Researchers use 3-D gaming system to detect concussion damage

Head injuries affect athletes' ability to play game, which is also used for sports training

BY RANDY SHORE, VANCOUVER SUN  NOVEMBER 18, 2013

University of Victoria neuroscience researcher Dr. Brian Christie, left, with test subject Haydn Evans reflected in the large screen on which Evans would be tracking the balls bouncing randomly about the screen.

A University of Victoria researcher is using a 3D gaming environment to detect damage caused by concussions that is not apparent using conventional testing.

Player performance on the system after a blow to the head appears to reveal injury to the very faculties that make top athletes perform better than the rest of us, according to researcher Brian Christie, a neuroscientist at UVic.

Christie is using the system to test B.C. minor hockey players and is now expanding his work to include university athletes and Paralympians.

Playing sports involves tracking the movements of all the players on the playing surface, as well as the ball or the puck — a massive computational exercise for the brain, but one at which elite athletes excel, Christie said.

Concussion disrupts these abilities, leaving a player who returns to action too early more vulnerable than ever.
According to Statistics Canada there are about 30,000 concussions or related head injuries reported annually among people aged 12-to-19. Sixty-six per cent of those concussions are sustained in sports activity.

The Cognisens NeuroTracker 3D Perceptual-Cognitive Training system is used by dozens of professional sports teams, including the Vancouver Canucks, to improve player visual tracking skills, awareness, attention, and resistance to mental fatigue.

The Canucks declined to comment, as they do on most matters related to concussion injuries.

In its role as a training system, the game takes note of the kinds of errors the player makes — losing track of target objects in peripheral vision or when objects cross paths, for example — and then it repeats those scenarios to improve performance.

"It's really training you to follow multiple objects in three dimensions, and if you are playing hockey, soccer, this is what you want to be able to do," said Christie. "Rugby players in Europe use this system extensively so they know where players are to make those no-look passes."

"This is a tool that was developed to help professional athletes use their special skills better, but it became apparent after athletes suffered a concussion that it could be used as a diagnostic tool," said Christie. "A Canucks trainer told me when [players] get injured they have to stop using it, that they can't do the task as well until they are recovered, then they can do it again."

The same is true for the minor hockey players.

"It looks like this system is going to be a really good measure of return-to-play status," he said.

Christie has tested more than 200 kids aged six to 17 from a Victoria minor hockey program on the system, gathering baseline data on cognitive function, with the goal of creating standardized testing protocol that would better diagnose concussion. Comparing 3D game performance before and after a head injury will also guide the decisions of doctors, coaches, parents and trainers about when it is safe for a child to return to play.

The system provides an extra level of certainty that a written test or a doctor's evaluation can't supply, said Frank Stanley, a spokesman for the Victoria Racquet Club Minor Hockey Association.

"If a player has been injured there's just no way he or she is going back on the ice if they can't achieve their baseline score," said Stanley.

Christie's project is part of a five-year, $7.5-million nationwide effort to better understand concussion, funded in part by the Canadian Institutes of Health Research.

The game requires athletes to remember and follow multiple objects over time in three-dimensional space, skills that more closely duplicate the playing experience than other widely used concussion testing protocols.
"Most conventional testing is done with pen and paper or cognitive tests that are very subjective and prone to error," said Christie. "They test comprehension and working memory, that sort of thing."

Coaches need to guard against kids who might deliberately perform poorly on a baseline test in order to get back to playing sooner after a concussion. Using a competitive game to train young athletes, one that does double duty as a diagnostic tool after injury, goes a long way toward ensuring accuracy and enhancing player safety, said Stanley.

"The kids get a score, they can compare and they try to do well," he said.

Christie has also been working with athletes from UVic’s rugby team and is in talks with the Vancouver Island Junior Hockey League, Canada’s Paralympic basketball team and Rugby Canada about using the system.

"Most sports associations aren’t doing baseline testing, but it’s a great idea to do it because you can really readily identify kids who shouldn’t be playing [due to injury]," Christie said. "I think the game will also prove useful as an active training tool to help athletes recover from concussion, to regain those damaged faculties.”

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• Concussion symptoms: loss of consciousness, blurred vision, difficulty remembering, seizures or convulsions, balance problems, fatigue or low energy, amnesia, sensitivity to light, confusion, headache, sensitivity to noise, drowsiness, more emotional, neck pain, irritability, naseau, sadness, dizziness, difficulty concentrating and anxiety.

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