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Testing of oculomotor nerve function may aid in concussion diagnosis

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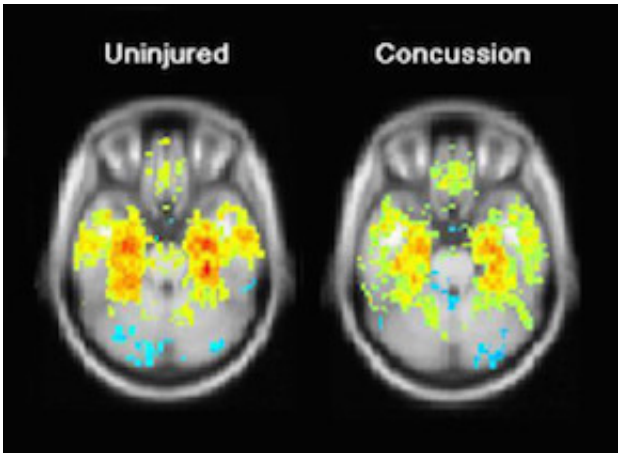

Credit: Penn State

There are approximately three million sports-related concussions reported each year in the U. S., and the rate of diagnosed concussions continues to rise. Concussions can have lasting impacts on injured athletes, including compromised nerve function weeks after the initial trauma, according to a recent Penn State study.

Semyon Slobounov, professor of kinesiology and director of the Penn State Center for Sport Concussion Research and Service, and his colleagues are studying brain functional integrity in concussed athletes post-injury. Their work was recently published in *Neurology*, the journal of the American Academy of Neurology.

In the study, concussed athletes were tested 30 days post-injury alongside healthy volunteers of the same age and gender at Penn State's Social, Life, and Engineering Science Center (SLEIC). Slobounov's previous functional magnetic resonance imaging (fMRI) research focused on concussed athletes seven days after injury and was published in Brain Imaging and Behavior.

"In both studies, subjects faced a battery of tests to measure oculomotor nerve deficits while using an fMRI," Slobounov explained. "The oculomotor nerve is the nerve in the brain that controls the muscles that enable eye movement. Oculomotor nerve function is becoming a valuable source of brain function information for clinicians and neuroscientists in diagnosing neural injuries and diseases."

According to Slobounov, both behavioral and fMRI data revealed discrepancies between the concussed and healthy volunteer groups. "Concussed subjects showed significant differences in three of the seven oculomotor tasks 30 days post-injury, including voluntary eye movement away from a stimuli and memory-guided movements of the eye," he said. Researchers discovered that while these three tasks did show significant improvement from the acute phase of injury, there was not complete resolution.

The findings are significant, as there are no universally accepted assessments for concussion diagnosis. "It's exciting, oculomotor testing is showing promise as a potential diagnostic and management tool," said Slobounov. "With this new knowledge we are closer to understanding the reasons for disrupted performance with the aide of advanced neuroimaging tools."

Despite the brain's capability to perform basic oculomotor tasks following concussion, there is evidence that concussion may disrupt its underlying neurophysiology. "It may also lead us to be able to pinpoint

changes and nuances in brain morphology, physiology, and function caused by concussion that may be of clinical importance," Slobounov said.

More information: B. Johnson et al. Follow-up evaluation of oculomotor performance with fMRI in the subacute phase of concussion, *Neurology* (2015). DOI: 10.1212/WNL.0000000000001968