



Virginia Tech Sports Medicine Program Uses MemoryMD Solutions to Conduct Pioneering Concussion Research

Concussion Management

Each year in the United States, our nation's athletes suffer over a quarter of a million sports-related concussions. Most athletes recover in 10-14 days with rest and limited stimulation; however, if young athletes return to play too quickly, they may not fully recover from the insult. A portion of athletes who sustain a concussion may develop post-concussion syndrome, and may be left with persistent or permanent neurological symptoms. Given the scope of the problem and the potential for severe consequences, researchers are actively searching for ways to quickly diagnose concussion and improve concussion management and treatment.

About Virginia Tech and Dr. Gunnar Brolinson

[Dr. Brolinson](#) is Vice Provost for Research, Professor of Family and Sports Medicine and the Discipline Chair for Sports Medicine at the Edward Via College of Osteopathic Medicine and Team Physician for Virginia Polytechnic Institute and State University, better known as Virginia Tech. He is the director of the Primary Care Sports Medicine Fellowship at VCOM and Virginia Tech. He is also a volunteer physician for the United States Olympic Committee and a team physician for the United States Ski Team and was head team physician for the Freestyle Ski Team at the 2006 Winter Olympic Games in Torino, Italy.

[Virginia Tech](#) is a NCAA Division I Atlantic Coast Conference powerhouse, a perennial performer in football, basketball, and 17 other varsity sports.

With that success comes concussions, and as Virginia Tech's Team Physician, Dr. Brolinson has seen more than his share, which is one of the reasons the Department of Defense, NCAA, NIH, and other agencies eager to find better concussion assessment and care fund his research program.

One of Dr. Brolinson's research interests is the role of Osteopathic Manipulative Treatment (OMT) in treating the soft tissue injury and somatic dysfunction that accompanies sports injury and concussion. To study this, his group needed a way to obtain electroencephalograms (EEGs) from athletes who sustained a traumatic injury on the field of play. By adding EEG to traditional concussion evaluation measures and biomarker analysis, Dr. Brolinson's group would be able to reliably diagnose concussion and track the subtle, functional brain networking changes that occur after traumatic brain injury and during healing.

An estimated 300,000 sports-related concussions occur each year in the United States.¹

Problem

Virginia Tech Sports Medicine providers needed a portable, reliable, and cost-effective means of obtaining EEG readings. The researchers needed to bring EEG testing to the athlete rather than transporting the athlete to a traditional EEG testing facility. Within the hectic environment of sports medicine, they needed a technology that could be deployed without EEG technicians and without

¹ Marar M, McIlvain NM, Fields SK, Comstock RD. Epidemiology of Concussions Among United States High School Athletes in 20 Sports. *The American Journal of Sports Medicine*. 2012;40(4):747-755. doi:10.1177/0363546511435626

bulky EEG equipment. As with any research program budget is a factor, so EEG had to be within predefined cost estimates. Most importantly, the EEG solution had to deliver tracings of the same quality and accuracy as traditional, bulkier, more expensive EEG systems.

Solution

MemoryMD solved Virginia Tech's problem by furnishing the sports medicine researchers with NeuroCap™ and NeuroEEG™. NeuroCap™ is a pliable, disposable, pre-gelled cap with 19 integrated EEG electrodes. NeuroCap™ can be applied within minutes by users with little to no previous training. NeuroEEG™ is a miniature EEG amplifier that fits in the palm of the hand. Both devices can be carried to the field of play and deployed in the locker room. MemoryMD's solution is much less expensive than a traditional EEG system, but delivers equally reliable EEG tracings. As such, MemoryMD products were the ideal solution for Virginia Tech's Sports Medicine sports-related concussion research program.

On-Site Training

MemoryMD dispatched two members of its clinical deployment team to Virginia Tech. The MemoryMD experts demonstrated how to use NeuroCap™, NeuroEEG™, and NeuroSoftware™ products. The MemoryMD team also performed on-site data quality assurance testing. The EEG output was verified by a board-certified neurologist and epilepsy specialist working on Dr. Brolinson's research team. In less than two hours, investigators and research staff were successfully applying caps to test subjects and obtaining accurate EEG readings. Once trained, research personnel were able to setup and begin recording EEGs in less than 10 minutes. While MemoryMD offered ongoing technical support, the research team was virtually self-sufficient after this brief training session.

Clinical Research Study Results

MemoryMD is already helping Dr. Brolinson and sports medicine researchers at Virginia Tech and the Edward Via College of Osteopathic Medicine meet their research objectives. First author Lauren Leslie, DO, showed the potential for OMT to improve outcomes in athletes with concussion using MemoryMD EEG solutions in a recent meeting abstract.

They report the case of a 21-year-old Virginia Tech running back who sustained a hit (linear acceleration of 130.8 g) to the back of the head during practice. Soon after the hit, the athlete felt as if he was in a fog, was confused and nauseated, and had photophobia and blurred vision. The young man was confused during the physical exam, but did not have any focal neurologic deficits. Vestibular Ocular Motor Screening and sideline concussion assessment tools were positive for concussion.

On physical exam nine days later, the running back reported headache, dizziness, tension in his neck, and feeling foggy after light exercise. He was also having difficulties looking from the board to his computer in class. He was found to have somatic dysfunction in the cranium, cervical spine, thoracic spine, lumbar spine, and sacral regions. To treat these symptoms, DO physicians used myofascial release, muscle energy, balance-ligamentous tension, and high-velocity low-amplitude OMT techniques.

OMT also resulted in profound clinical improvements. Within two days of manipulation treatment, the player no longer had symptoms of concussion and could fully participate in classwork.

The researchers compared EEGs obtained with NeuroCap™ and NeuroEEG™ before and after OMT. Treatment was associated with an increase in coherence between the prefrontal regions and the midline central and temporal regions. The amplitude of alpha activity over the posterior regions also decreased with after OMT. Interestingly, EEG and fMRI findings both demonstrated correlating changes in the midline central and temporal regions.

Osteopathic Manipulative Treatment resulted in clear and quantifiable changes on EEG that correlated with changes seen on fMRI.

MemoryMD's solution was integral to the work of Dr. Brolinson's research team, showing the clinical benefit of Osteopathic Manipulative Treatment corresponded to neurophysical EEG changes. The Virginia Tech sports medicine program has already contracted with MemoryMD to expand their use of NeuroCap™ and NeuroEEG™ for future concussion research. This work should lead to an expanded role of MemoryMD EEG solutions in sideline concussion management.

About MemoryMD

MemoryMD is a New York City based medical device and technology firm who combines brain analysis software with wireless sensor technologies to offer 21st century EEG solutions. Our FDA approved medical devices, NeuroEEG™ and NeuroCap™, simplify EEG set up and speed up data acquisition across diverse environments from emergency departments and ICUs to primary care physician offices and sleep labs.

To learn more about MemoryMD's EEG solution, visit www.brainscientific.com