UNIVERSITY OF VERONA
DEPARTMENT OF NEUROLOGICAL, NEUROPSYCHOLOGICAL, MORPHOLOGICAL AND MOTOR SCIENCES
Section of Physiology and Psychology

PhD SCHOOL "SCIENCE ENGINEERING MEDICINE"
PhD Program in NEUROSCIENCE
PhD Program in PSYCHOLOGICAL AND PSYCHIATRIC SCIENCES

ASSOCIAZIONE PER LE NEUROSCIENZE
"GIUSEPPE MORUZZI"

Seminars in
NEUROSCIENCE
and
PSYCHOLOGICAL and PSYCHIATRIC SCIENCES

Wednesday, May 23, 2012
at 5:00 p.m.
Room "F" – Istituti Biologici

Mel Goodale, PhD, FRSC
The Brain and Mind Institute
The University of Wester Ontario (USA)

Title of the Seminar

"The Neural Correlates of Echolocation in the Blind"

Abstract

Everybody has heard about echolocation in bats and dolphins. These creatures emit bursts of sounds and listen to the echoes that bounce back to detect objects in their environment. What is less well known is that people can echolocate, too. In fact, there are blind people who have learned to make clicks with their mouth and tongue – and to use to use the returning echoes from those clicks to sense their surroundings. Some of these people are so adept at echolocation that they can use this skill to go mountain biking, play basketball, or navigate unknown environments. In this talk, we will learn about several of these echolocators – some of whom train other blind people to use this amazing skill.

Using fMRI we showed that blind echolocation experts use what is normally the 'visual' part of their brain to process the clicks and echoes. We first made recordings of the clicks and their very faint echoes using miniature microphones inserted in the ears of the blind echolocators as they identified different objects. We then played the recorded sounds back to the echolocators in the scanner. Remarkably, when the echolocation recordings were played back to the blind experts, not only did they perceive the objects based on the distinctive echoes, but they also showed activity in the calcarine cortex, a brain area corresponding to primary visual cortex in sighted people. This activation was particularly striking in the blind echolocator who had lost his vision early in life. Interestingly, auditory cortical areas were no more activated by sound recordings of outdoor scenes containing echoes than they were by sound recordings of outdoor scenes with the echoes removed – even though the 'visual' brain areas were remarkably sensitive to the faint echoes. When the same experiment was carried out with sighted people who could not echolocate, these individuals could not make sense of the clicks and echoes, and neither did their brains show any echo-related activity. This study raises many questions about neuroplasticity and sensory substitution. But even at this point, it is clear that echolocation enables blind people to do things that are otherwise thought to be impossible without vision and in this way it can provide blind and vision impaired people with a high degree of independence in their daily lives.

Everyone is welcome to attend

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