Scientists link brain development to chances of recovering vision after blindness

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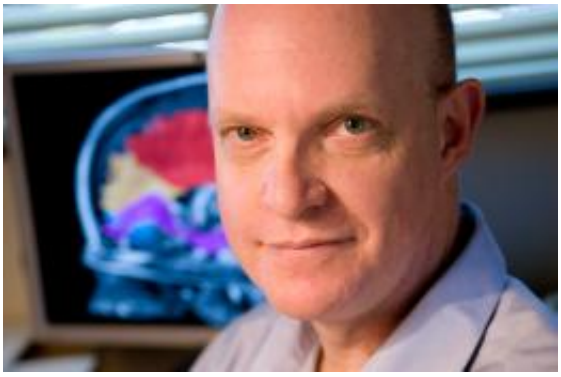

Stanford psychologist Brian Wandell believes that certain visual abilities must develop properly in childhood and cannot be learned as an adult.

(PhysOrg.com) -- The findings bolster the claims by some scientists, like Stanford's Brian Wandell, who say certain visual abilities must develop properly in childhood and cannot be learned as an adult.

Mike May was 3 years old when a chemical explosion in his family's garage burned out his left eye and blinded his right one.

Surgeries immediately following the accident couldn't restore his vision. But 43 years later, doctors figured out how to replace his cornea and keep it clear by transplanting stem cells around it. There was a chance May would see again, and he took it.

The operation 10 years ago was a procedural success, but May still cannot use his sight to read or see the expressions on the faces of his wife and sons. At best, he can detect light and motion and identify colors. While his new cornea is healthy and his retina appears to send all the right signals to his brain, his brain can't properly interpret them.

Stanford researchers think they know why: May's blindness came at a crucial time in his brain's growth. While his brain had already produced the cells needed to interpret large images, sets of smaller cells that decipher more refined resolution were just starting to come online. Blindness put an end to their development.

"The time of Mike's accident was the time the little cells just got a toehold and hadn't locked down," said psychologist Brian Wandell. "His visual world was blurred out. Those high-resolution cells weren't getting any stimulation for 43 years. Because they didn't see anything changing before them, they lost their toehold."

Specialized MRI scans used

Netta Levin, a visiting scientist from the Hadassah Hebrew University Hospital in Israel, studied May's brain using a variety of techniques developed in Wandell's VISTA lab at Stanford. Helped by other members of the lab, Levin used specialized MRI scans that let them measure the structures carrying information from the retina to the visual cortex. Their findings will be published in the Jan. 14 issue of the journal *Neuron*.

The paper comes during a debate among scientists over the brain's plasticity. Some researchers claim an adult brain can learn to see, even after it has finished developing. And others, like Wandell, argue that certain visual abilities must develop properly in childhood and cannot be learned as an adult.

If May's accident happened two years later - after his brain's visual cortex had fully developed - the surgery he had when he was 46 years old may have worked, Wandell said.

"You can fix the eye, which they did with Mike," Wandell said. "But when you fix the eye and the brain isn't ready to interpret the signals from the eye, the outcome of the surgery is not likely to be a happy one."

As scientists and doctors are developing treatments, prosthetics and surgeries to cure blindness, Wandell's research offers a cautionary tale: Make sure a patient's brain can handle what's happening to his eyes.

"As excited as we are about the advances, these technologies are expensive and risky," Wandell said. "It's helpful to know if there's a condition where these things will work or not. Our paper answers one little piece of that, and Mike's story is a suggestion that you should be aware that the likelihood of restoring vision in an adult after losing it as a young child is very low."

May knew the odds for a successful surgery weren't great. But taking risks often pays off for him. He's traveled around the world alone. He's set a downhill skiing record by being the first blind person to race at 65 mph. And he started his own business, the Sendero Group, which makes GPS systems for blind people.

When his doctors approached him about the surgery 10 years ago, May said he didn't agree to it with any great expectations.

Self-described pioneer

"I figured that if I consider myself a pioneer and like to check out new things, I have to do it," said May, who is now 56 and lives in Davis, Calif. "There was no other reason to do it except for the curiosity to see

if it would work."

He was frustrated at first by the extremely limited vision he had after the surgery, but he's not waiting for his world to come into visual focus.

"Whatever the vision does for me was the icing on the cake," he said. "Before I had it, I dealt with everything by listening closely and paying attention and concentrating. If you can see, some things may be a little easier. But it's not like listening is that much work."

Since he met Wandell about eight years ago, May and his brain have been the subject of ongoing scientific curiosity. He's traveled to academic conferences, discussed and argued his case with researchers around the world and has gladly made himself available for study.

"Mike is an example of one kind of natural experiment where we could answer questions that are important to a large number of people," Wandell said.

Provided by Stanford University