

Soccer concussion quiz

Soccerheadinjuries.org believes all people associated with soccer should be well-informed about all aspects of soccer, and should have the right to reach their own conclusions about many of the matters affecting the players and the sport. To help with one small part of soccer education, soccerheadinjuries.org has, with the assistance of members of the American Academy of Neurology (AAN), developed this brief quiz to allow you to test your knowledge and understanding of concussions that may occur in soccer. After taking this quiz, we hope you will be more confident in making decisions about possible head injuries that may happen in soccer.

See how much you know about concussions in soccer by taking this quiz, brought to you as a public service. In all cases, check all answers that you believe are correct; some questions have more than one correct answer. The correct answer(s) will appear after you enter your selection.

- 1. Concussions occur in soccer:**
 - A. Never
 - B. Seldom
 - C. Often
 - D. Only in professional soccer

- 2. Most concussions in soccer are caused by:**
 - A. Heading the ball
 - B. Head-to-other object impacts
 - C. Both
 - D. Neither

- 3. Common observable symptoms of a concussion are (Check all that apply):**
 - A. Bruising on the forehead
 - B. Loss of consciousness
 - C. Headache
 - D. Amnesia

- 4. A concussed player should not return to action until:**
 - A. He feels okay
 - B. All his cognitive functions have returned to normal
 - C. His headache goes away
 - D. A week after the concussion occurs

- 5. When players strike head to head, the combined impact speed is usually no more than (Normal walking speed is about 3 miles/hr, or about 1.34 meters/sec):**
 - A. 2 m/h
 - B. 7 m/h
 - C. 14 m/h
 - D. 20 m/h

6. A player needs to be careful about head injuries after he has received (Check all that apply):

- A. No concussions
- B. One concussion
- C. Two concussions
- D. Three or more concussions

7. Who is more likely to be concussed?

- A. Males
- B. Females
- C. Younger players
- D. Older players

8. Who typically recovers faster from a concussion?

- A. Younger players
- B. Older players
- C. Males
- D. Females

9. The risk of receiving a concussion can be reduced by:

- A. More stringent officiating
- B. Better training and fitness methods
- C. Wearing head protection
- D. All of the above

10. Concussive forces can be reduced by:

- A. Banning heading
- B. Wearing headguards
- C. Wearing mouthguards
- D. All of the above

This information about the risks of concussions in soccer has been published by soccerheadinjuries.org with assistance of members of the American Academy of Neurology (AAN) as a public service. We encourage you to share the information with anyone involved in soccer or in the study of head injuries. Copies of this document can be made as desired.

Answers

1. Concussions occur in soccer:

Answer: C. Often

Concussions occur much more frequently in soccer than most people recognize. In a study of the soccer teams at McGill University, Dr. J. Scott Delaney found that 62.7% of the players had concussion symptoms in a single year. Similar studies at other schools have obtained results of 40% or more of the players being concussed annually, so concussions occur with alarming frequency. In fact, the rate of concussions in soccer is similar to the rate in American football, which is considered to be a much more dangerous sport.

One reason why people are unaware of the frequency of concussions in soccer is that concussion symptoms can be subtle. They can easily be overlooked by observers, or hidden and denied by athletes who don't want to be removed from action. Loss of consciousness is not required; in fact it rarely occurs with concussions. Some of the more common symptoms are headache, nausea, amnesia, dizziness, and confusion, all of which may go unnoticed in the excitement of a soccer match. To make matters worse, sometimes there are no symptoms at all at the time of the injury; they may not occur until hours or even days later. All of these factors combine to make diagnosis of a concussion very difficult. The National Institutes of Health (NIH) conducted an extensive study of rehabilitation after brain injury, and concluded that 90% of the concussions that occur in sports are not noticed, reported, or diagnosed.

Concussions occur frighteningly often in soccer. We must all become more aware of concussion indications, and watch for them carefully. If there is even a suspicion that a player has received a concussion, he should be removed from play immediately, and evaluated thoroughly by a physician before being returned to action.

2. Most concussions in soccer are caused by:

Answer: B. Head-to-other object impacts

A pumped-up soccer ball may feel hard in your hands, but it is much softer than your head. When a ball strikes your head, it is dramatically deformed, attempting to wrap itself around your head. Because the ball is also very lightweight, it doesn't carry much energy – it can be stopped quite easily. As a result, when a soccer ball hits a player's head, not much energy is transferred to the head, and the energy that is transferred is spread over a relatively large area. The transferred energy is usually much less than that required to cause a concussion, so actively and purposely heading the ball is very unlikely to cause a concussion. Just about the only time a ball impact to the head may result in a concussion is when the player is unaware that he is about to be struck, so he is not prepared for the blow.

Nearly all of the concussions in soccer occur when a player's head collides with some hard (and usually relatively massive) object, such as another player's head, the ground, or even a goal post. In these cases the object being struck is both harder and heavier than a soccer ball, so much more energy is transferred to the head – often enough energy to cause the brain to move inside the skull sufficiently to cause injury. The harder the impact, the more likely there will be a concussion.

It is important to note that repeated sub-concussive blows to the head, such as those incurred in heading the ball, may lead to cognitive problems later in life. Some studies have indicated that a history of many such impacts is linked to depression and Alzheimer's Disease, both of which may occur more frequently and earlier in life than when there is no history of head impacts. The magnitude of this link, if it in fact exists, has not been determined, and no one knows whether the problems may be related to the number of impacts, or the severity of the impacts, or the period of time over which the impacts take place. On-going studies should help to clarify this issue, but complete answers are not likely for many years.

3. Common observable symptoms of a concussion are

Answer: C and D. Headache and amnesia

The vast majority of concussions do not include loss of consciousness. In fact, recent studies conclude that loss of consciousness may not even be related to the severity of a concussion. It appears likely that the severity of relatively minor concussions is more closely related to amnesia than to loss of consciousness. Of course extremely severe concussions almost always include LOC – sometimes of quite long duration – but in less severe injuries, LOC does not seem to be correlated with severity.

The currently accepted definition of concussion is “a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces.” In more easily understood terms, a concussion is an alteration of mental status. Note that a direct impact is not required; a concussion may be caused by a whiplash event, and is closely related to what happens to the brain in “shaken baby syndrome.” If the brain is shaken enough to cause it to be bruised or distorted, it is possible that a concussion will occur.

There are about a dozen symptoms that are recognized as being indicative of a concussion. These include:

- Headache
- Amnesia
- Dizziness
- Nausea
- Sensitivity to light
- Sensitivity to sound
- Blurred vision
- Nervousness
- Sadness
- Changes in sleep pattern – sleeping either more or less than normal
- Irritability

Not all of the symptoms need to be present for a concussion to have occurred. Very often only one or a few of them can be detected. Therefore, if you have any of these

symptoms, or if you know someone who has any of them, a concussion should be suspected. If there is a possibility of concussion, the victim should be taken immediately for a thorough evaluation by competent medical personnel, and should rest both physically and mentally until allowed to resume activities by a physician.

4. A concussed player may return to action:

Answer: B. All his cognitive functions have returned to normal

Recovery from physical symptoms of concussion may not coincide with recovery from neuropsychological symptoms. In essentially all cases, a concussed player recovers from physical concussion symptoms before his brain recovers, so observing physical symptoms is not enough to decide whether he should return to action. The best way to determine whether the brain has recovered from the concussion is via formal neuropsychological (NP) testing, in which baseline (pre-injury) test scores are compared to post-concussion scores to see if any deficits remain. Resumption of activity before the brain has totally recovered can lead to immediate brain swelling – referred to as Second Impact Syndrome - and potentially catastrophic results, so it is imperative to take every precaution to ensure that the player has returned to his baseline test scores before he resumes activity. Evaluation should be conducted by a physician trained in neurology, and play should not be resumed until the physician agrees.

“Resumption of activity” is not a term to be taken lightly. The concussed player should rest both his body and his brain until NP testing indicates that recovery is complete. He should not play or practice soccer or any other strenuous physical activity, and also should not undertake mentally taxing activities until his brain has recovered from the concussion.

5. When players strike head to head, the combined impact speed is usually no more than (Normal walking speed is about 3 mph):

Answer: B. 7 mph

It is sometimes assumed that a head to head collision in soccer, with both players actively attempting to win control of a ball in the air, results in a terrific combined impact speed. However, analysis of FIFA game films has shown that these collision speeds are usually no more than 3 meters/second, which is about 6.7 miles per hour, or a little more than two times a normal walking pace.

To put this in perspective, helmet-to-helmet collisions in American football, with players charging deliberately to hit each other as hard as possible, may reach 10 m/s (over 22 mph). The impact velocities used in testing bicycle and equestrian helmets reach 6.2 m/s (13.9 mph), and it is known that unprotected impacts at this velocity can be fatal. A head-to-head crash at 3 m/s (6.7 mph), while almost never fatal, can frequently cause a concussion. Therefore protection against impacts of 2.5 – 3 m/s (5.6 – 6.7 mph) should be beneficial in reducing injuries.

6. A player needs to be even more careful about head injuries after he has received:

Answer: A, B, C, and D. Any number of concussions.

It has been confirmed in several controlled studies that once a player has received one concussion, he is about four times as likely to receive a second concussion as a player who has never been concussed. A player with two prior concussions may be more than six times as likely to sustain another one. To make matters worse, each succeeding concussion is likely to be more serious than the first one, even if the succeeding impacts are no worse than the first one. Therefore a player who has a history of several past concussions is at very high risk of being concussed again, with more serious results. Every player should try to avoid all concussions – especially the first one – because his risk increases with each concussion he receives.

Also, if a concussive impact occurs before the brain has completely recovered from a prior concussion, there is a risk of Second Impact Syndrome (SIS), which is an immediate swelling of the brain with potentially catastrophic results. Because of this constantly increasing risk as more concussions occur, it is vitally important to prevent the first concussion, and to continue with extreme care as the number of concussions increases. Any product or practice that may reduce the risk of a concussion should be utilized if possible.

7. Who is more likely to be concussed?

Answer: B. Women

Although the reasons are not completely understood, several studies have shown that women are about 2.4 times as likely to be concussed as men. This increased risk may be related to strength and conditioning, particularly of the neck, or to the size/shape/thickness of the skull compared to a male skull, or even to undiscovered physical differences in the properties of female brains compared to male brains. More research will be required before we can understand the reasons for this increased concussion risk among women. The lesson here is that women should be particularly cautious about taking risks or playing aggressively in soccer.

8. Who typically recovers faster from a concussion?

Answer: B. Older players

A large study conducted by researchers at the University of Pittsburgh concluded that if a high school player and a college player receive similarly-severe concussions from similar impacts, the high school player generally requires more time to recover than the college player. In this study the difference was so significant that high school players receiving their first concussion often recovered more slowly than college players who had a history of previous concussions, and when the college player's concussion was deemed to be more serious than the high schooler's concussion.

This result was recently confirmed in a study that compared high school athletes to professional athletes, strengthening the likelihood that the observation is correct and is significant.

9. The risk of receiving a concussion can be reduced by:

Answer: D. All of the above

All of these options would be likely to result in some reduction in the number of concussions; however, a study of FIFA game films by trained referees indicated that in 70% of the instances of concussions, no foul was committed by any player involved in the action. In only 30% of the injurious occasions might more stringent officiating have changed the outcome of the play, and even then only if officiating had prevented the contact that caused the concussion. Therefore even perfect officiating that prevents all head-related fouls might reduce the number of concussions by only 30% - more than 2/3 of the concussions would continue to occur.

Likewise, changes in training protocols have proven to be inconclusive, sometimes even increasing the risk of head injuries. Although some reduction in concussions could probably be achieved by improving the coaching and training of players, these actions would result in limited improvement.

Soccer headguards, although evidence of their benefit has not been measured in clinical studies, seem in laboratory testing to provide a significant reduction in concussion probability in at least some impact situations. More studies are required before we can confidently predict the potential magnitude of injury reduction as a result of wearing headguards.

Some people have rather rashly suggested that heading should be banned entirely from soccer, thereby eliminating most of the heading-related collisions. However, the radical change to the game that this would entail would likely be unacceptable to nearly all of the soccer world, as it would result in a completely different game. And even if heading were banned, it would not prevent players from falling down, or being kicked, or running into hard objects, all of which are known to cause concussions in some cases.

ASTM International, a highly respected performance standards development organization, has approved a standard that defines a level of performance for soccer headguards that is believed by the experts at ASTM to provide a reasonable benchmark for what headguards should accomplish. Headguards labeled with this standard number, ASTM F2439-06, have been tested and shown to satisfy the requirements of the standard. The impact of this standard is unknown, but it will at least establish a baseline of performance by which the various products can be compared.

10. Concussive forces can be reduced by:

Answer: D. All of the above

Concussions are usually caused by linear and/or rotational acceleration of the head as a result of a head impact. Each head has its own particular threshold for concussion caused by acceleration, but in general if we can reduce the level of acceleration (related to the impact forces) reaching the head, we can probably reduce the severity of a concussion, and possibly prevent some concussions altogether. Any product or practice that reduces the accelerations (impact forces) reaching the head may be capable of reducing concussion risk or severity. Thus banning of heading, although it might not reduce the impact in any particular collision, would reduce the number of times players' heads are impacted, and would probably reduce the number of head injuries in soccer. Mouthguards have been shown to protect against dental and orofacial injuries, and there are claims that they prevent concussions. Unfortunately, the only situation in

which a mouthguard could reduce the likelihood of a concussion is a direct blow to the chin that, without a mouthguard, would transfer all the energy of the blow to the brain through the jaws. This is a rare situation in soccer, so it is unlikely that mouthguards can have much impact on the risk of concussion. By comparison, some commercially available headguards have been shown to reduce head acceleration, and a laboratory study funded by FIFA's F-MARC committee showed that they can reduce the risk of concussion by 50% in some common impact situations.

In contrast, consider that shin injuries, which are very common but almost never result in serious injuries, are supposedly reduced by the mandate that all players wear shin guards. While shin guards may reduce or prevent some abrasions or contusions, they do not provide sufficient protection to prevent many tibia fractures. In addition, almost all shin injuries heal of their own accord in a matter of days or months with no lingering problems. Concussions, on the contrary, carry no outward physical symptoms so they can easily be overlooked, or their severity can be underestimated, and recovery cannot be measured by simply looking at the head or asking the player how he feels. Concussions are "stealth" injuries, with the result that many go unrecognized and unheeded, with possibly devastating results, while shin injuries, that are generally obviously visible and are almost never life-threatening, must be protected by mandated uniform equipment. Ask yourself which you would rather have – a shin injury or a head injury. Then decide which is more important to protect – your shins or your head.

The risk of concussion cannot be eliminated by more strict officiating, or by banning heading, or by modifying game equipment. However, some laboratory studies indicate that headguards may be able to reduce concussion risk, so possibly headguards satisfying ASTM standard F2439-06 should be considered for use by soccer players.

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