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Effects of repeated mild head impacts in contact sports

Adding it up

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WHAT WAS THE PURPOSE OF THIS STUDY? Concussions are becoming better recognized because they are widely covered in the media. This is because researchers are collecting strong proof about how a concussion changes brain function. Experts now have information on long-lasting problems from repeated concussions. In addition, there can be short-term problems from only one concussion. However, often during contact sports athletes may get hit many times, but that injury does not meet current conditions for a concussion.[1] These individual impacts—or hits—during a game do not cause loss of consciousness or change in brain function. The added effects of these smaller impacts are uncertain. In the article "Cognitive effects of one season of head impacts in a cohort of collegiate contact sport athletes,"[2] the authors wanted to measure the effects of repeated impacts even though the individual "hits" did not cause problems with cognitive function that meet the conditions for a concussion. Cognitive function is the process of thinking, judgment, problem solving, and learning. The authors set out to test if repeated head impacts over a single season would hurt a person's cognitive performance. If they saw a change, they also wanted to see if there was a link to how many hits the athlete had.

HOW WAS THE STUDY CONDUCTED? The authors took 214 Division I college football and hockey players and put a device in their helmets. This device recorded the force and time of impacts during the season. They compared these players to 45 noncontact college athletes such as runners and rowers. Any athlete who had a concussion either in the past or during the season was excluded from the study. Information about both the maximum force per impact and the number of impacts an athlete had was recorded.

To study the cognitive effects of the impacts, the athletes were tested using computer tests to measure memory, concentration, problem solving, reaction time, and ability to learn. Each athlete was tested before the season and again after the season. Testing done after the season was done about 30 days after the last hit. The computerized testing used for this study is the current standard testing used for concussions.

WHAT WERE THE RESULTS? On average, athletes in contact sports had about 470 smaller impacts over one season. As a group there was no measurable difference on cognitive performance at the end of the season when compared to the start of the season. There was also no difference in preseason cognitive performance of contact athletes when compared to noncontact athletes. A smaller group of the contact athletes did test lower on memory and learning in just one part of the computerized testing. However, when averaged together with all the other results there was no overall difference.

WHY ARE THE RESULTS IMPORTANT? This study is important because it provides better information about whether short-term cognitive performance of contact athletes is changed by many impacts over the course of a season. We know there are long-term cognitive effects from repeated concussions. We also know there are temporary short-term cognitive effects from a single concussion. We still do not have proof if the smaller impacts an athlete has during a season will have harmful cognitive effects. Although there are some limitations to this study, it is fairly good news. It shows that the sum of impacts not meeting the conditions for concussion over a single season may not have cognitive consequences. Even though there was a change in learning and memory with the contact athletes, we do not know if these would still be seen after a period of rest such as an off season. If any study like this were to show cognitive decline, it would be important to tell athletes about all of these concerns so they could make a good decision about whether to play contact sports.

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About concussion

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WHAT IS CONCUSSION? Concussion is a type of mild brain injury. It is usually caused by hitting or jolting the head. The American Academy of Neurology defines concussion as "trauma-induced alteration in mental status that may or may not involve loss of consciousness." In other words, a person who has a concussion does not need to pass out as a result of the injury. In fact, many people who have had a concussion never lost consciousness.[3]

Almost any sport can cause a head injury and therefore a concussion. American football and ice hockey players have the most concussions. However, concussions also occur in European football (soccer), wrestling, basketball, baseball, and softball. Mostly, concussions occur during games. Less often, head injuries and concussions occur during sports practice.[3] In college sports, concussion is common. McCrea et al.[4] reported the percentage of head injuries as follows: ice hockey (12.2%), football (8%), and soccer (4.8%). In high school students, McCrea estimated that up to 8% have had a concussion.

The symptoms of concussion vary. Common complaints are vacant stare, confusion, dizziness, memory problems, poor balance, and vomiting. However, not every person who has a concussion will have all of these symptoms. For some people, the symptoms may be very mild.

In general, there are 3 main categories of symptoms of concussion.

1. Somatic refers to bodily complaints. Headaches, tiredness, low energy, dizziness, and balance problems are a few examples of this.
2. Emotional refers to symptoms that are primarily related to changes in mood. For instance, irritability, depression, anxiety, and personality changes can be the main symptoms of concussion.
3. Cognitive refers to the way that a person thinks. A concussion can affect thinking by changing how quickly a person responds (they seem slower). A person might have trouble concentrating or focusing. They may become easily distracted.

There are several ways that concussions are graded. The lowest is grade I. In grade I concussion, the person is confused for less than 15 minutes, but never loses consciousness. Grade II means confusion without loss of consciousness for more than 15 minutes. Grade III means that the athlete lost consciousness. Any loss of consciousness should be evaluated by a neurologic examination, and some type of imaging of the brain (MRI or CT).

In the past, doctors thought that children were less affected by head injuries than adults. However, more recent evidence suggests that the opposite may be true, and that children are more susceptible to the effects of head injuries than adults. In one study, high school football and soccer players were compared to college level athletes.[3] The high school athletes needed more time to recover from a concussion as compared to the older athletes.

Although these studies have focused on athletes, there is another at-risk group: soldiers. It is estimated that over 300,000 soldiers in Iraq have had some type of head injury.[5] The Department of Veterans Affairs is very interested in concussion. They are conducting their own studies, but it is clear that studies of head injury in athletes can be important to many other people (and vice versa).

POSTCONCUSSION SYNDROME Most athletes recover fully from a concussion in hours, days, or (at most) weeks. The time to full recovery depends on the person as well as how he or she was injured. In addition, research has suggested that having a second concussion before recovering from the first can lead to serious problems with thinking, attention, concentration, and other brain functions. The most severe form of this is a condition called chronic traumatic encephalopathy. After many head injuries and concussions, a boxer can start to have the kinds of problems that happen when people have Alzheimer disease.

TREATMENT OF CONCUSSION The treatment needs to begin before the injury occurs. More specifically, parents and the athletes themselves need to consider how they can prevent a head injury. In some sports, like ice hockey, protective equipment is mandatory. In other sports, this type of equipment may be recommended, but not required. In short, preven-

tion of the concussion is probably the most important aspect of treatment.

EVALUATING A PERSON WHO HAS HAD A CONCUSSION There a many ways to test a person who has had a concussion. Some of the tests can be performed on the sidelines. These tests are usually brief, and require no special equipment. For instance, the Graded Symptom Checklist (GSC) is a questionnaire that the person who had the concussion fills out. The checklist includes 17 symptoms that can occur after a head injury. The injured person rates or grades each of these, and a score is then assigned. The higher the score, the more severe the injury. The test takes 2 or 3 minutes to complete.[4]

Another test is the Standardized Assessment of Concussion (SAC). The examiner does a brief screen for neurologic and cognitive function which takes about 5 minutes. In addition, the SAC takes into account whether there was loss of consciousness, or if amnesia occurred as a result of the head injury. As with GSC, a score is assigned, with a higher score indicating a more severe head injury.[4]

The Immediate Postconcussion Assessment and Cognitive Test (ImPACT) is a computer test that the injured person takes. Unlike GSC or SAC, which do not require special equipment, ImPACT requires a computer. The computer administers a series of tests which are then scored.[6] Because the test is computer-driven, it is given in exactly the same way each time. In short, there is less room for errors that can occur if a person does the assessing.

The military has long been interested in head injuries. They have developed their own test: the Military Acute Concussion Evaluation (MACE). MACE uses a history of the person's thinking, and combines it with memory testing and a neurologic screen. It usually takes 15–20 minutes to complete.[7] Depending on the score, MACE then recommends more detailed testing for brain injury.

Finally, there is detailed neuropsychological testing. This usually takes about 30 minutes (or more), and is administered by a specially trained person. Neuropsychological testing is made up of many separate tests. These assess several brain functions, including both word-related and visual tasks.[4] They are complicated tests, and usually are not performed on the sidelines. Instead, they are usually done in the first few days following the head injury.

The above tests have been studied carefully. The tests are reliable. They can be used to assess the severity of a head injury. Some are quick, while others require more time to complete, special equipment, and specially trained personnel.

FOR MORE INFORMATION

AAN Patients and Caregivers site
http://patients.aan.com/go/home

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