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West Meck tackling head injuries with high tech

By Andrew Batten

New helmets measure collision force, warns coaches and trainers when a player is in danger. Pilot program is first in the Southeast.

This season, whenever a West Meck football player takes a nasty hit in a game, gasps from the crowd won't be the only reaction to the collision.

Thanks to some new, and unique, high-tech equipment, Hawks coaches will know the instant a player sustains an impact that may have caused a head injury.

The equipment, known as HITS (for Head Impact Telemetry System), turns a regular helmet into one that will offer players more protection than just hard polymers and heavy-duty padding. The helmets will provide coaches and athletic training personnel instant feedback on impact to the head of a player wearing HITS-equipped headgear. The HITS data, which is instantly downloaded to a laptop computer on the sideline, will warn coaches that a player may be injured before he ever shows any signs.

Dr. David Price, associate director of the Primary Care Sports Medicine Fellowship at Carolinas Medical Center, which is managing the HITS demonstration project at West Meck, says that while the system can't tell coaches if a player has sustained a concussion, it will provide athletic trainers another tool when looking for the symptoms of a head injury.

"If a player takes a hit and the beeper goes off it just makes us more aware," Price says. "It's not going to tell us if they have a concussion. It's just a way of monitoring and saying that was a big hit we need to monitor that player a little more closely."

Combining information gleaned from the system with physical symptoms of a concussion - - such as headache, mental foggy and nausea -- will let coaches know if a player needs to be removed from the game and examined further. But even if those physical symptoms

aren't present, Price says, just knowing that a player took a hard hit will be useful because more than 50 percent of concussions are never reported by the player.

So far this year, HITS' potential for injury detection or prevention is just a theory at West, and that's just fine with head coach Mark Harman. During the first four weeks of the Hawks' season, the system didn't register any hits that were hard enough to trigger the warning system.

"It's just an extra reminder in case there is a big hit on the field," Harman says. "It could just be a wake-up call between a big hit that's safe and a big hit that could have caused an injury. It's just an extra precaution now that we have, knowing that someone extra is monitoring our players."

\$1,000 helmets

The equipment, which has been installed in 20 helmets of West Meck's starting offensive and defensive players, isn't cheap. It turns a regular \$170 helmet into one that costs \$1,000. But Charlotte-Mecklenburg Schools (CMS) didn't have to pony up a dime for the \$60,000 system. The program is being sponsored by the Department of Sports Medicine at Carolinas Medical Center (CMC), which received a \$70,000 grant from Kohl's department stores for the joint project between the hospital and school system. The package also includes concussion-assessment software, which is being made available to all 18 CMS high schools.

As noted, not all of West Meck's players are fitted with helmets, which means Harman and company had to decide who got the helmets. Obviously, the players facing the most risk are those who play the most, so that was essentially the criteria for deciding who is a HITS' player and who is not.

HITS has been used to track injuries in Division I college football and the National Football League, but its use at West Meck is the first in the Southeast by high school players. West Meck was chosen as a participant because of the school's relationship with CMC's Sports Medicine Fellowship. Each year, a general practice physician is selected to participate in the fellowship and work with West Meck's trainers. Because Dr. Nadya Volsky, this year's fellow, was already working with the school's athletic program, CMC felt it was the best use of staff resources because the program isn't only about special helmets, West is receiving CMC's medical advice as well. Physicians will monitor players who need further evaluation and assist players with concussions during the first few weeks of injury. Dr. Flora Hammond, director of the Brain Injury Program at Carolinas Rehabilitation, and her colleague, Dr. Lori Grafton, will treat players whose symptoms persist beyond four weeks. Those players will be referred to the post-concussion clinic at Carolinas Rehabilitation and assisted by a multi-disciplinary team of brain injury experts.

The differences between the appearance of HITS' equipment and the regular padding inside a helmet is subtle. The system is only a small, two-ounce piece of padding that surrounds the back of the player's head and doesn't alter the helmet's fit. On the extra piece of padding are six sensors -- similar to those found on car airbags -- that measure and record the location, magnitude, duration and direction of impacts.

When a player takes a hit, information is sent wirelessly to a laptop computer on the sideline that tracks and records the data in terms of impact's G-force, a measure of acceleration against the earth's gravitational pull that is most often associated with barrel rolls of a fighter jet or the fast turns on a roller coaster. In each of those situations, the body takes a maximum of about 4.5g, or four-and-a-half times the force of gravity.

But a hit in football can jerk the head, for milliseconds, at 50g, and hits above 100g are common, according to a study by the University of North Carolina at Chapel Hill, which studied the HITS system from 2004 to 2006.

If a player receives a particularly hard hit that exceeds a set G-force threshold, the system alerts the coach and athletic trainer via two beepers they carry with them during games. The G-force threshold at West Meck is currently set at set at about 90g, or the equivalent of a 30 m.p.h. car crash.

Even if the beepers never go off at West, the data collected will be useful. It will become part of a growing HITS database that should help researchers better understand concussions.

Some players, for example, can take harder hits better than others. It had been thought that impacts greater than 75g would likely result in a concussion, but UNC researchers say new data disputes that notion. The UNC study showed that some players suffered concussions at little more than 60g, while others sustained hits of more than 90g and showed no signs of concussions. HITS, however, can be tailored to solve that variable. Each player's G-force threshold can be adjusted depending on how hard of a hit he can take and, over the course of the season, Price and his colleagues review the data and adjusting HITS accordingly.

After a big hit is detected, trainers will employ the analytical process of the project, the Immediate Post-Concussion Assessment and Cognitive (ImPACT) Testing, which determines if an athlete can safely return to play after suffering a head injury. ImPACT is a computer test that measures cognitive function in athletes with concussions, including attention span, memory, non-verbal problem solving and reaction time.

"If we see that player repeatedly sustaining the same magnitude (we'll) probably pull him out if he's showing symptoms of a concussion," Price says. "I think that over time it will be a great tool that will help guide us around the management of those impacts."

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