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Tech to Protect Football Players' Heads

Technology Emerging to Detect and Prevent Concussions in Football

By AMANDA ONION

Oct. 13, 2004 - During a Saturday night football game under the lights this September, DeShawn Smith snagged a pass and turned to run when he was smacked by a defensive player — helmet to helmet. He struggled to his feet and walked to the sideline, where he sat down and collapsed.

Three days later, Smith, a high school sophomore running back at Tyhee High in Sea Tac, Wash., was dead. The cause was a ruptured blood vessel between his brain and its outer lining.

Two weeks after Smith's fatal collision, high school player Jacob Snakenberg died after taking multiple hits on the field in Centennial, Colo.

Although most don't end as tragically as Smith and Snakenberg's cases, head injuries are fairly common in the game of football. And studies show the youngest players are most at risk.

Research by the Brain Injury Association has found that high school football players have a 20 percent risk of a brain injury during their four-year careers. Even seasoned players can be seriously affected, as when quarterback Troy Aikman of the Dallas Cowboys and Steve Young of the San Francisco 49ers were forced to retire early as a result of on-field blows to the head.

Impact Alert

Researchers are working on several ways to reduce players' risk of head injuries, from designing better helmets to using sensors and computer tests to assess the severity of a hit and determine when to remove a player from the field.

"The brain is more vulnerable after a concussion until it is completely healed," said Mark Lovell, a specialist in sports-related concussions at the University of Pittsburgh Medical School. "That's why it's so important to know when a serious impact has occurred and then get them off the field."

At Simbex, a Lebanon, N.H.-based company, researchers have developed a wired helmet system called HITS — Head Impact Telemetry System — that reads the intensity of impacts in terms of "G," or gravity forces, and alerts trainers when a player has taken a strong hit to the head.

"We put six sensors in the helmet that have little springs so it measures the movement of the head, not the helmet, during impact," explained Rick Greenwald, president of the company.

The data is stored in the helmet after a hit and then beamed by radio waves to a computer on the sidelines. If the computer senses that the impact is over a certain level, it will send a beeper signal to the trainer. Then the trainer can decide whether or not to pull a player from the game to examine him.

"Most football players won't tell their trainers that they got hit," said Greenwald. "They don't want to come out of the game. But this lets the trainer know directly."

Part of the danger of head impacts is the effects are often cumulative. By recording the impact level of each hit, directly, trainers can automatically compile a record of each player's impacts and assess when each player is most at risk.

Right now the technology is still experimental. Fifty players at Virginia Tech University, the University of North Carolina and the University of Oklahoma have been wearing the sensor-equipped helmets this season. Data from last season revealed fairly shocking statistics. The 38 football players wearing the helmets were struck in the head 30 to 50 times per game and regularly faced blows similar to those experienced in a car crash.

The NFL reportedly is considering using the wired helmets and Greenwald hopes that by accumulating data on which hits cause concussions, the technology may eventually help in developing helmets that are better designed to protect players.

Other work by Elliott Pellman of the NFL's Committee on Mild Brain Injury reviewed injuries to 182 NFL players over a period of five years and recreated them in the lab using crash test dummies. Partly as a result of the work and other research, the helmet company Riddell developed a new helmet that more fully covers the jaw and contains more padding in key places.

Lovell says the latest concussion-sensing technology "has a lot of potential," but, he says more emphasis should also be focused on basic clinical evaluation.

"When deciding whether to pull an athlete off the field, you're still asking the fundamental questions — how do you feel? Do you have a headache? And simple memory tests," he said. "It's very simple stuff, but very important."

Lovell, who is in the process of analyzing how collisions affect the brains of young players, is the lead creator of a computer testing program designed to detect brain injuries early on.

The 20-minute program, called ImPACT, measures verbal and visual memory, reaction time and processing time. Trainers have athletes take the test before the season begins to learn their baseline and then look for differences in their score following an injury or incident on the field.

This way trainers can pick up on any small change in the mental performances of their athletes and hopefully detect any concussion. Meanwhile, Lovell is trying to understand the exact effects of a football-related concussion on the brain.

Using functional MRIs, which read the electrical activity and blood flow inside a conscious person's brain, Lovell has noticed immediate changes hours or days after a football player experiences an impact. So far, his studies on college and high school athletes show more parts of the brain are recruited to solve particular tasks after an injury than before.

He says such changes are ones that no helmet can ever completely protect against.

"Football players are very, very competitive and some people just love the physical contact," he said. "As long as people are colliding at high velocities, we're going to have concussions."