Postdoc unravels secrets to implant effectiveness

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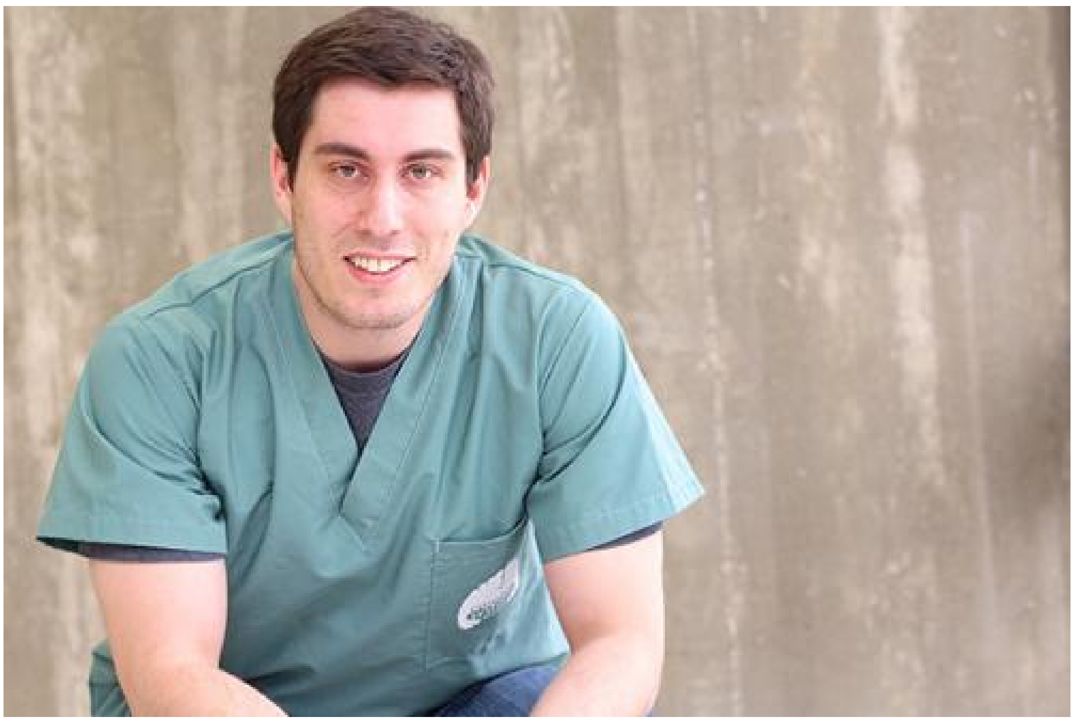

Brain and Mind Institute postdoctoral fellow Dan Stolzberg hopes his recent Canadian Institute of Health Research Fellowship will strengthen his research around cochlear implants and how they communicate with the brain. Credit: Paul Mayne

There's a saying in neuroscience: 'Neurons that fire together wire together.' Dan Stolzberg wants to better understand how those 'firing neurons' impact the success of cochlear implants.

A postdoctoral student in Western's Brain and Mind Institute, Stolzberg was recently rewarded with a Canadian Institute of Health Research (CIHR) Fellowship, finishing in the top 2 per cent of all applications.

The award, $135,000 over three years, recognizes the potential impact of his exploration and will allow him to advance the understanding of why the performance of sensory prostheses implanted during adulthood is often limited by specific mechanisms in the brain.

"Long-term deaf subjects tend to have better visual ability. They detect motion in the periphery better and have some abilities that are above those with normal hearing," said Stolzberg, who works under the supervision of Physiology and Pharmacology professor Stephen Lomber.

"By finding this, it generates some hypothesis that maybe these visual abilities are interfering with the effectiveness of cochlear implants."

For long-term deaf subjects, there is no brain activity or activation in regions of the brain that normally assist with hearing. Stolzberg said this 'extra real estate' opens the door to other sensory systems that use it to better navigate the world from their perspective.

"The way to test this hypothesis is to look at these specific brain regions and how they process information from vision before and after restoring hearing. If a person is deaf, and you give them hearing, what is happening to what they are now processing," said the Long Island, N.Y., native.

Stolzberg's research asks if the brain is improving visual senses as a coping mechanism (sort of an evolutionary theory) or if it is a sort of brain training as these individuals lean more on their other senses.

"It might even be that it just happens," he said. "The regions that normally subserve hearing are just available and the brain doesn't want to waste metabolic resources, so other regions just take it over - which is more of a philosophical discussion."

A healthier understanding of what is happening in the brain when cochlear implants are introduced will help those who have trouble managing their cochlear implants.

While successful, cochlear implants are best if implanted in those under the age of 4. After that, the effectiveness decreases. While patients can still hear, the ability and effort required to develop speech decreases dramatically.

Why is this happening?

"One hypothesis is that the other senses are interfering and the circuits aren't set up quite right to process speech," Stolzberg said. "There are some ideas already as to how we might approach that. We need to know how the brain is working in order to determine the best path to pursue."

Using electrophysiology to record neurons in these regions and how they are communicating with each other, Stolzberg will also use behavioral and anatomical laboratory tools to investigate how the better-than-normal visual abilities in deaf subjects limit the effectiveness of hearing restoration later in life.

"I'm still new to this field, and feel lucky to get the recognition for it," he said. "Restoring a sense tells us about the fundamental nature of what the brain does to adapt. It's really exciting and rare to find something you're passionate about that will hopefully help people."

Provided by University of Western Ontario