THIS WAY IN

The Latest Concussion Research

BY THOMAS COLLINS

Two studies presented at the 66th Annual Meeting of the American Academy of Neurology (AAN), which took place from April 26 to May 3 in Philadelphia, PA, offer the promise of improved care for sports concussion.

One study points out flaws in the protective abilities of helmets. The other examines a potential improvement in the way concussions are identified on the sideline.

In the first study, a Florida research team found that football helmets do not provide adequate protection against the forces thought to cause concussion.

Helmets were originally designed to protect against the kind of head-on collisions that can cause penetrating injuries, in which an object penetrates the skull and damages brain tissue.

But most concussions do not involve penetrating head injury. Instead, they occur when the brain continues to move inside the skull while the head has stopped, scraping over the uneven surface of the inner skull and finally colliding with the skull. In addition, concussions are caused by a combination of linear force (such as in a head-on collision) and rotational force, which involves impact at an angle. Rotational force can actually cause more serious damage to the brain by breaking the connections between brain areas.

"This rotation causes the skull to move while the brain lags behind," says AAN member John Lloyd, Ph.D., of BRAINS, Inc., a research and development company in San Antonio, FL, that focuses on the biomechanics of traumatic brain injury (TBI). Dr. Lloyd helped lead the study.

"Helmets were never designed to protect against concussion," explains AAN member Francis Conidi, M.D., D.O., a sports neurologist also involved in the study. Dr. Conidi is director of the Florida Center for Headache and Sports Neurology in South Florida, team neurologist for the Florida Panthers hockey team, and assistant clinical professor of neurology at Florida State University in Tallahassee, FL. Our understanding of the long-term effects of concussion is relatively recent, according to Dr. Conidi.

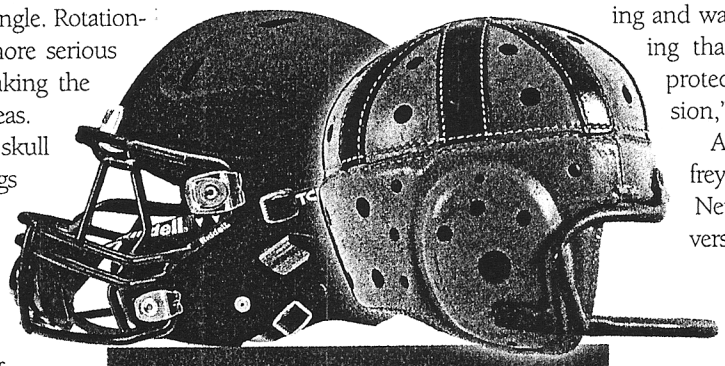
Using a special test apparatus with the head and neck of a crash-test dummy, the researchers measured both the linear and rotational force after football helmets were dropped from a height of 2 meters onto a steel plate. The researchers conducted 330 tests to measure how well 10 popular football helmet designs protected against TBI. Some of the helmets are used by NFL players and some by college players; some are the newest models, and some are older models. Six of them failed to protect against rotational force adequately to prevent life-threatening TBI. The others were deemed protective enough to protect against such injuries. The Riddell 360 helmet, used in the NFL by some players, performed worse in terms of protecting against concussion than a leather helmet from the 1930s, probably because it weighs more than a leather helmet, the researchers say.

One of the most worrisome findings, the researchers say, is that the helmets reduced the risk of TBI by only 21 percent on average.

"We're hopeful that our research will lead to improved testing and warning labels on helmets stating that they may not completely protect the athlete against concussion," Dr. Conidi says.

According to AAN member Jeffrey Kutcher, M.D., director of the Neurosport Program at the University of Michigan in Ann Arbor, the study authors did not look at exposure to force over time, which neurologists are starting to suspect is more important to long-term brain health. "A 21-percent reduction in force might not sound like much, but added up over the course of a playing career, that reduction becomes quite significant," he notes.

In the second study, a team led by Laura Balcer, M.D., Fellow of the AAN, professor and vice chair of neurology at New York University Langone Medical Center in New York, NY, examined how a vision-based



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test of rapid number naming, performed on the sidelines, might improve concussion diagnosis.

Standard sideline tests for concussion now include the Standard Assessment of Concussion (SAC), which examines information-processing (for example, by reciting the months in reverse order); and the Balance Error Scoring System (BESS) test, which examines how well a person can maintain his or her balance on various surfaces.

Dr. Balcer and her team looked at the benefits of using the vision-based King-Devick test, which measures how long it takes someone to name numbers on test cards or using an iPad app. A baseline test is taken, and those results are compared to a sideline test after a suspected concussion. For all the tests, a comparison is made between the baseline time and the post-injury time.

The researchers first looked at 217 athletes, 30 of whom had a concussion. Neither test—taken on its own or together with the other—caught all the concussions. However, when the researchers added the King-Devick test, all the concussions were identified, researchers found.

"Adding a vision test enhances our detection of athletes with concussion," Dr. Balcer says. "Given the many brain pathways involved in concussion, we think that a combination of cognitive, balance, and vision tests may be best to improve diagnosis of concussion in athletes," she says.

According to the AAN's latest guideline on sports concussion, no definitive, objective test has been developed yet to diagnose concussion. And it's still unclear how much the King-Devick test adds to a focused neurologic evaluation, notes Dr. Kutcher. "Also, neurologic examination results are often affected by the act of playing sports, regardless of injury. Studies like this would benefit from the use of a comparison group of non-concussed teammates exposed to the same level of exertion," he says.

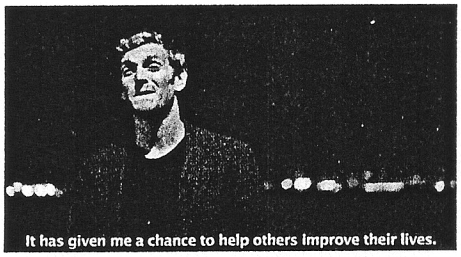
FOR MORE INFORMATION

- For more *Neurology Now* articles on traumatic brain injury (TBI), go to **bit.ly/1hjZ9SK**
- For more *Neurology Now* coverage of research from the AAN Annual Meeting, visit our Breaking News blog at **bit.ly/1m2901l**
- For articles on TBI in *Neurology: Clinical Practice* (and a free podcast), go to **bit.ly/1kvlktm** and **bit.ly/QnJo4D**
- For a patient summary (in English and Spanish) of the American Academy of Neurology's guideline for the evaluation and treatment of sports concussion, go to **bit.ly/1nJg9VT**

To watch a video interview with NFL Superbowl champion Ben Utecht about his retirement from football after repeated concussions, go to **bit.ly/1nJvoy5.**

AAN EVENT

Winners of the 2014 Neuro Film Festival Share Their Stories



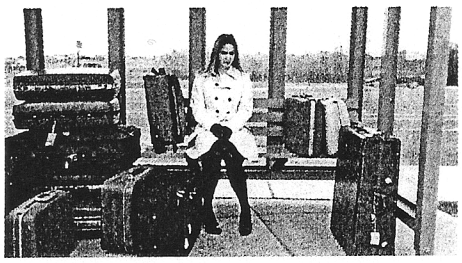
DYSTONIA DEVIN

by Devin McClernan

"I was about to give up on life," says 30-year-old film student Devin McClernan of Los Angeles, CA, of his struggle with dystonia, "until I found deep brain stimulation."

McClernan's moving film about his experience, "Dystonia Devin," was the Grand Prize winner of the 2014 Neuro Film Festival, an annual contest presented by the American Brain Foundation (**AmericanBrainFoundation.org**) to help raise awareness about why more research is needed to cure brain diseases. The $1,000 Grand Prize is awarded by a select panel of judges for a film exhibiting creativity in a technically polished presentation.

"Participating in the Neuro Film Festival has been a pleasure and an honor," says McClernan. But he and his crew—Clair Chang, John McConaghy, Johnny Mam, Alex Reynolds, and Aaron James Eckardt—aren't done with the movie yet. "We plan on entering a longer version of it, which includes other people's stories as well as mine, into more festivals." Find out more at **Facebook.com/DystoniaDevin.**



LIFE IS A JOURNEY

by Douglas Browning

The $500 Runner-Up Prize was awarded to "Life Is a Journey." Produced and directed by Douglas Browning of Kennewick, WA, the film stars Tina Lagonegro, who developed early-onset Parkinson's disease (PD) in her mid-20s. Like McClernan, Lagonegro was helped by deep brain stimulation. "Everything quit shaking. It was a peace I hadn't felt in years, down to my bones," she says of the treatment.

Browning is a custom homebuilder and designer as well as owner of Reel Moving Pictures, a film production company.

The Fan Favorite, awarded by peers as a result of online public voting, went to "My Hero, an MSA Angel Story" by Alix Sun of Sarasota, FL. The film depicts her mother Valerie Stephanski's struggle with multiple system atrophy (MSA).

To view the winning entries and the other submissions, visit **NeuroFilmFestival.com.** —*Michael Smolinsky*