves spontaneously
 - Traditional imaging (CT and MRI 1.5T)
 - usually normal
 - May or may not involve Loss of Consciousness (LOC)*



The Problem

- **1.6 - 3.8 million** sports and recreational related concussions per year
- **Players:** 34% with 1 concussion, 20% with multiple concussions
- **Individual Risk:** 19% per year of play in contact sports
- 1 concussion per team per 3 games



Perhaps the most difficult decision that must be made by Team Physicians, coaches, managers, parents, Certified Athletic Trainers (ATCs) and the athletes themselves is when it is safe and prudent to *Return to Play (RTP)*.



CONQUERING
CONCUSSIONS



CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

The commonly accepted methods for determining whether an athlete of any age has suffered a concussion during practice or in a game include...

A Physical Examination, with special attention to neurological signs and symptoms



CONQUERING
CONCUSSIONS



CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

Computerized Neurocognitive Testing

ImPACT: A computer-based neurocognitive test - preseason "Baseline" for comparison after a concussion occurs and to follow the results of treatment and confirmation of recovery



**CONQUERING
CONCUSSIONS**

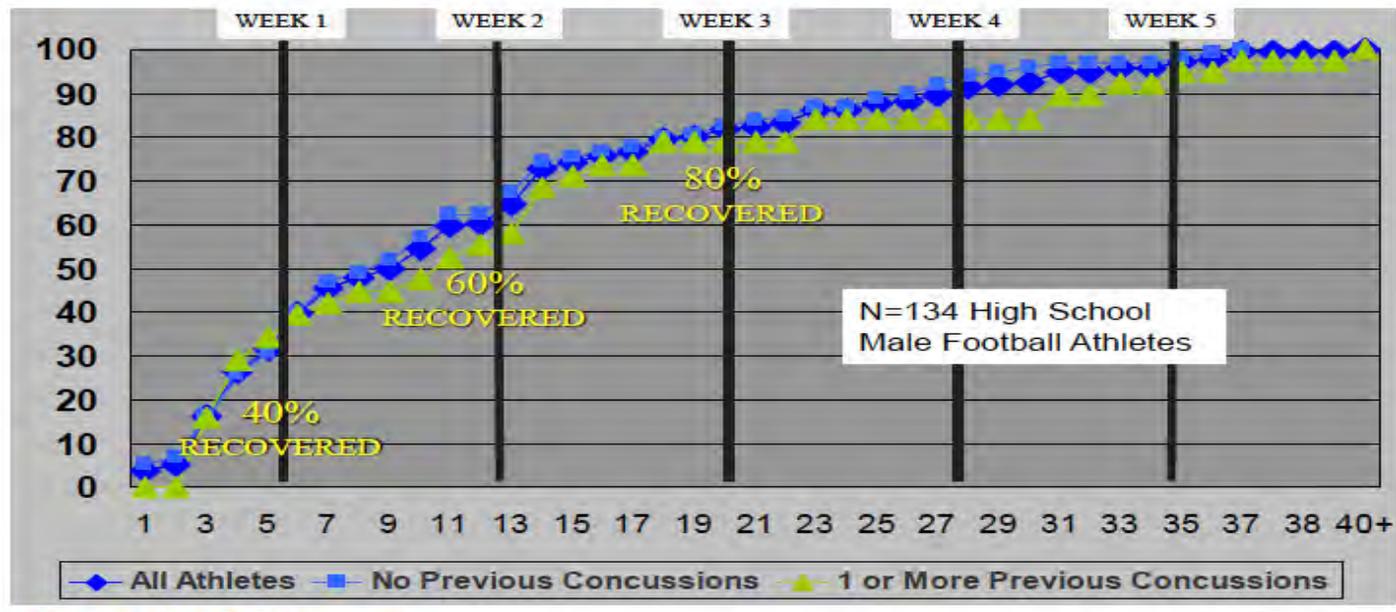
CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

Neurocognitive (ImPACT) Testing

- Traditionally administered on Days 2, 5, 7, and 10 following mTBI
- Results compared to *baseline* testing
- College/Professional recovery curves indicate about 5 days on average
- High School recovery curves about 7-8 days



Individual Recovery From Sports MTBI: How Long Does it Take?



Collins et al., 2008, Neurosurgery

Balance Testing



**CONQUERING
CONCUSSIONS**

CACTIS™
FOUNDATION
Informatics/Imagenomics/Innovation

Contemporary Eye Movement detection devices combine the latest in electronic and computer technology to evaluate the three critical eye movements which have been reported to become abnormal immediately after concussions.



CONQUERING
CONCUSSIONS

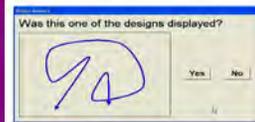
CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

The Concussion Puzzle



Physical Examination

Neurocognitive Testing



Eye Movement Assessment



Balance Testing

Return To Play Guidelines

- Asymptomatic at rest
- Asymptomatic with exertion
- Neurocognitive Testing at or above baseline
- Resolution of vestibular dysfunction
- Normal CT/MRI if done



Multiple Concussions

Following the first episode of an mTBI, an athlete is 4X more likely to experience another mTBI and 3X more likely to experience an mTBI in the same season



Second Impact Syndrome

- Occurs in athletes or patients with a prior concussion and then a relatively minor second impact
 - Can occur up to 14 days post-injury
 - Athlete returns to risky situation/competition before symptoms have resolved
- Catastrophic increase in intracranial pressure
 - Massive swelling, herniation and death
- Most often occurs in athletes < 21 years old
 - Developing (unmyelinated) brain at higher risk



YOUTH CONCUSSION STATISTICS

- Traumatic Brain Injury (TBI) is the leading cause of death and disability for America's youth
- Concussions are one of the most common injuries in many amateur and professional sports
- Approximately 3.8 Million sports and recreation-related concussions occur in the US each year (figure only includes athletes who lost consciousness)
- Likelihood of a contact sport athlete experiencing a concussion may be as high as 19% per athlete per season
- Over 767,000 American youth annually visit emergency room because of TBI
 - 80,000 are hospitalized
 - 11,000 die



Recent Publications and Data

Epidemiology, trends, assessment and management of sport-related concussion in United States high schools.

- The number of high school athletes being diagnosed with sport-related concussions is rising.
- An estimated 2.5 reported concussions occur for every 10,000 athletic exposures, in which an athletic exposure is defined as one athlete participating in one game or practice.

Curr Opin Pediatr. 2012 Dec;24(6):696-701.



Recent Publications and Data

Concussion in the adolescent athlete.

In the school-aged athlete, new concepts, such as complete brain rest, have made school management decisions as important as sport Return-to-Play decisions

Cur Probl Pediatr Adolesc Health Care 2010 Aug;40(7):154-69



Recent Publications and Data

Premature return to play and return to learn after a sport-related concussion

- In 43.5% of concussion cases, the patient returned to sport too soon and in 44.7% of concussion cases, the patient returned to school too soon.
- Patients with a history of previous concussion required more days of rest before being permitted to participate in any physical activity than those patients without a previous history of concussion.
- Many students with sport-related concussions experience a recurrence or worsening of symptoms after premature RTP or RTL, suggesting that they have not adequately recovered.

Can Fam Physician. 2014 Jun; 60(6): e310–e315



Recent Publications and Data

American Medical Society for Sports Medicine - Position Statement: concussion in sport.

- Students will require cognitive rest and may require academic accommodations such as reduced workload and extended time for tests while recovering from a concussion.
- The primary concern with early RTP is decreased reaction time leading to an increased risk of a repeat concussion or other injury and prolongation of symptoms.
- Long-Term Effects:
 - There is an increasing concern that head impact exposure and recurrent concussions contribute to long-term neurological sequelae.
 - Some studies have suggested an association between prior concussions and chronic cognitive dysfunction.
- Greater efforts are needed to educate involved parties, including athletes, parents, coaches, officials, school administrators and healthcare providers to improve concussion recognition, management and prevention.

Br J Sports Med 2013 Jan;47(1):15-26



Recent Publications and Data

Supporting the Student-Athlete's Return to the Classroom After a Sport-Related Concussion

- Educators should understand that recovering students may not be able to meet the usual expectations for class participation and homework completion until symptoms have cleared and neurocognitive function has returned to normal.
- Post-concussion symptoms often interfere with a student-athlete's ability to do academic work, participate in the classroom setting, and function interpersonally with peers and parents. Fatigue and sleep disruption may leave the student-athlete without the mental energy to participate in a full day of class work and evening studies. Cognitive deficits, which can exist even when student-athletes claim they are symptom free, may further undermine school participation.
- In more severe cases, the student-athlete may have to drop classes or even an entire semester of studies if all attempts at accommodation fail and if disabling symptoms continue even

J Athl Train 2010 Sep-Oct; 45(5):492-498



Just as there are no two grains of sand on the beach that are the same,
there are no two concussions which are alike.



A Grain of Sand - Nature's Secret Wonder
The Amazing Microphotography of Dr. Gary Greenberg

CONQUERING
CONCUSSIONS



CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

State of the Art

If you've seen one concussion,
you've seen
one concussion...



Expected opening: September 1, 2015



TUCSON
CONCUSSION
CENTER

CONQUERING
CONCUSSIONS

CACTISTM
FOUNDATION
Informatics/Imagenomics/Innovation

INTERIM CONTACT INFORMATION



CONCUSSION PROFESSIONALS

- **Michael Hamant, MD**
 - Family Practice / Sports Medicine Physician
 - 520-298-2313
- **Tanya Polec, OD, FCOVD**
 - Neuro-Optometrist
 - 520-299-4100
- **Patricia Beldotti, PysD**
 - Neuropsychologist
 - 520-404-7553
- **Tom Sanderson, PT, GPS**
 - Physical Therapist
 - 520-733-6227



TAKEAWAYS

- Concussions Will Happen
- Baseline Testing – A Standard of Care
- Sideline ATCs have a critically important role to play here
- Return To Play and Return To Learn Decisions
 - Made by qualified professionals trained in concussion diagnosis and management
- Short and Long-Term Risks Decrease When Patients Fully Recover From Concussions
- Legal Implications



CDC FACT SHEETS

School Professionals

CONQUERING CONCUSSIONS **CACTIS FOUNDATION**
informatics/imagenomics/innovation

CONCUSSION FACT SHEET FOR SCHOOL PROFESSIONALS

HEADS UP CONCUSSION

WHAT IS A CONCUSSION?
 A concussion is a type of brain injury that changes the way the brain normally works. A concussion is caused by a bump, blow, or jolt to the head. Concussions can also occur from a fall where the head hits the ground or from a violent shaking of the head or neck. Even when someone has a mild bump to the head or a bruise.

Children and adolescents are aware of their risk for concussion. The potential for concussion is present during activities where collisions can occur, such as during physical education (PE) class, playground play, or contact sports activities. However, concussions can happen any time a student's head experiences a violent jolt, such as from a fall, auto, or another student's head or body. Proper recognition and response to concussion can prevent further injury and help with recovery.

Children and adolescents who are aware of their risk for concussion. The potential for concussion is present during activities where collisions can occur, such as during physical education (PE) class, playground play, or contact sports activities. However, concussions can happen any time a student's head experiences a violent jolt, such as from a fall, auto, or another student's head or body. Proper recognition and response to concussion can prevent further injury and help with recovery.

HOW CAN I RECOGNIZE A CONCUSSION?
 Teachers and other caretakers may be the first to notice changes in their students. The signs and symptoms can take time to appear and can become confused during recreational and learned activities in the classroom.

Send a student to the school nurse, or another health professional, if the student or caretaker has a student head injury.

1. Any loss of consciousness in the head or the neck that results in rapid removal of the head.

AND

1. Any change in the student's behavior, thinking, or physical functioning. Check the signs and symptoms of concussion.

"WHEN IN DOUBT, SET THEM OUT!"

JOIN THE CONVERSATION www.facebook.com/CDCHeadUp

Parents

CONQUERING CONCUSSIONS **CACTIS FOUNDATION**
informatics/imagenomics/innovation

CONCUSSION FACT SHEET FOR PARENTS

HEADS UP CONCUSSION

WHAT IS A CONCUSSION?
 A concussion is a type of traumatic brain injury. Concussions are caused by a bump or blow to the head. Car or "tag," "tipping your hat over," or what seems to be a mild bump or blow to the head can be serious.

You can't see a concussion. Signs and symptoms of concussion can show up right after the injury or may not appear or be noticed until days or weeks after the injury. If your child reports any symptoms of concussion, or if you notice the symptoms yourself, seek medical attention right away.

WHAT ARE THE SIGNS AND SYMPTOMS OF A CONCUSSION?
Signs Observed by Parents or Guardians
 (Look for any unexpected change in the way of their functioning, waking or sleeping, and behavior of their following agreed-upon symptoms of a concussion.)

- Appears dazed or stunned
- Is confused about questions or location
- Forgets an instruction
- Is unsure of game, score, or opponent
- Words slowly
- Answers questions slowly
- Looks dazed or blank
- Shows mood, behavior, or personality changes

Symptoms Reported by Athlete

- Headache or "pressure" in head
- Nausea or vomiting
- Double or blurry vision
- Sensitivity to light
- Sensitivity to noise
- Feeling sluggish, fuzzy, foggy, or groggy
- Concentration or memory problems
- Confusion
- Just "not feeling right" or "feeling down"

HOW CAN YOU HELP YOUR CHILD PREVENT A CONCUSSION ON OTHER SPORTS/TEAM/ACTIVITY?
 - Check that they follow their coach's rules for safety and the rules of the sport.
 - Encourage them to practice good sportsmanship at all times.
 - Make sure they wear the right protective equipment for their activity. Protective equipment should fit properly and be well maintained.
 - Wearing helmets is a must to reduce the risk of a serious brain injury or skull fracture.
 - However, helmets are not designed to prevent concussions. There is no "concussion-proof" helmet. So, none with a helmet, it is important for kids and teens to avoid hits to the head.

WHAT SHOULD YOU DO IF YOU THINK YOUR CHILD HAS A CONCUSSION?
 A health care professional will be able to decide how serious the concussion is and when it is safe for your child to return to regular activities, including sports.

2. KEEP YOUR CHILD OUT OF PLAY.
 Concussions take time to heal. Don't let your child return to play the day of the injury and don't let a health care professional say it's OK. Children who return to play too soon while the brain is still healing—risk a greater chance of having a repeat concussion. Repeat or later concussions can be very serious. They can cause permanent brain damage, affecting your child for a lifetime.

3. TELL YOUR CHILD'S COACH ABOUT ANY PREVIOUS CONCUSSION. Caution should be used if your child had a previous concussion. Your child's coach may not know about a concussion your child sustained in another sport or activity unless you tell the coach.

IT'S better to miss one game than the whole season.

©2014-2015 CDC/NIH, and the National Concussion Clearinghouse

Athletes

CONQUERING CONCUSSIONS **CACTIS FOUNDATION**
informatics/imagenomics/innovation

CONCUSSION FACT SHEET FOR ATHLETES

HEADS UP CONCUSSION

CONCUSSION FACTS
 A concussion is a brain injury that affects how your brain works.
 A concussion is caused by a bump, blow, or jolt to the head or body.
 A concussion can happen even if you haven't been knocked out.
 If you think you have a concussion, you should not return to play the day of the injury and not until a health care professional tells you are OK to return to play.

CONCUSSION SIGNS AND SYMPTOMS
 Concussion symptoms differ with each person and with each injury, and they may not be noticeable for hours or days. Common symptoms include:

- Headache
- Confusion
- Difficulty remembering or paying attention
- Balance problems or dizziness
- Feeling sluggish, fuzzy, foggy, or groggy
- Feeling nauseous, more emotional, or "down"
- Nausea or vomiting
- Blurred or double vision
- Double or blurry vision
- Sensitivity to light
- Sensitivity to noise
- Feeling sluggish, fuzzy, foggy, or groggy
- Concentration or memory problems
- Confusion
- Just "not feeling right" or "feeling down"

WHAT SHOULD I DO IF I THINK I HAVE A CONCUSSION?
DON'T HIDE IT. REPORT IT. (telling your parents and trying to "tough it out" often makes symptoms worse. Tell your coach, parent, and adult trainer if you haven't been knocked out or if your symptoms may have a concussion. Don't be embarrassed if you're continuing to practice or play with a concussion.)

1. GET CHECKED OUT. Only a health care professional can tell if you have a concussion and when it's OK to return to play. Sports team health resources are great resources so that you can get checked out and the team can perform as its best. The sooner you are checked out, the sooner you may be able to safely return to play.

2. TAKE CARE OF YOUR BRAIN. A concussion can affect your ability to do schoolwork and other activities. Many athletes with a concussion get better and return to sports, but it's important to rest and give your brain time to heal. A repeat concussion that occurs while your brain is still healing can cause long-term problems that may change your life forever.

HOW CAN I HELP PREVENT A CONCUSSION?
 Every sport is different, but there are steps you can take to prevent a concussion:

- Follow your coach's rules for safety and the rules of the sport.
- Practice good sportsmanship at all times.

IT'S better to miss one game than the whole season.

©2014-2015 CDC/NIH, and the National Concussion Clearinghouse

Coaches

HEADS UP CONCUSSION **IN HIGH SCHOOL SPORTS**

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
 CENTER FOR DISEASE CONTROL AND PREVENTION

SIGNS AND SYMPTOMS
 Athletes who experience one or more of the signs and symptoms listed below after a bump, blow, or jolt to the head or body may have a concussion.

Signs Observed by Coaching Staff	Symptoms Reported by Athlete
Appears dazed or stunned	Headache or "pressure" in head
Is confused about assignment or position	Nausea or vomiting
Forgets an instruction	Balance problems or dizziness
Is unsure of game, score, or opponent	Double or blurry vision
Doesn't clearly answer questions	Sensitivity to light
Answers questions slowly	Sensitivity to noise
Looks dazed or blank	Feeling sluggish, fuzzy, foggy, or groggy
Shows mood, behavior, or personality changes	Concentration or memory problems
Can't recall events prior to hit or fall	Confusion
Can't recall events after hit or fall	Just not "feeling right" or "feeling down"

ACTION PLAN
 If you suspect that an athlete has a concussion, you should take the following four steps:

- Remove the athlete from play.
- Ensure that the athlete is evaluated by a health care professional experienced in evaluating for concussion. Do not try to judge the seriousness of the injury yourself.
- Inform the athlete's parents or guardians about the possible concussion and give them the facts about concussions.
- Keep the athlete out of play the day of the injury and until a health care professional, experienced in evaluating for concussion, says the athlete is symptom-free and it's OK to return to play.

CONQUERING CONCUSSIONS

1-866-300-MTBI
www.conqueringconcussions.com

IT'S better to miss one game than the whole season.
 For more information and for additional resources, free of charge, visit: www.cdc.gov/concussion

©2015

CONQUERING CONCUSSIONS

CACTIS FOUNDATION
informatics/imagenomics/innovation

**“When in doubt,
sit ‘em out!”**

www.conqueringconcussions.com

www.CACTIS.org

