

CONCUSSIONS IN SPORTS

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(1) These days sports concussions are getting more attention as there are up to 4 million cases of concussions reported due to recreational, amateur and professional sports in North America each year. A concussion isn't just a simple bump to the head. It can be a very serious injury, especially when experienced repeatedly as in the case of professional sports like football and boxing.

(2) A concussion is an injury to the brain which can result in bruising of the brain tissue, damage to the brain's blood vessels and injury to its nerves. The term concussion comes from the Latin term *concussus*, meaning the "action of striking together". Concussions occur when a player takes a blow to the head by contacting another player, by being hit by equipment or when hitting the ground. A concussion can also occur due to a blow to the body that causes the head to rapidly snap forward. When a concussion happens, it means that the force to the head was great enough to bypass the two main protective features of the brain.

(3) The brain is a 3 lb organ made up of soft and vulnerable tissues. The brain has two forms of protection against physical damage. One is the cranium, which is the curved top part of the skull (not including the jaw bone), which encases the brain. The other protection involves the thin layer of fluid, called cerebral spinal fluid (CSF), that surrounds the brain and is found between the surface of the brain and the cranium. Essentially, the brain is gently "floating" in a liquid within your skull. When you turn, nod or shake your head, your brain would hit the inside of your cranium if you didn't have CSF to absorb the impact. The combination of your cranium and your CSF protects your brain from minor injuries. During a concussion, the blow to the head causes the brain to contact the inside of the cranium forcefully which bruises the brain tissue. The thin layer of CSF is not sufficient enough to cushion such a strong impact.

(4) Concussions can be caused by coup or contrecoup injuries. Coup injuries often occur when a moving object hits the head, like when a fastball hits a batter on the head during a baseball game. In this situation the brain is injured at the site of impact because the skull



accelerates very rapidly and slams into the brain. The thin layer of CSF can't provide enough shock absorption in this case. Contrecoup injuries occur at the side opposite the point of impact. These typically occur when a moving head slams into a stationary object, like the ground. In this scenario, the brain slams into the inside of the skull when the skull decelerates upon impact. A combination of both a coup and contrecoup injury can also occur simultaneously if the brain is first injured at the site of impact, causing a coup injury, and then whiplashes to the opposite side of the skull, causing a contrecoup injury. A concussion with a contrecoup injury component is often more dangerous because they are difficult to diagnose since it isn't obvious that the head has been hurt opposite to the site of impact.

(5) The immediate and short-term symptoms of a concussion can include any combination of the following: headache, nausea, vomiting, confusion, slurred speech and trouble walking. About a quarter of people with concussions also report delayed and chronic symptoms that can include fatigue, memory problems, sleep disturbance and mood changes. Short-term symptoms are typically noticed right away, but some people can suffer a concussion and not exhibit symptoms until later. This can be dangerous because players can sustain a concussion in a game but show few immediate signs of injury so they want to continue playing. In the past, many coaches pushed their players to continue even after a concussion had been suspected, but these days, growing awareness has made this practice more questionable. Once a player has suffered a concussion, they are 3 times more likely to suffer another one.

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This can be extremely dangerous if the brain has not yet healed from the first concussion.

(6) The long-term consequences of multiple concussions are most widely seen in boxing and football. A progressive degenerative brain disorder (meaning it will get worse with time) called chronic traumatic encephalopathy (CTE) can result from a career filled with blows to the head. It can lead to unpredictable behavior, drug and alcohol abuse, depression and in some cases, suicide or an early death. The only way to know with certainty if someone suffers from CTE is to open up their brain, so CTE is difficult to diagnose while a person is alive. On

December 1st of 2012, 25 year old Jovan Belcher, an NFL linebacker with the Kansas City Chiefs, shot his girlfriend and then himself. A year after the funeral, Belcher's family requested that his body be exhumed and his brain be examined. The examination revealed that Belcher suffered from CTE which may have contributed to his deadly behavior. Multiple head traumas in athletes is also suspected in the later development of Alzheimer's, ALS (amyotrophic lateral sclerosis) and Parkinson's disease. Mohammed Ali's boxing career was a great one, but may have contributed to the development of his Parkinson's.

Article Questions

1) What are the two main things that protect the brain from physical damage?

2) When a boxer is hit in the head by a moving fist, what type of concussion injury does this cause? Explain how the brain is injured in this situation.

3) When an athlete has a hard hit to the head in a game, but shows no signs of a concussion, why might this be a dangerous situation?

4) What are some of the long-term symptoms of a concussion?

5) What is CTE and how do athletes get this type of injury?

6) Why do you think Jovan Belcher's family want his brain examined after his death?

7) If a football player has a career that results in CTE, who do you think is responsible and why?