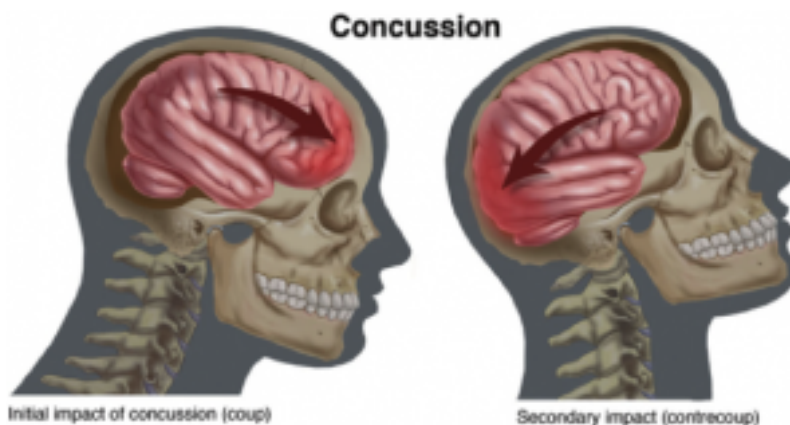


HLC HEALTH NEWS

Concussions, also known as traumatic brain injuries (TBI), have been a common topic in the news and medicine recently. The Centers for Disease Control and Prevention (CDC) recently rolled out [new guidelines for the identification and management post-concussion](#). The CDC states that a TBI can range from mild (brief change in mental status or consciousness) to severe (an extended period of unconsciousness or memory loss after the injury). Mild forms of TBI are commonly called concussions¹. Following a mild traumatic brain injury (mTBI), symptoms can range from loss of consciousness to “not feeling right” or just generalized irritability. There are an increasing number of **sports-related concussions** and the greatest demographic affected by such head injuries are high schoolers. Some of the reasons for this are behavioral, environmental and physiological. It is important to recognize any symptom following a hit to the head.

Head injuries will cause a *double impact* scenario: 1) head contacts object 2) object propels head in the reverse direction causing a second impact on the opposite side of the brain. However the idea of getting your “bell rung” belies the true issue and long term implications of a mild TBI.



It's not simply deciding how bad the goose egg will be or icing down the inflammation from the hit. The impact of the head and the shearing of tissues between the head and brain sets off a cascade of metabolic, physiological and microstructural injuries to the brain.

Metabolic/Physiologic/Vascular

The blunt force, shearing and resultant inflammation following a head trauma cause a waterfall of chemical and vascular changes. The changes then affect how the connections of your brain interact with each other - connections that are made without conscious thought are vital to survival. Traumatic brain injury affects the control center of our bodily functions not under conscious control, such as breathing, heartbeat and digestive processes. This system is called the autonomic nervous system (ANS). Concussions also can affect the control of both the cerebral brain flow (CBF) and cardiac rhythm.² The typical window of healing or return to baseline metabolic activity is roughly 14 days in adult males, but can take longer for females or younger populations. There are other factors that can lead to protracted recovery, such as behavioral disorders like ADHD, that will inhibit the recovery process.

Physical/Structural

The trauma sustained to structures from the head injury also can cause lingering symptoms. Cervical joints can be sprained or compressed, muscle and connective tissue can be torn or stretched which can lead to local pain and tenderness as well as additional neurologic irritability at the site of the joint, muscle or fascia that was disrupted. Cervical spine screening is also an important factor to determine cause of continued symptoms from a concussion.

Diagnosis

Recent evidence has not supported routine imaging (x-rays, MRI) or blood tests to identify the presence or severity of a concussion.³ Therefore the ability to seek out clinical assessment from a trained provider is the most effective and efficient way to begin the process of recovery from any lingering symptoms following a head injury.

In the presence of symptoms, initial recommendations of rest for the first 2-3 days following a concussion are designed to allow for the metabolic process to normalize. Any person that sustains a concussion should not return to physical activity while symptoms remain as those individuals often show decreased coordination and reactions time and are more vulnerable to another concussion. A second concussion during this window can prove deadly. If symptoms linger or do not abate in the first 2-3 days, follow up with a healthcare provider that specializes in concussion management. Healthcare providers can utilize clinical tests (tests

done on the sideline or an office setting) to determine the underlying cause of ongoing symptoms. Balance, gaze/visual stability, reflexes, heart rate and blood pressure are all simple and straight forward tests that will yield results that help determine a plan to recover from a concussion. Understanding this physiology can help explain the varying and diverse effects that concussions can have on individuals – dizziness, irritability, headaches, visual disturbances, appetite changes and exercise intolerance.



Concussion Rates per Sport

The CDC reports that falls are the leading cause of head injuries reported to the ER for all but one age group: 15-24 year olds. Being struck by or against an object was the leading cause of TBI-related ER visits for this age group. In a study conducted by Meehan, et al in 2011 found that approximately 9% of all high school sports injuries are concussions – that’s almost 1 out of 10 injuries! ⁴

Concussion incidence rates are calculated using a number of variables, to include the overall number of concussions in a particular sport during a specific time period, how many “athletic exposures” an athlete has (activities on the field or court) during that time period and if the exposure is a practice/training or competition. Using data, one can speculate occurrence rates. Recent [research](#) by Kerr, et al, reports the top 5 high school sports for rates of concussion. See the Table below for breakdown between boys and girls sports.

	High School Boys		High School Girls
Football	10.4*	Soccer	8.2*
Ice Hockey	7.7	Basketball	4.6
Lacrosse	4.9	Lacrosse	4.2
Wrestling	4.8	Volleyball	3.1
Soccer	3.6	Field Hockey	2.7

* Rates per 10,000 Athletic Exposures

When examining sports in which both boys and girls have equal athletic exposures (comparing which gender is more likely to sustain a concussion during the same sport), the overall concussion rate was higher in girls than in boys.

Currently there is no substantial evidence to support training that will decrease the risk of concussion for athletes. Reviewing research for prevention measures such as neck strengthening is inconclusive; reaction time training demonstrates no beneficial prevention according to a [2018 article by Honda, Chang and Kim](#). Vision training has been proven to prevent concussions in a collegiate football setting, but there is no literature on different levels or sports. Be skeptical and do your diligence on companies/programs that market concussion prevention.

Treatment

Understanding the data and science behind mild traumatic brain injuries makes for effective identification and treatment. Research supports that an individualized plan in the presence of protracted recovery is best: a cookie-cutter approach will not facilitate recovery without identifying the underlying cause. Testing of autonomic variables (heart rate, blood pressure), cervical structures (manual and clinical mobility testing) and vestibular function (balance and gaze stabilization) are all essential to develop an effective treatment plan. You should expect this at your healthcare provider's office or clinic if you or your loved one is dealing with the effects from a concussion.

Depending on the findings from a clinical exam, the treatment expectations should match the most notable dysfunctions. For example, if headache is one of the primary symptoms, treatment may zero in on the autonomic nervous system. If physical exertion brings on the symptom, exercise under the guidance of a heart

rate monitor will be prescribed with specific, objective parameters of intensity and duration. A dysfunction in the vestibular system can also cause headaches. Balance training in static (stationary) or dynamic (on-the-move) conditions, gaze/eye tracking activities and placing individuals in environments that cause additional challenges via distractions (loud noises, moving backgrounds, unstable surfaces) will be part of the plan. Yet another option for the treatment of headaches could target the cervical spine for neck stability and proprioception exercises, manual therapy for soft tissue or joint manipulation and/or dry needling for improving blood flow and neuromuscular irritability.

Return to Play

Parameters have been set forth by the CDC under the guidance from a committee of specialists that review data and literature. These guidelines are for individuals that have experienced any symptoms following a concussion:

Step 1: Back to regular activities (such as school)

Athlete is back to their regular activities (such as school) and has the green-light from their healthcare provider to begin the return to play process. An athlete's return to regular activities involves a stepwise process. It starts with a few days of rest (2-3 days) and is followed by light activity (such as short walks) and moderate activity (such as riding a stationary bike) that do not worsen symptoms. You can learn more about the steps to return to regular activities at: https://www.cdc.gov/headsup/basics/concussion_recovery.html.

Step 2: Light aerobic activity

Begin with light aerobic exercise only to increase an athlete's heart rate. This means about 5 to 10 minutes on an exercise bike, walking, or light jogging. No weight lifting at this point.

Step 3: Moderate activity

Continue with activities to increase an athlete's heart rate with body or head movement. This includes moderate jogging, brief running, moderate-intensity stationary biking, moderate-intensity weightlifting (less time and/or less weight from their typical routine).

Step 4: Heavy, non-contact activity

Add heavy non-contact physical activity, such as sprinting/running, high-intensity stationary biking, regular weightlifting routine, non-contact sport-specific drills (in 3 planes of movement).

Step 5: Practice & full contact

Young athlete may return to practice and full contact (if appropriate for the sport) in controlled practice.

Step 6: Competition

Young athlete may return to competition.

These steps should be followed under the direction of a medical advisor. Any return of symptoms or new onset of symptoms is a sign of pushing too hard. Activities should be stopped and return to healthcare provider is warranted.

The take away message is that the traditional model of rest following a mild traumatic brain injury is no longer the accepted model of treatment. Instead, an active rehabilitation may improve symptom recovery more than rest alone. Active treatment strategies may be initiated the day of injury and any athlete or their family should have education regarding expectations and management strategies following a concussion. Exposing individuals with persistent post-concussion symptoms is safe and effective when guided by an experienced healthcare provider (physician, athletic trainer or physical therapist).

To learn more about [Concussion Management](#), contact the [Physical Therapists at Evolution Sports](#)! Early treatment is key to a successful outcome!

¹ Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control. Report to Congress on mild traumatic brain injury in the US: steps to prevent a serious public health problem. Atlanta (GA): Centers for Disease Control and Prevention; 2003.

² Leddy J, Baker JG, Haider MN, Hinds A. A Physiological Approach to Prolonged Recovery from Sports-Related Concussion. J Athl Train 2017 Mar; 52(3). 299-308.

³ Lumba-Brown A, Yeates KO, Sarmiento K. Diagnosis and Management of Mild Traumatic Brain Injury in Children. JAMA Pediatr. Published online Sep 4 2018. doi 10.1001

⁴ Meehan WP. Assessment and Management of Sports-Related Concussion. AM J Sports Med. 2011 Nov; 39(11): 2304-10.