



Concussions Are Giving Me a Headache

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Why Do We care?

- ▶ Most common sports related injury in adolescents
 - ▶ Males: Football, Rugby, ice hockey and lacrosse
 - ▶ Females: soccer and basketball.
 - ▶ Females have a higher rate of concussions
- ▶ Result in 144,000 ER visits per year
- ▶ 3.8 million recreation and sports related concussions occur annually in the U.S.



Consequences of Concussion

- ▶ Consequences of concussions worse when:
 - ▶ not recognized
 - ▶ sustained multiple concussion over the course of an athletic career
- ▶ Concussion associated with poor school performance.
- ▶ Symptoms can last for 1-2 months
- ▶ High activity after concussion associated with poorer neurocognitive performance
 - ▶ Problems with verbal and visual memory
 - ▶ Slow visual motor speed
 - ▶ Slow reaction time



Long Term Consequences of Concussion

- Concussions in children have been linked with ADHD¹
- Mild TBI linked with long term changes with learning disabilities, cognitive function, and sleep²
- Second impact syndrome:
 - massive swelling of the brain in athletes who sustain a second head injury prior to full recovery from a concussion.
- Chronic traumatic encephalopathy (CTE): In patients with multiple concussions.
 - Permanent changes in mood, behavior, cognition, somatic symptoms,
 - linked with dementia, multiple sclerosis and Parkinsonian symptoms.

¹ Adeyemo et al in 2014

² Pieper et al study

Current Issues With Concussion: Underreporting

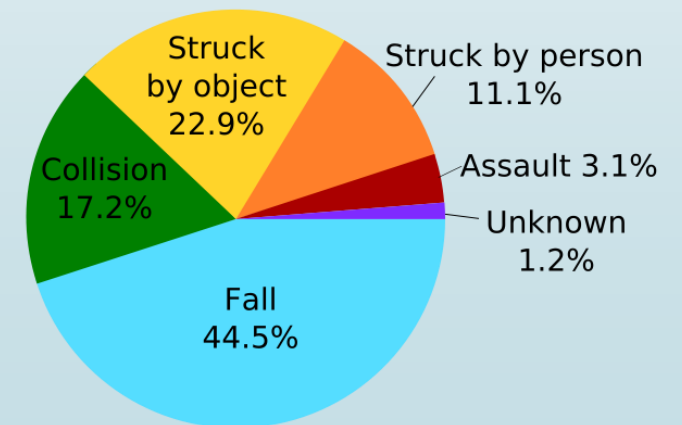
- ▶ Many young athletes, especially adolescents, do not report symptoms as they fear activity restrictions.
 - ▶ 60 percent of concussions events were **not** disclosed to an adult¹
 - ▶ 56 percent never saw a qualified health professional¹
- ▶ There is no requirement to report concussion during non-athletic competition/practice
 - ▶ Physical education classes, recess or play grounds
- ▶ Data are significantly lacking about concussions in grade school and middle school athletes.
 - ▶ estimate is 841 per 100,000

Not All Concussions Are Sports Related!

- Sports related concussion make up only 50% of concussions
- Frequently seen in motor vehicle collisions and other recreational activities
 - bicycle riding, skate-boarding, ice skating, or skiing
- In elementary school children, commonly occurs on playgrounds, recess, afterschool activities



Causes of concussion in children



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Current Issues with Concussion: Lack of Knowledge

- ▶ Lack of knowledge of symptoms of concussions
- ▶ Children can continue to play after concussions
- ▶ Non-compliance with treatment
- ▶ Lack of follow up with Physician to decide when it is safe to return to game play

Video on Pediatric Concussion



https://www.youtube.com/watch?v=DJ2LmEYB_JQ

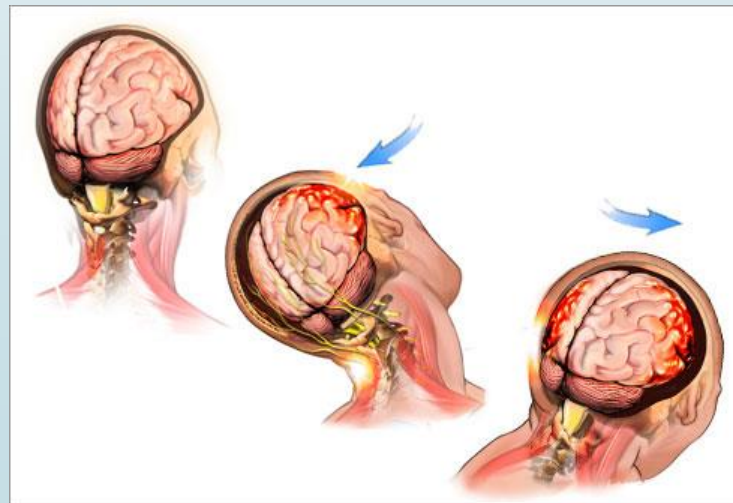
Definition

- ▶ Concussion is a form of mild traumatic brain injury
- ▶ Caused by a direct blow to the head, face, neck, or to elsewhere on the body with an 'impulsive' force transmitted to the head.
- ▶ Loss of consciousness occur in only 10% of concussion
- ▶ Criteria for concussion/mild TBI
 - ▶ GCS of 14 or 15 at the initial examination
 - ▶ No abnormal or focal findings on neurologic exam
 - ▶ No physical evidence of skull fracture



Causes of Concussion

- ▶ A rapid rotational acceleration of the brain
- ▶ shear strain from injury of the underlying neuron
 - ▶ From acceleration, deceleration, shearing, and rotation of brain
- ▶ no abnormality is seen on standard structural neuroimaging studies.



Symptoms of Concussion

- ▶ rapid onset, short-lived impairment of neurological function
- ▶ symptoms and signs may evolve over minutes up to 72 hours
- ▶ Symptoms by categories:

Physical	Physical	Thinking	Emotional	Sleep
Headaches	Sensitivity to light	Mental Foggy	Irritability	Drowsiness
Nausea	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Vomiting	Numbness/Tingling	Problems remembering	Feeling more emotional	Sleeping less than usual
Fatigue	Visual problems	Feeling slowed down	Nervousness	Trouble falling asleep
Dizziness	Balance Problems			

List of Common Symptoms

Symptoms of concussion recorded by the High School Reporting Information Online injury surveillance system (HS RIO)

Symptom recorded	No. of concussions resulting in symptom	Percentage of concussions resulting in symptom*
Headache	508	93
Dizziness/unsteadiness	406	75
Difficulty concentrating	308	57
Confusion/disorientation	250	46
Vision changes/sensitivity to light	204	38
Nausea	157	29
Drowsiness	144	27
Amnesia	132	24
Sensitivity to noise	103	19
Tinnitus	58	11
Irritability	50	9
Loss of consciousness	25	5
Hyperexcitability	12	2
Other	41	8

* Percentages do not total 100, as athletes could report more than 1 symptom.

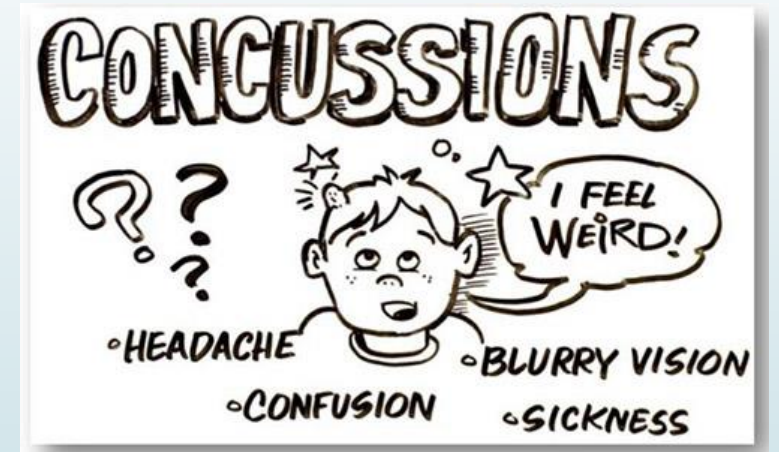
Initial Assessment for Concussion

- 1) Evaluating mechanism of injury
- 2) Obtain medical history
- 3) Evaluating clinical signs and symptoms
 - In a quiet environment free of distractions.
 - Systematic and comprehensive
 - typically requires between 8 to 20 minutes



Questions to Ask

- ▶ Ask about the students actions immediately following the episode:
 - ▶ Confused or disorientated?
 - ▶ Movements unsteady or uncoordinated?
 - ▶ Appear dazed?
 - ▶ Speech slow or incoherent?
 - ▶ Difficulty following directions or completing assignments?
 - ▶ Were they holding their head, or complaining of anything?
 - ▶ Vomiting?
- ▶ Knowledge of any recent concussion in last several months
 - ▶ presence of unresolved symptoms increases susceptibility for worse injuries and complications
- ▶ Asking about comorbidities (specifically bleeding disorders)



Physical Assessment

- 1) Observation
 - Look closely for signs of disequilibrium and lack of coordination.
 - Concerning: inattentiveness, confusion, atypical emotionality, or problems following instructions or focusing on a task.
- 2) Memory and attentiveness
 - Look for deficits in recall and concentration are common with a concussion.
 - Simple orientation questions (eg, person, place, time) alone have **not** been shown to be as helpful.
- 3) Physical Exam
 - Looking for signs of scalp trauma, abnormal eye movement.
 - Balance



Red Flags

- ▶ When to Call 911 or have seen in ED
 - ▶ Worsening headaches
 - ▶ Seizures
 - ▶ Neck pain
 - ▶ Looks very drowsy, can't be awakened
 - ▶ Can't recognize people or places
 - ▶ Weakness or numbness in arms or legs
 - ▶ Repeated vomiting
 - ▶ Increasing confusion
 - ▶ Slurred speech
 - ▶ Increasing irritability
 - ▶ Loss of Consciousness.



Assessment Tools

- Acute Concussion Evaluation [ACE]
- Sideline Concussion Assessment Tool 3 (SCAT3) symptom checklist questionnaire
 - Also with Child SCAT3
- Concussion Assessment & Response: Sport Version (CARE) –
 - smart-phone application that helps health care professionals evaluate a potential concussion in a systematic fashion.
- Standardized Assessment of Concussion (SAC)
 - Earliest and best studied tools for acute evaluation of concussion.

ACUTE CONCUSSION EVALUATION (ACE) CARE PLAN

Student Name: _____
 DOB: _____ Age: _____
 Date: _____ Student # _____
 Date of Injury: _____

PARENT / STUDENT REPORT

You have been diagnosed with a suspected concussion (also known as a mild traumatic brain injury). This personal plan is based on your symptoms and is designed to help speed your recovery. Your careful attention to it can also prevent further injury.

PARENT INFORMATION & HISTORY: Your child needs to see their primary care physician within 24-48 hours

Rest is the key. You should not participate in any high risk activities (e.j., sports, physical education (PE), riding a bike, etc.) if you still have any of the symptoms below. It is important to limit activities that require a lot of thinking or concentration (homework, job-related activities), as this can also make your symptoms worse. If you no longer have any symptoms and believe that your concentration and things are back to normal, you can slowly and carefully return to your daily activities. Children and teenagers will need help from their parents, teachers, PE teachers, coaches, or athletic trainers to help monitor their recovery and return to activities.

Physical	Physical	Thinking	Emotional	Sleep
Headaches	Sensitivity to light	Mental Foggy	Irritability	Drowsiness
Nausea	Sensitivity to noise	Problems concentrating	Sadness	Sleeping more than usual
Vomiting	Numbness/Tingling	Problems remembering	Feeling more emotional	Sleeping less than usual
Fatigue	Visual problems	Feeling slowed down	Nervousness	Trouble falling asleep
Dizziness	Balance Problems			

RED FLAGS: Call 911, your doctor or go to your nearest emergency department if your child suddenly experiences any of the following

Headaches that worsen	Looks very drowsy, can't be awakened	Unusual behavior change	Slurred Speech
Seizures	Can't recognize people or places	Repeated vomiting	Increasing irritability

SCAT3™



FIFA®



Sport Concussion Assessment Tool – 3rd Edition

For use by medical professionals only

Name

Date/Time of Injury:
Date of Assessment:

Examiner:

What is the SCAT3?¹

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool¹. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a medical professional. The SCAT3 should not be used solely to make, or exclude, the diagnosis of concussion in the absence of clinical judgement. An athlete may have a concussion even if their SCAT3 is "normal".

What is a concussion?

A concussion is a disturbance in brain function caused by a direct or indirect force to the head. It results in a variety of non-specific signs and/or symptoms (some examples listed below) and most often does not involve loss of consciousness. Concussion should be suspected in the presence of **any one or more** of the following:

- Symptoms (e.g., headache), or
- Physical signs (e.g., unsteadiness), or
- Impaired brain function (e.g. confusion) or

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4
Oriented	5

Best motor response (M)

No motor response	1
Extension to pain	2
Abnormal flexion to pain	3
Flexion/Withdrawal to pain	4
Localizes to pain	5
Obeys commands	6

Glasgow Coma score (E + V + M) of 15

GCS should be recorded for all athletes in case of subsequent deterioration.

Related Products

Concussion Assessment & Response™: Sport Version (CARE)

Jason Mihalik, PhD, CAT(C), ATC, and Gerard A. Gioia, PhD



Purpose: Provides tools for athletic trainers, team physicians, and other qualified health care professionals to assess the likelihood of a concussion and respond quickly and appropriately

Admin time: Less than 5 minutes

Qualification level: A

PAR will donate 15% of the proceeds from the sale of this app to support concussion research at the Children's National Medical Center and the Matthew A. Gfeller Sport-Related Traumatic Brain Injury Research Center at the University of North Carolina, Chapel Hill.

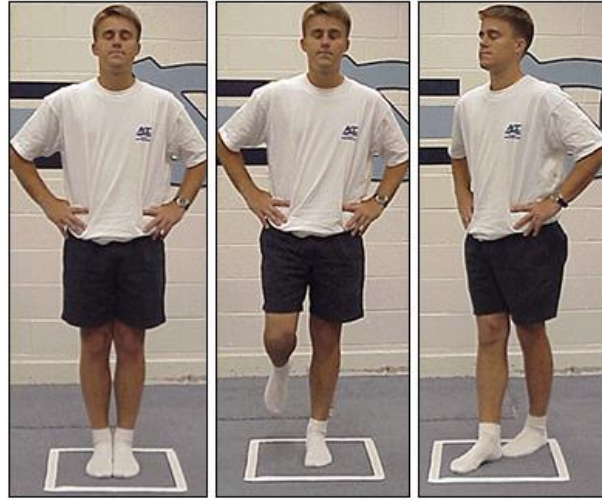
Balance error scoring system

Hard surface

Double leg
(feet together)

Single leg

Tandem stance

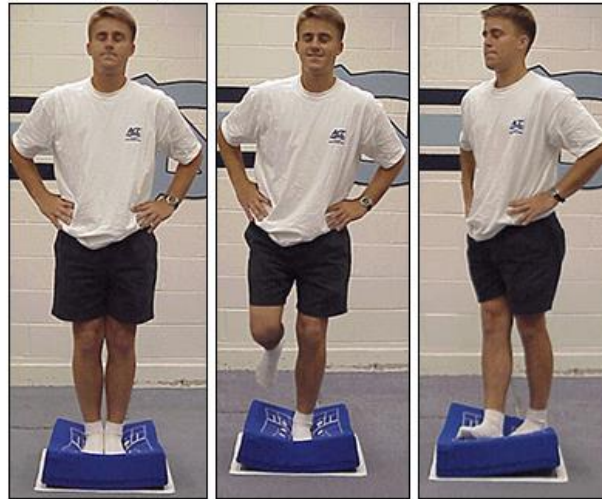


Soft surface

Double leg
(feet together)

Single leg

Tandem stance



Treatment of Children with Concussion: Remove from Play

- ▶ Removed from all further competition/play that day.
 - ▶ If a concussion is diagnosed, the athlete should **not** return to play until a full recovery is evident.
- ▶ Need further evaluation by a licensed physician
- ▶ Remove from PE classes, sports practice, running, exercising, heavy lifting
- ▶ Avoid any recreational activities that may result in a second head injury
 - ▶ cycling, skateboarding, bicycle, scooters, ice skating, or climbing

California Concussion Law



Education Code Section 49475

“An athlete who is suspected of sustaining a concussion or head injury in an athletic activity shall be immediately removed from activity for the remainder of the day, and shall not be permitted to return to the activity until he or she is evaluated by a licensed health care provider, trained in the management of concussion, acting with the scope of his or her practice. The athlete shall not be permitted to return to activity until he or she receives written clearance to return to the activity from that licensed health care provider. “

Treatment of Children with Concussion: Physical Rest

- ▶ Plenty of rest and sleep
- ▶ As symptoms decrease, may gradually return to daily activities
 - ▶ NSAID okay to use in the beginning, but not to mask symptoms of concussion to return to play
- ▶ Full physical rest until the following criteria are fulfilled:
 - ▶ No symptoms of concussion or return to baseline on standardized assessment tools
 - ▶ Normal balance or return to baseline on standardized assessment



Treatment of Children with Concussion: Cognitive Rest

- Avoid all mental activity that makes them involves concentration or memory
 - absence from school
 - Avoid reading, video games, or screen time
 - Limiting Social visits
 - Lighter school activity
- Depending on symptoms, may engage in light mental activities
 - limited amounts of television and family interaction
- Close follow-up with a pediatrician, PCP, or sports medicine specialist
 - guide the liberalization of mental activity.



Return to Learn

- Return to school:
 - If can tolerate 30 to 45 minutes of concentration.
 - Typically require 1-2 days
- May return to school with mild symptoms, but with restrictions or extra help.
- School nurse/Teachers to monitor for:
 - Problems with concentration or paying attention
 - Problem memorizing
 - Longer time needed to complete assignment.

PHYSICIAN ORDERS FOR SCHOOL

(Yellow Sections for Physician Use)

NAME: _____ BIRTH DATE: _____

Returning to School

Until you (or your child) have fully recovered, the **following supports are recommended: (M.D. check all that apply)**

- No return to school. Return on (date) _____
- Return to school with following supports. Review on (date) _____
 - Shortened day. Recommend ____ hours per day until (date) _____
 - Shortened classes (i.e., rest breaks during classes). Maximum class length: _____ minutes.
 - Allow extra time to complete coursework/assignments and test.
 - Lessen homework load by ____%. Maximum length or nightly homework: _____ minutes.
 - No significant classroom or standardized testing at this time.
 - Check for the return of symptoms (use symptom table on front page of this form) when doing activities that require a lot of attention or concentration.
 - Take a rest breaks during the day as needed.
 - Request meeting of 504 or School Management Team to discuss this plan and needed supports.

The following are recommended at the present time: (M.D. check all that apply)

- Do not return to PE class at this time
- Return to PE class
- Do not return to sports practices/games at this time
- Gradual return to sports practices under the supervision of an appropriate health care provider (e.g., athletic trainer, coach, or physical education teacher).
 - Return to play should occur in gradual steps beginning with aerobic exercise only to increase your heart rate (e.g., stationary cycle); moving to increasing your heart rate with movement (e.g., running); then adding controlled contact if appropriate; and finally return to sports competition.
 - Pay careful attention to your symptoms and your thinking and concentration skills at each stage of activity. Move to the next level of activity only if you do not experience any symptoms at each level. If your symptoms return, let your health care provider know, return to the first level, and restart the program gradually.

Treatment of Children with Concussion: Return to Play

- ▶ Complete cognitive and physical rest before clearance
- ▶ UpToDate requirements for children and adolescents to begin the RTP protocol:
 - ▶ Successful return to school
 - ▶ Symptom-free and off any medications prescribed to treat the concussion
 - ▶ Normal neurologic examination
 - ▶ Back at baseline balance and cognitive performance measures.

Graduated return to play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70 percent MPR; no resistance training	Increase HR
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer; no head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg, passing drills in football and ice hockey; may start progressive resistance training	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

Return to Sports

- Requires written physician clearance for return to sports and play activity!
- Minimum of 6 days of gradual return to play before can return to competitive sports.
- Educate on dangers of second concussion before full recovery

PHYSICIAN ORDERS FOR SCHOOL
(Yellow Sections for Physician Use)

NAME: _____ BIRTH DATE: _____

Returning to School

Until you (or your child) have fully recovered, the following supports are recommended: (M.D. check all that apply)

No return to school. Return on (date) _____

Return to school with following supports. Review on (date) _____

Shortened day. Recommend _____ hours per day until (date) _____

Shortened classes (i.e., rest breaks during classes). Maximum class length: _____ minutes.

Allow extra time to complete coursework/assignments and test.

Lessen homework load by _____%. Maximum length or nightly homework: _____ minutes.

No significant classroom or standardized testing at this time.

Check for the return of symptoms (use symptom table on front page of this form) when doing activities that require a lot of attention or concentration.

Take a rest breaks during the day as needed.

Request meeting of 504 or School Management Team to discuss this plan and needed supports.

The following are recommended at the present time: (M.D. check all that apply)

Do not return to PE class at this time

Return to PE class

Do not return to sports practices/games at this time

Gradual return to sports practices under the supervision of an appropriate health care provider (e.g., athletic trainer, coach, or physical education teacher).

- Return to play should occur in gradual steps beginning with aerobic exercise only to increase your heart rate (e.g., stationary cycle); moving to increasing your heart rate with movement (e.g., running); then adding controlled contact if appropriate; and finally return to sports competition.
- Pay careful attention to your symptoms and your thinking and concentration skills at each stage of activity. Move to the next level of activity only if you do not experience any symptoms at each level. If your symptoms return, let your health care provider know, return to the first level, and restart the program gradually.

Additional Instructions: _____

This referral plan is based on today's evaluation:

Return to this office. Date/Time: _____

Refer to: Neurosurgery _____ Neurology _____ Sports Medicine _____ Physiatrist _____ Psychiatrist _____ Other _____

Refer for neuropsychological testing

Other _____

MEDICAL PROVIDER INFORMATION	PARENT PERMISSION
Medical Provider (Print Name): _____	Parent Signature: _____ Date: _____
Medical Provider Signature: _____	<input type="checkbox"/> I have reviewed this plan and give my permission for school to contact physician for consultation and exchange of information.
Address: _____	<input type="checkbox"/> I decline medical care
Or Stamp)	
Phone: _____	

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What We Can do About Concussions

- ▶ Have index of suspicion when children presents with symptoms
- ▶ Referral to physician for appropriate follow up
 - ▶ Appropriate education for the student athlete and parents.
- ▶ Following up with students regarding appropriate rest
 - ▶ Removal from physical activity, cognitive rest, return to learn/play

Advocating

- ▶ Educating on the importance of reporting head injuries of any type.
- ▶ Factors associated with an increased likelihood of reporting a concussion:
 - ▶ approval of such reporting by peers, coaches, and parents
 - ▶ a positive view of reporting by the individual
 - ▶ ease of reporting
- ▶ Head's Up program
 - ▶ Online resource developed by experts and the CDC to provide educator
- ▶ Adherence to the rules and encouragement of fair
 - ▶ Concussions tend to occur during illegal play or when athletes use improper technique



HEADS UP

HEADS UP



- Brain Injury Basics +
- Helmet Safety
- HEADS UP to Parents
- HEADS UP to Youth Sports +
- HEADS UP to High School Sports +
- HEADS UP to Schools +
- HEADS UP to Health Care Providers +
- Sports Concussion Policies and Laws
- HEADS UP Resource Center +
- Get Involved
- HEADS UP Partners +
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What's this?

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Keeping children and teens healthy and safe is always a top priority.

Whether you are a [parent](#), [youth sports coach](#), [high school coach](#), [school professional](#), or [health care provider](#), this site will help you recognize, respond to, and minimize the risk of concussion or other serious brain injury.

A Fact Sheet for HIGH SCHOOL SPORTS OFFICIALS



Officials, learn how you can help keep athletes safe



HEADS UP to Parents



HEADS UP to Youth Sports



HEADS UP to High School Sports



HEADS UP to Schools



HEADS UP to Providers



HEADS UP on Facebook



Goals

For Schools

- Establish standardized way to assess concussion not only in athletic sports but also in Physical Education class, Club sports, and recess.
- Find ways to promote students to report symptoms of concussion

For the Community

- Education program to teach students, parents, coaches, and teachers about the importance of full cognitive rest and recovery prior to return to play and return to learn
- Educate more about signs and symptoms of concussion



Sources

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- Bloom et al, Sideline evaluation of concussion, Uptodate, May 5th 2015