

'Tip of the iceberg' in concussion treatment

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Back view of the WEIkins Temperature Management System. Credit: Kevin Sliman/Penn State

In an attempt to find a better approach to treating and preventing sports-related concussions, a Penn State faculty member is using cutting-edge

medical technology to explore the effects of cooling helmets on brain injuries.

Semyon Slobounov, professor of kinesiology and director of the Penn State Center for Sport Concussion Research and Service, studies sports-related traumatic brain injuries using advanced virtual reality and brain imaging tools. Now, he is determined to learn what more can be done about a problem that continues to arise in athletes of all ages, despite advanced testing and updated regulations and protocols.

In the Traumatic Brain Injury Research Laboratory in Rec Hall at University Park, Slobounov and his team intend to study 21 healthy adult volunteers, Penn State student-athletes at risk for concussion, including members of the football, ice hockey, soccer, and rugby teams. They also intend to study 21 concussed athletes in acute phase of injury and 21 concussed athletes with obvious concussive symptoms in chronic phase of injury.

Penn State researchers will use Spartan Medical's WELkins Temperature Management System, which applies cooling to the scalp and the back of the neck, to examine the effect of cooling on neurocognitive, balance and executive functions.

"Our hypothesis is that cooling the brain will modulate clinical symptom resolution in the acute phase of injury," Slobounov says. "We will reduce brain temperature by applying a cooling helmet to the scalp and then test its effect using both the control group and concussed Penn State student-athletes."

He plans to observe any changes directly via MRI and electroencephalography, which measures the brain electrical activity along the scalp.

"We also hypothesize that there will be a beneficial effect of cooling in concussed athletes suffering from residual cognitive and balance dysfunctions far beyond the acute phase of injury," Slobounov says.

A 'silent epidemic'

Induced hypothermia has been studied for more than 50 years as a treatment for [brain injury](#). Researchers have looked at both whole body and head-and-neck-only cooling applications.

"The higher the temperature of the brain, the more susceptible it is to injury," Slobounov explains. After concussive injury, the immediate goal is to reduce the metabolic crisis in the brain.

"This study is important because concussive injury is a silent epidemic," Slobounov said. "Brain injury is not always easy to identify, and symptoms vary by individual."

Brain damage also doesn't always occur immediately after injury. As a result, many athletes who are injured during a game or competition may continue performing, furthering the damage.

"This treatment may play a significant role in reducing and/or potentially preventing that further damage," Slobounov said. "This is a very promising tool. We are encouraged that it will be a revolutionary step in management of concussive injuries."

The 'tip of the iceberg'

The Welkins Temperature Management System was first developed around 2001. A pilot study, first published in the journal *Neurosurgery* in February 2004, was conducted to determine if the device was usable and

safe. The patients enrolled in the pilot study all had some form of traumatic brain injury or stroke.

"Since then, there have been a handful of studies looking at use in epilepsy and just cooling in the general population with healthy subjects," says John Tessada, a vice president at Spartan Medical.

The system itself is comprised of a cooling unit, tubing and a washable nylon head covering. The ice cartridge is water and propylene glycol. Once the ice cartridge is inserted into the unit, coolant within the unit is chilled and cycles through the head covering at a temperature of approximately 50 degrees Fahrenheit, cooling the scalp and lowering brain temperature in 15 to 20 minutes.

"The device has been proven to selectively cool the brain and not affect core body temperature until after several hours of prolonged use," Tessada says. It is portable and battery-operated.

Tessada says this is the first time the cooling helmet is being used to specifically manage [traumatic brain injury](#) by selectively cooling the [brain](#). Proposed future studies will determine if it would be best utilized before, during, or after activity, in athletes with and without history of concussive injuries.

The [cooling](#) helmet could potentially be used to treat concussive injury in high school, college and professional athletes, as well as in military personnel. It might also be useful for treating epilepsy and migraines.

"This study is the tip of the iceberg," Tessada says.

Provided by Pennsylvania State University

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