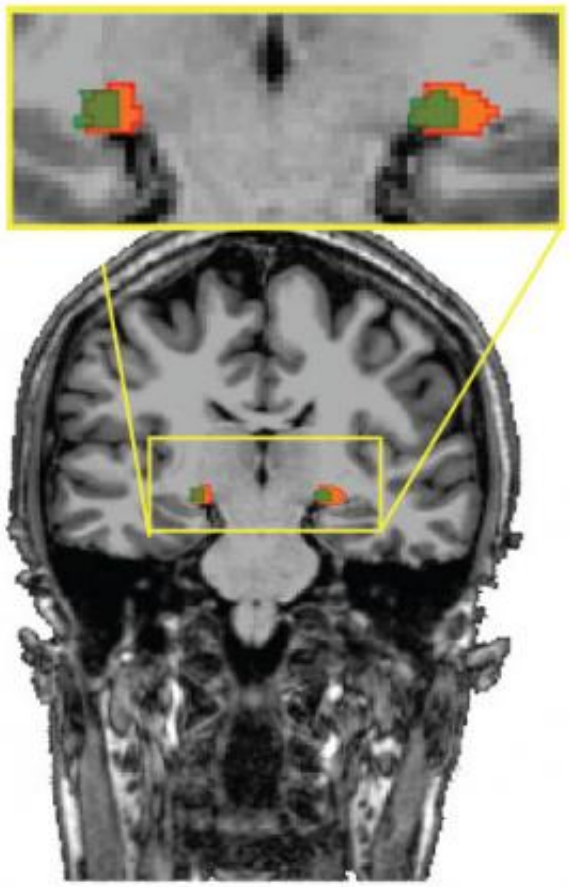
Medical Xpress

Results challenge conventional wisdom about where the brain processes visual information

March 2 2015



Localization of the human lateral geniculate nucleus, using high-resolution functional MRI (orange) and anatomical MRI (green). Credit: Tong Lab, Vanderbilt University

Neuroscientists generally think of the front end of the human visual system as a simple light detection system: The patterns produced when light falls on the retina are relayed to the visual cortex at the rear of the brain, where all of the "magic" happens that transforms these patterns into the three-dimensional world view that we perceive with our mind's eye.

Neuroscientists generally think of the front end of the human visual system as a simple light detection system: The patterns produced when light falls on the retina are relayed to the visual cortex at the rear of the brain, where all of the "magic" happens that transforms these patterns into the three-dimensional world view that we perceive with our mind's eye.

Now, however, a brain imaging study - published online by the journal *Nature Neuroscience* on Mar. 2 - challenges this basic assumption. Using high-resolution functional magnetic resonance imaging (fMRI), a team of researchers from Vanderbilt and Boston universities, have discovered that more complex processing occurs in the initial stages of the visual system than previously thought. Specifically, they have found evidence of processing in the human lateral geniculate nucleus (LGN), a small node in the thalamus in the middle of the brain that relays nerve impulses from the retina to the primary visual cortex.

An important function of the visual cortex is the processing of rudiments of shape, the angles of lines and edges, which are important for defining the outlines of objects. The researchers found that the human LGN is also sensitive to the orientation of lines and that this effect is enhanced when a person simply pays attention to the orientations in an image.

"These findings demonstrate that even the simplest brain structures may play a fundamental role in complex neural processes of perception and attention," said Frank Tong, professor of psychology at Vanderbilt, who

conducted the study with postdoctoral fellow Michael Pratte and Sam Ling at Boston University. "They also highlight how higher cortical areas can influence and modulate how we see by modifying the responses of neurons at the earliest stages in the visual pathway through feedback connections."

"The findings challenge the conventional wisdom about how and where in the brain the processing of visual orientation information first occurs," commented Michael A. Steinmetz, acting director of the Division of Extramural Research at the National Eye Institute, which provided funding for the study. "The research also underscores the concept that the perception of visual stimuli evolves from dynamic processes in widely distributed networks in the brain."

More information: Attention alters orientation processing in the human lateral geniculate nucleus, *Nature Neuroscience* , DOI: 10.1038/nn.3967

Provided by Vanderbilt University

Citation: Results challenge conventional wisdom about where the brain processes visual information (2015, March 2) retrieved 2 May 2024 from https://medicalxpress.com/news/2015-03-results-conventional-wisdom-brain-visual.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.