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Science

Video eye tests help screen toddlers' brain function



Researcher Rebecca Titman monitors Jakeson Bowlby, 2, as he undergoes tests designed to assess his brain function at Kingston's Hotel Dieu Hospital on Wednesday. Kevin Van Paassen/The Globe and Mail

Research could be used to detect learning disabilities, damage caused by fetal alcohol syndrome

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Two-year-old Jakeson Bowlby has a bull's eye sticker on his forehead that helps a computer system track the movement of his eyes.

He sits in a high chair and watches a video, but instead of *Toy Story* or another favourite, researchers at Queen's University in Kingston show him a high-definition video that is part of a new test to assess brain function in toddlers. It jumps quickly from one image to another – kangaroos sitting under a tree, kids playing soccer, buses and cars zooming by.

How quickly children can zero in on the kangaroos and follow the ball or the vehicles is a measure of how well their brains are directing the movement of their eyes, says Queen's neuroscientist Doug Munoz. He has devoted nearly two decades to documenting how eye control is related to abnormal brain function, both in children and adults.

His work is part of a broad investigation involving labs around the world which, over the last two decades, has laid the groundwork for relatively simple tests that could soon be used to detect everything from learning disabilities to the early onset of Parkinson's or Alzheimer's disease.

Dr. Munoz's latest project is aimed at the high chair set, a way to screen youngsters for problems that may make it difficult for them to learn in school. He and his colleague, Laurent Itti at the University of Southern California, have preliminary evidence that shows their "free viewing" test can identify children with attention deficit hyperactivity disorder and fetal alcohol spectrum disorder.

That study was in children over the age of 8. Next, they plan to conduct a trial at St Michael's Hospital in Toronto with both toddlers who were exposed to alcohol in the womb and a control group. They want to see if the test can pick out the children who have suffered brain damage.

Early interventions can make a big difference with these youngsters, says Brenda Stade, the researcher at St. Mike's who, along with Queen's University's James Reynolds, will help evaluate the test.

Dr. Stade recently found that babies who were exposed to alcohol before birth and who received a lot of extra help with language and other aspects of cognitive development showed significant improvement by the age of 2, compared to similar children who didn't get intensive therapy.

But it can be difficult to diagnose brain damage caused by exposure to alcohol in the womb. This eye movement test wouldn't be enough to diagnose a toddler, Dr. Munoz says. However, if further testing backs up the preliminary results, it could identify young children in need of a more in-depth assessment and evaluation for possible treatment.

Dr. Munoz says eventually it would be possible to do the testing as part of a standard eye exam. "A mass screening of kids at a young age would sort out who needs help," he said. "There is tremendous payback in that."

He studies how the brain directs the eye to make quick movements from one place to another. These movements, called saccades, are essential for reading and other visual tasks.

He and his colleagues have documented abnormalities in saccade control in children with attention deficit hyperactivity disorder and fetal alcohol spectrum disorder, as well as in patients with Parkinson's or Alzheimer's. Other scientists have found differences in children and adults with dyslexia.

The tests that work well with older children and adults are too difficult for young children, so Dr. Munoz and his colleagues came up with the idea of using a 20-minute video and an eye tracker.

The new "free viewing" test is portable and would be easy to train a technician to use, says Dr. Munoz's colleague, Courtney Green. Her son Jakeson is being tested as part of a control group, but the scientists have done trial runs with a number of toddlers to make sure the test works well with super-squirmy children or if the equipment gets smeared with a little oatmeal.

"It is ready to go," she said.