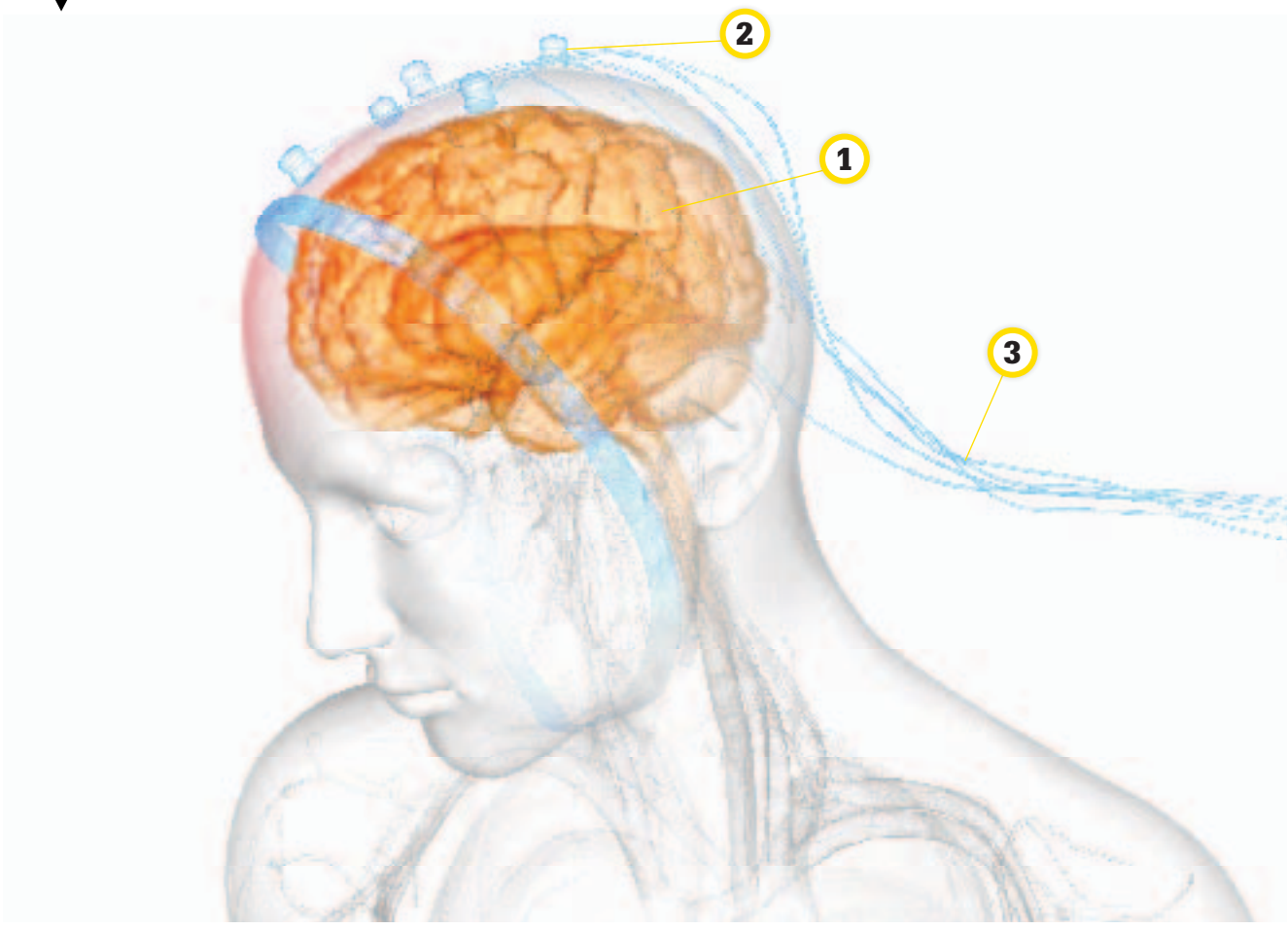
SCIENCE OF SPORT CONCUSSION TESTING

BY RYAN VAN HORNE



Dr. Ryan D'Arcy, head of the National Research Council's Institute for Biodiagnostics (Atlantic), wants to change how NHL teams test for brain injuries ILLUSTRATION BY BRYAN CHRISTIE

IT'S A DISTURBINGLY COMMON event these days. Once a groggy hockey player has skated off the ice after a hard hit, his team's trainer will check for a concussion using a test such as the Glasgow Coma Scale (GCS), which uses behaviour to provide evidence. If the results indicate a brain injury, the player sits. If they don't, he might miss only a few shifts. Dr. Ryan D'Arcy, a Halifax neuroscientist, thinks this process is putting players at risk. "In sport, you could have a subtle change in your brain function. A crude behavioural test is just not sensitive to detecting that; it can cause lots of problems," he says. For example, if a player's brain function is altered and he returns to the ice before it normalizes, a second hit—compounded with the first—can cause a more serious injury than either on its own. Many believe this is what happened to Sidney Crosby when he took hits in consecutive games in January 2011, and the all-star centre has missed a combined 101 games since.

43
PERCENT
The failure rate of diagnoses using tests like the Glasgow Coma Scale, the most common test for brain injury

Enter D'Arcy. Three years ago, he started developing the Halifax Consciousness Scanner (HCS), a device designed to measure a brain's ability to function. It has other general uses, but there was a clear focus on tackling the concussion problem in sports—especially hockey.

BRAIN MONITOR The neurons in your brain (1)—roughly 100 billion of them—use electrochemical signals to communicate. The HCS uses electroencephalography, or EEG, to measure this electricity and record it with sensors on your scalp (2). "If we present certain stimuli, we can look for specific responses that tell us the level at which you're functioning," says D'Arcy.

In its prototype state, the HCS isn't much to look at—a jumble of speakers, straps and wires connected to a computer mounted on a box (3). The speakers project sounds—tones and speech—to elicit responses, and the sensors measure the brain's response using five key indicators: sensation, perception, attention, memory and ability to understand language. It gives a score out of three for each category and provides an overall score out of 15. A reading of less than 15 indicates that an athlete should sit.

This kind of testing can be done in a research lab, but would normally take three hours. The HCS can do it in five minutes in the locker room. "It's all about giving a better tool," says D'Arcy. And we could be seeing that tool in action in short order. D'Arcy and his Halifax-based company, Mindful Scientific, are preparing to start clinical trials. Though he can't confirm which ones, he's already talking to professional and amateur teams. *SN*