# Finding a new test for children with concussions

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Researchers at the Montreal Neurological Institute and Hospital -The Neuro, at McGill University and the MUHC, are working to develop a much needed tool for helping diagnose concussions or mild traumatic brain injuries suffered by thousands of young Canadians —-hockey and football players among them. Post-concussion symptoms can include physical ailments, emotional disturbances and sleep disruption. Objective methods for predicting how severely mild brain trauma can affect a young person's brain are sorely needed. The potential for harmful effects is especially real in the case of children and youths - with the higher threat of repeated injury and cumulative effects of concussions (and links to other serious neurological illnesses) - accurate diagnosis and proper follow-up is essential.

"Current diagnostic tools are not sensitive enough for detecting subtle

abnormalities following concussion or for measuring its severity. As a result, diagnosis, treatment and prognosis are difficult," says Dr. Rajeet Singh Saluja, a neurosurgeon and the study's first author working under the guidance of Dr. Alain Ptito, a neuropsychologist whose laboratory is at The Neuro. "Our study provides valuable data for creating a tool to help diagnose concussions objectively and thus aid in assessing recovery."

In recent years it has become evident that spatial memory (positions of objects in space) and route learning (spatial memory navigation) may be impaired in adults with concussion. Until now however, there have been no studies examining spatial navigational memory in children with concussion.

Fifty adolescents-15 subjects with concussion and 35 controls-participated in the study. In addition to standard neuropsychological testing given to concussion victims, a navigational memory test was administered in which the adolescents had to orient themselves in a virtual reality neighbourhood. During this test, the subjects were scanned with functional magnetic resonance imaging (fMRI) to measure their brain activity while carrying out the task.

"Standard neuropsychological tests showed no significant differences between concussed and control subjects," say Drs. Saluja and Ptito. "But during the navigational memory task, certain parts of the brains of subjects with concussion showed altered activation patterns, either diminished or increased activity. We still need to know whether the activation patterns later return to normal or remain permanently altered, but this could provide the basis of a robust diagnostic test for children suffering from concussions and aid in evaluating recovery."

The study concludes that the spatial memory task has the potential to be used as an fMRI diagnostic test of a suspected concussion victim and

help to make the decision whether to return to activities.

**More information:** The study is published in the *Journal of Neurotrauma* (fast track online ahead of print Feb 25, 2015): online.liebertpub.com/doi/abs/ … 0.1089/neu.2014.3470

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