Neuropsychologist proves that some blind people 'see' with their ears

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Dr. Olivier Collignon of the University of Montreal's Saint-Justine Hospital Research Centre compared the brain activity of people who can see and people who were born blind, and discovered that the part of the brain that normally works with our eyes to process vision and space perception can actually rewire itself to process sound information instead.

The research was undertaken in collaboration with Dr Franco Lepore of the Centre for Research in Neuropsychology and Cognition and was published late yesterday in the Proceedings of the National Academy of Sciences.

The research builds on other studies which show that the blind have a heightened ability to process sounds as part of their space perception. "Although several studies have shown occipital regions of people who were born blind to be involved in nonvisual processing, whether the functional organization of the visual cortex observed in sighted individuals is maintained in the rewired occipital regions of the blind has only been recently investigated," Collignon said. The visual cortex, as its name would suggest, is responsible for processing sight. The right and left hemisphere of the brain have one each. They are located at the back of the brain, which is called the occipital lobe. "Our study reveals that some regions of the right dorsal occipital stream do not require visual experience to develop a specialization for the processing of spatial information and are functionally integrated in the preexisting brain network dedicated to this ability."

The researchers worked with 11 individuals who were born blind and 11 who were not. Their brain activity was analyzed via MRI scanning while they were subjected to a series of tones. "The results demonstrate the brain's amazing plasticity," Collignon said. Plasticity is a scientific term that refers to the brain's ability to change as a result of an experience. "The brain designates a specific set of areas for spatial processing, even if it is deprived of its natural inputs since birth. The visually deprived brain is sufficiently flexible that it uses "neuronal niche" to develop and perform functions that are sufficiently close to the ones required by the remaining senses. Such a research demonstrates that the brain should be more considered as a function-oriented machine rather than a pure sensory machine".

The findings raise questions regarding how this rewiring occurs during the development of blind new born babies. "In early life, the brain is sculpting itself on the basis of experience, with some synaptic connections eliminated and others strengthened," Collignon noted. Synaptic connections enable our neurons, or brain cells, to communicate. "After a peak of development ending approximately at the age of 8 months, approximately 40% of the synapses of the visual cortex are gradually removed to reach a stable synaptic density at approximately the age of 11 years. It is possible that that the rewiring occurs as part of the maintenance of our ever changing neural connections, but this theory will require further research," Collignon said.

Provided by University of Montreal