

Special Report

New Brain Injury Monitoring System

While they were busy overpowering the Texas A&M Aggies on Sept. 18 in Lane Stadium, the Virginia Tech Hokies became the first athletes in the world to test a new brain injury monitoring system.

Every year in the United States, thousands of athletes suffer traumatic brain injuries. Virginia Tech researchers and sports medicine professionals have launched the monitoring project in an attempt to help prevent these injuries.

Stefan Duma, associate professor of mechanical engineering at Virginia Tech and director of the Center for Injury Biomechanics, came up with the idea for the project in February after seeing a presentation about a new type of sensor system that can be used to record impacts to football helmets. The system -- called HITS (head impact telemetry system) -- is manufactured by SIMBEX, a company in Lebanon, New Hampshire.

After talking with SIMBEX president Rick Greenwald about HITS, Duma initiated a collaborative project with Dr. Gunnar Brolinson, the head team physician, and Mike Goforth, head trainer, both of Virginia Tech Sports Medicine.

Over the past six months, the research team has developed a comprehensive study that combines the data from HITS with new methods for clinically evaluating brain trauma. Currently the project is in the pilot stage.

Each of four Hokies' helmets are fitted with six accelerometers, which measure impacts to the helmets in terms of "G" -- or gravity -- forces. During football games, the sensors transmit real-time impact data to a sideline computer system that keeps track of a range of head impact data for each player wearing the HITS sensors.

"Football helmets receive a lot of impacts that will register but that don't indicate injury," said Bill Bussone, Duma's graduate assistant. A fellow player smacking a sensor-equipped helmet might cause the system to show several G forces, for example. What the researchers are hoping to discover is the level at which impacts begin to result in injury and the cumulative effects of impacts.

Duma and Brolinson can read and evaluate the data on the spot while impacts are taking place. They plan to use the monitoring system during every Virginia Tech home game this season. In the coming year, Duma said, as many as 64 Hokies can be connected to the monitoring system simultaneously.

"There's great potential for prevention of sports-related brain injuries," Duma said, "but the lack of scientifically sound, evidence-based studies is a barrier to improved prevention and treatment. We need to learn more about what happens to the brain at the moment of impact and to study other factors, such as the protective values of different types of headgear."

One injury of particular interest to the researchers is concussion. If their monitoring project succeeds, someday coaches will be able to tell from the sidelines if a player is at risk of having suffered a concussion.

Although Hokie football will be the groundbreaking arena for the monitoring system, Duma believes that this research can lead to advances in brain injury prevention in a number of sports that pose the risk of head injury.

"Once we collect and evaluate a body of data, we can redefine injury limits for the human brain," Duma said. "In order to design better sports headgear, we need data on what types of mechanical loads and accelerations actually cause injuries."