

# The Boston Globe

## Student athletes return too soon after concussions

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Some student athletes who suffered a head injury are at risk of returning to the field or rink before their brain is fully healed, according to a new study on a concussion test used by more than 300 schools in Massachusetts.

The study, slated for publication in January's issue of the journal *Brain Injury*, found that 28 percent of the athletes who initially seemed to have regained their cognitive abilities, particularly memory, saw a dip after moderate exertion.

The sample of athletes studied was small: just 54 athletes, primarily high school football, soccer, and hockey players in the Boston area. But it adds to the body of research on concussions in sports, as coaches and parents wade through the confusion to figure out how best to protect children from injuries that could have lifelong consequences. Specialists say the public and even physicians have a long way to go in understanding how to balance their love of competing with real risk.

Young people usually want to get back on the field. The study, though, suggests much tighter rules might be needed on when athletes can return to play after a head injury.

"The spirit here is we're trying to learn more about when an athlete is fully recovered and when they're not," said Neal McGrath, a Brookline neuropsychologist and lead author on the study whose company offers cognitive testing to schools across the state. "There appear to be very serious implications for athletes, especially young athletes, returning to play and sustaining further trauma before they're fully recovered."

Nearly 3,000 students across 164 Massachusetts schools suffered a concussion or other head injury while playing sports during the 2011-2012 school year, according to data submitted to the state under a new law and reported by the *Globe* in October. Separate surveys of local high school sports teams by the *Globe* found the highest numbers of head injuries in football and girls' soccer, a trend that meshed with national statistics.

The means of measuring cognitive performance in the study is the commercially successful Immediate Post-

Concussion Assessment and Cognitive Testing, known as ImPACT, which is used by about 350 public and private high schools in Massachusetts.

ImPACT is a computerized test of memory, reaction time, visual motor speed, and other cognitive tasks. A baseline test is performed preseason, so that it can be used for comparison after a student is injured.

Costs to schools or parents vary. A popular package costs around \$500 per school annually to test up to 300 athletes per year, according to the company. But that does not include the cost or salary of someone such as McGrath or an athletic trainer to help interpret results.

While the study results suggest more ImPACT testing, there is a persistent controversy among some specialists about the overall usefulness of the test for concussion diagnosis and management.

Further muddying the debate: ImPACT's co-owners coauthored several of the published studies, including the latest one in *Brain Injury*.

The study's authors, whose affiliations are disclosed in the study, defend their research. The study is peer-reviewed.

"People just need to understand that potential conflict exists when they look at the study," said McGrath. "... We're not at all putting this forward to say you need ImPACT to do this."

McGrath's study, published online this month, started with a review of past ImPACT tests administered to young men and women, mostly in their freshman or sophomore year of high school, who received a concussion while playing a sport.

Students who did not have a baseline, had a medical history that would have clouded the results, or who never experienced a significant decline in cognitive

21 percent of Mass. students reported concussion symptoms after a head injury in sports in the previous 12 months. SOURCE: 2011 Youth Health Survey

performance on the ImPACT test after a concussion were excluded from the sample.

The 54 student athletes used in the study were symptom-free and had returned to their baseline cognitive performance on the ImPACT test after suffering a concussion.

Of these athletes, 15 (27.7 percent) saw a decline in cognitive performance, specifically in memory tasks, on the ImPACT test after about 20 minutes of moderate exercise.

The study recommends that the students should not be allowed to play again until they can get back to a baseline score even after exercise.

Christopher Randolph, clinical professor of neurology and director of neuropsychology service at Loyola University Medical Center outside Chicago, has been a critic of ImPACT and found fault with the study.

Randolph said his biggest problem with the current study was a lack of controls. It is possible that such moderate physical exertion could cause lower ImPACT scores even in someone who did not have a concussion, he said.

“The published false positive rates for ImPACT have ranged from 22-35 percent . . . so the 27 percent failure rate here could simply have been false positives,” he said in an e-mailed statement, after reviewing the study at the request of the Globe.

Randolph has published studies saying such tests as ImPACT have not been proven to work. In other research, he said, there is no consequence when football players return to the gridiron while they still have symptoms.

The idea that it might be OK to return someone to play while they still have symptoms is “a really dangerous opinion,” said Mark Lovell, founder of ImPACT Applications, as well as a coauthor on the study.

ImPACT is accurate but was never meant to stand alone, said Lovell, and a better estimate of the false positive rate is around 10 percent.

“No test is perfect,” said Lovell, a neuropsychologist. “ImPACT certainly isn’t perfect. It’s why we don’t say it should be used in and of itself.”

But some practitioners are indeed relying too heavily on ImPACT, said Robert Cantu, co-director of Boston University’s Center for the Study of Traumatic Encephalopathy.

“They’re important, but they’re widely misused as the only tool in the toolbox,” said Cantu, referring to ImPACT, the market leader, as well as other computerized neurocognitive tests.

ImPACT only measures cognitive symptoms, and there are three other types of concussion symptoms to consider, including physical (problems balancing), emotional (anxiety, depression), and changes in sleep habits.

He said the study is interesting and added that the underlying problem it examines – whether young athletes get back to tackling or checking too soon – is pervasive.

“We have a huge problem, and the problem now is mostly the doctors who are evaluating the kids don’t really have enough background of assessing and evaluating the concussion, and therefore many kids are being returned prematurely,” said Cantu.

“It’s a valuable tool, I believe,” he said. “It can never be used to stand alone.”

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