The brain as a 'task machine'

February 17 2011

The portion of the brain responsible for visual reading doesn't require vision at all, according to a new study published online on February 17 in *Current Biology*. Brain imaging studies of blind people as they read words in Braille show activity in precisely the same part of the brain that lights up when sighted readers read. The findings challenge the textbook notion that the brain is divided up into regions that are specialized for processing information coming in via one sense or another, the researchers say.

"The brain is not a sensory machine, although it often looks like one; it is a task machine," said Amir Amedi of The Hebrew University of Jerusalem. "A brain area can fulfill a unique function, in this case reading, regardless of what form the sensory input takes."

Unlike other tasks that the brain performs, reading is a recent invention, about 5400 years old. Braille has been in use for less than 200 years. "That's not enough time for evolution to have shaped a brain module dedicated to reading," Amedi explained.

Nevertheless, study coauthor Laurent Cohen showed previously in sighted readers that a very specific part of the brain, known as the visual word form area or VWFA for short, has been co-opted for this purpose. But no one knew what might happen in the brains of blind people who learn to read even though they've had no visual experience at all.

In the new study, Amedi's team used functional magnetic resonance imaging to measure neural activity in eight people who had been blind

since birth while they read Braille words or nonsense Braille. If the brain were organized around processing sensory information, one might expect that Braille reading would depend on regions dedicated to processing tactile information, Amedi explained. If instead the brain is task oriented, you'd expect to find the peak of activity across the entire brain in the VWFA, right where it occurs in sighted readers, and that is exactly what the researchers found.

Further comparison of brain activity in blind and sighted readers showed that the patterns in the VWFA were indistinguishable between the two groups.

"The main functional properties of the VWFA as identified in the sighted are present as well in the blind, are thus independent of the sensory modality of reading, and even more surprisingly do not require any visual experience," the researchers wrote. "To the best of our judgment, this provides the strongest support so far for the metamodal theory [of brain function]," which suggests that brain regions are defined by the tasks they perform. "Hence, the VWFA should also be referred to as the tactile word form area, or more generally as the (metamodal) word form area."

The researchers suggest that the VWFA is a multisensory integration area that binds simple features into more elaborate shape descriptions, making it ideal for the relatively new task of reading.

"Its specific anatomical location and its strong connectivity to language areas enable it to bridge high-level perceptual word representation and language-related components of reading," they wrote. "It is therefore the most suitable region to be taken over during reading acquisition, even when reading is acquired via touch without prior visual experience."

Amedi said the researchers plan to examine brain activity as people learn

to read Braille for the first time, to find out how rapidly this takeover happens. "How does the [brain](link) change to process information in words?" he asked. "Is it instantaneous?"

  Provided by Cell Press

Citation: The brain as a 'task machine' (2011, February 17) retrieved 13 March 2023 from https://medicalxpress.com/news/2011-02-brain-task-machine.html