Brain processes written words as unique 'objects'

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A new study provides direct experimental evidence that a brain region important for reading and word recognition contains neurons that are highly selective for individual real words. The research, published by Cell Press in the April 30th issue of the journal *Neuron*, provides important insight into brain mechanisms associated with reading and may lead to a better understanding of reading disabilities.

The ability to read is a complex cognitive skill that is thought to depend on neural representations built as a result of experience with written words. "Although some theories of reading as well as some neuropsychological and experimental data have argued for the existence of a neural representation for whole real words, experimental evidence for such a representation has been elusive," explains senior study author Dr. Maximilian Riesenhuber from the Department of Neuroscience at the Georgetown University Medical Center.

Previous neuroimaging studies have identified an area in the left visual cortex, called the visual word form area (VWFA), as being important for reading words. However, thus far, scientists have not demonstrated that this brain region has a preference for real words when compared with pronounceable nonsense words, known as pseudowords (i.e. "farm" versus "tarm"). Dr. Riesenhuber and colleagues performed a series of experiments using a neuroimaging technique that allowed very sensitive examination of neuronal activity. Subjects were imaged while performing reading detection tasks using real words and pseudowords.

The researchers found that neurons in the VWFA were highly selective for whole real words, supporting the idea of experience-driven tuning of neurons in the VWFA to real words but not pseudowords. Further, a whole-brain analysis revealed that the left VWFA was the only brain area that consistently exhibited this selectivity for written words during the experimental reading tasks. The findings provide evidence that experience-driven neural plasticity extends beyond lower level representations of characters and also involves whole words.

"These results are not just relevant for theories of reading and reading acquisition but also for our understanding of the mechanisms underlying experience-driven cortical plasticity in general," says Dr. Riesenhuber. "It will be interesting in future studies to investigate how the specificity of the representation in the VWFA changes during development and how it might differ in individuals with reading disorders."

Source: Cell Press (news : web)