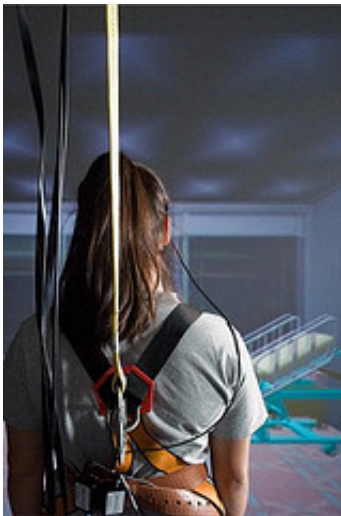


Researchers pioneer virtual reality to help athletes after concussions

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Realistic 3-D computer generated environments enable the athlete to feel fully immersed in cyber-imagery.

Penn State may be the first institution to use virtual reality to protect student athletes from the very real consequences of concussions. University researchers in kinesiology, information technology and sports medicine are using the technology to investigate cognitive changes beyond the limits of typical diagnostic tests.

Sam Slobounov, director of Sport Concussion Research Services, and Elena Slobounov, lead applications programmer in [Information Technology Services](#) Research Computing and Cyberinfrastructure, have

been partnering with Penn State's Director of [Sports Medicine](#), Dr. Wayne Sebastianelli, to design rehabilitative software for athletes at Penn State for more than a decade. One of the crowning achievements of their work is a National Institute of Health funded Virtual Reality (VR) lab in Rec Hall.

The lab is Penn State's latest, most sophisticated tool to investigate and treat traumatic [brain injury](#) in student-athletes. More than 300,000 sports-related concussions occur annually, and the likelihood of suffering a concussion while playing a contact sport can be as high as 19 percent per year.

Penn State's current approach to the growing concussion crisis is to administer baseline tests at the beginning of every season for high injury prone athletes and measure normal cognitive function. Many of these assessments involve [virtual reality](#), and feature realistic 3-D computer generated environments that enable the athlete to feel fully immersed in cyber-imagery.

In the lab, the participant wears a special headset and stands on a platform in front of a 12-foot by 10-foot screen, then navigates with a joystick through a simulation of hallways and rooms, a 3-D elevator and more. Researchers assess [brain function](#) using electroencephalogram (EEG), balance, memory, attention and reaction time tests.

By comparing participant's performance in the simulation before and after trauma, medical professionals can determine the severity of the injury.

The project comes at a time when the discussion over concussion analysis and treatment has been gathering steam nationwide. Professional athletes and organizations such as the NFL, NCAA, and Big Ten Conference have recently moved toward more formal protocols to

recognize and treat sports-related brain trauma.

This attention to the consequences of concussions is essential to maintaining the health of players both in the game and later in life.

Sports fans are likely familiar with Sebastianelli and his medical staff rushing onto the field to examine injured players during a Nittany Lions football game. In these first moments, trainers look for physical symptoms like blurred vision, nausea, memory loss or slurred speech when diagnosing brain injury.

However, a critical concern is also whether an athlete has had a previous concussion. A second impact coming within days of an initial blow can cause cerebral edema and herniation, leading to collapse and even death within minutes. Trainers also know that multiple concussions, over time, can result in long-term neurological deficits that can mimic advanced stage Parkinson's and Alzheimer's diseases.

While both fans and players may want the game to go on, it is important for everyone to take the risk of brain injury seriously. According to Slobounov, who also serves as a professor in Penn State's Kinesiology department, it's essential the athlete doesn't return to play before they are fully recovered, because decreased reaction time could make them susceptible to new injuries.

Fortunately, the increased awareness of governments and professional organizations is a step in the right direction. "We're working to make it more socially acceptable for athletes to report concerns about themselves or their fellow team members and have instituted baseline cognitive testing both before and after a concussion takes place," Sebastianelli added. "This type of support is essential to saving lives—and athletic careers."

Also essential are better data, and Penn State's VR lab is on the leading edge.

Slobounov said that VR assessment is an enormous breakthrough. "To my knowledge, Penn State is unique in using VR to solve the brain injury epidemic. Because of this work, national organizations such as the Department of Defense and the NFL are beginning to take interest."

The Slobounovs and Sebastianelli ultimately wish to use their success in [traumatic brain injury](#) analysis to advocate mandatory testing and [concussion](#) assessment for high school athletes.

More information: To learn more, visit Stream magazine at stream.it.psu.edu/feature/v1/i1

Provided by Pennsylvania State University

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