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How the brain recognises the words it reads

Daniel Bardsley

11-14 minutes

When we read a book or a newspaper, we typically recognise words without thinking about what we are doing.

After all, when we see a word such as facility, for example, we don't look at the letters, think about their relative positions and then come to a conclusion about which word is in front of us.

We simply look at it and, immediately it seems, recognise it for what it is. It's as simple as putting one foot in front of the other.

Yet by carefully designed reading and recognition tests, psychologists have, over the decades, been able to uncover all sorts of fascinating details about how our brain works out what words we are looking at.

As adults, when we need to recognise a word, our brain does not start at the beginning and scan the letters sequentially until it identifies the word.

Instead, even though we may not realise this is happening, we typically start from the outside – the first and the last letters –

and work our way in.

"The brain is very clever at working out the easiest way to a solution. It's a very busy thing. If it can make life easier it can find a way of doing that," said Dr Timothy Jordan, a professor of cognition and cognitive neuroscience at Zayed University in Dubai.

"The first and last letters are surrounded by spaces – this makes these letters more visible, more distinctive."

For example, when we read the word 'duck', our brain processes the letters 'd' and 'k' first and then identifies the other letters, allowing us to distinguish the word from alternatives such as 'deck'.

"We don't feel that's happening. We probably feel the first, second and third letters are processed first," said Dr Jordan.

That is happening, however, and it has consequences for the mistakes we might make when we recognise words, because words with the same initial and final letters are easier to be mistaken for the other.

For example, an adult is more likely to be confused by the words "beard" and "bread" than he or she is by "begin" and "being". In both cases, the words are anagrams but, in the first case, only the middle letters are rearranged, while in the second example a change in the last letter makes the two words easier to tell apart.

At the same time, the emphasis on the first and the last letters

means that we can often recognise what a word should be, even if the letters in the middle are in the wrong order, or even missing. There is, then, a degree of flexibility in terms of the order of the letters in the middle when we recognise a word.

Although the importance of the external letters for word recognition for adults has long been known, it had been thought that children might have used a different word recognition system and that, for them, the relative position of letters within the word was more strictly encoded.

Dr Jordan and several other researchers – including Dr Kevin Paterson, a senior lecturer in psychology at the University of Leicester – set out to test this hypothesis.

They studied word recognition by children aged eight to 10 years old and compared them with a group of adults.

Participants were shown, for three seconds, words of four to seven letters, and asked to read them aloud as quickly and as accurately as possible. Among the words were many pairs of anagrams, in some of which only the interior letters were different, in others both interior and exterior letters had changed places.

Published in the *Developmental Science* journal and written by University of Leicester researchers Josephine Read and Victoria McGowan, the study found that younger readers showed slower response times and more errors compared to the adults who took part.

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That was to be expected. Perhaps of greater interest, the children and the adults had particular difficulty in recognising anagrams where only the interior letters had been moved around. The children and adults had less difficulty recognising anagrammatical words correctly when interior and exterior letters were shifted.

If young people had yet to develop the technique that adults have in focusing on the exterior letters of words, this result would probably not have come about. In that case, the children would have been expected to have had similar degrees of difficulty recognising the two different types of anagrams.

As the authors of the study put it in their paper, *Children and Adults Both See "Pirates" in "Parties": Letter-Position Effects for Developing Readers and Skilled Adult Readers*, the findings indicate that "the privileged status of exterior letters in words is well established in developing readers".

That we can sometimes recognise words even when letters, particularly internal ones, have been slightly jumbled can be a useful skill. It means, for

example, that we will usually recognise the word "cholate" for what it was meant to be, "chocolate".

But if that flexibility with respect to letter order is too great, it could help to cause reading problems, Dr Paterson suggested.

"I imagine there is variation in that flexibility. If there's a part of the brain dedicated to working out the position of letters and words, that may show variation between individuals," he said.

In extreme cases, this flexibility could be a component of dyslexia, he said. This suggestion corroborates reports from people with dyslexia that letters seem to jump about on the page.

More broadly, work such as the recent study is part of a body of evidence that helps researchers to better understand the difficulties children can experience when trying to read.

"This is one study among a series. The general approach is very useful for being able to understand typical and atypically developing children," said Dr Paterson.

With poor literacy often linked to negative outcomes in life – such as unemployment, long-term illness and involvement in crime – insights into how young people learn to read and how they might fail to learn are nothing if not important.

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One-page article

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