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Brain stores words in visual dictionary

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ABC

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When we read, our brains are instantly able to recognise words because we have stored them in a 'visual dictionary', say researchers.

Their findings, which are likely to be hotly debated, will be presented this week in Washington DC at Neuroscience 2011, the major meeting of the Society of Neuroscience.

By better understanding how our brain enables us to read, the research could help uncover what happens in the brain in reading disorders such as dyslexia, says lead researcher Dr Laurie Glezer at the Georgetown University Medical Centre.

Neuroscientists have long debated whether an area of the brain involved in reading, called the visual word form area (VWFA), responds to the sound of a word or the appearance of the written word, or to both.

Glezer says one camp of neuroscientists believes that when we read, we pick up both the sound of the word (phonology) and the way it appears, and that the VWFA does both.

"But our study proves this isn't the case," she says. "Our results are the first to show that we have a purely orthographic or 'visual dictionary' of sorts."

Glezer and co-authors used brain imaging to compare the activity in the VWFA in 10 volunteers who were shown different pairs of words.

Each word we learn to read gets encoded by a unique set of neurones and added to a visual dictionary in the brain.(Source: iStockphoto)

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Glezer says she expected to see the lowest brain activity for two identical words (such as 'hair' and 'hair'), and a significantly higher signal for 'homophones' that sounded the same but looked different (such as 'hair and 'hare').

"And this is exactly what we found," she says.

"If the sound of words had influence in this part of the brain, we would expect to see that they activate the same or similar neurons ... but this was not the case: 'hair' and 'hare' looked just as different as 'hair' and 'soup'.

"This suggests that all we use is the visual information of a word and not the sounds," she says.

The findings could help in understanding and treating dyslexia.

"We know already that people with dyslexia show reduced activity in the VWFA. It could be that they have not developed this tightly tuned 'visual word dictionary' and therefore have difficulty accurately identifying words," says Glezer.

"There may be ways of helping train children with dyslexia to form a more finely tuned dictionary."

Dr Amy Brodtmann, who is codivisional head of behavioural neuroscience at the Florey Neuroscience Institutes in Melbourne welcomes the research.

"This report may represent the first strong evidence for a neural representation of whole words: our 'orthographic lexicon'," she says.

"It's very exciting, as it would represent the confirmation of many decades of research and hypothesising - and controversy - of groups across the world."

But Brodtmann says, there is still hot debate over the idea that the VWFA responds to visual stimulus alone.

"There are still die-hard neuroscientists out there who are vehemently opposed to the notion of such selective cortical organisation," she say.

Brodtmann adds that the research gives strong evidence that these regions of the brain are very plastic, suggesting that they are amenable to structured therapies.

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