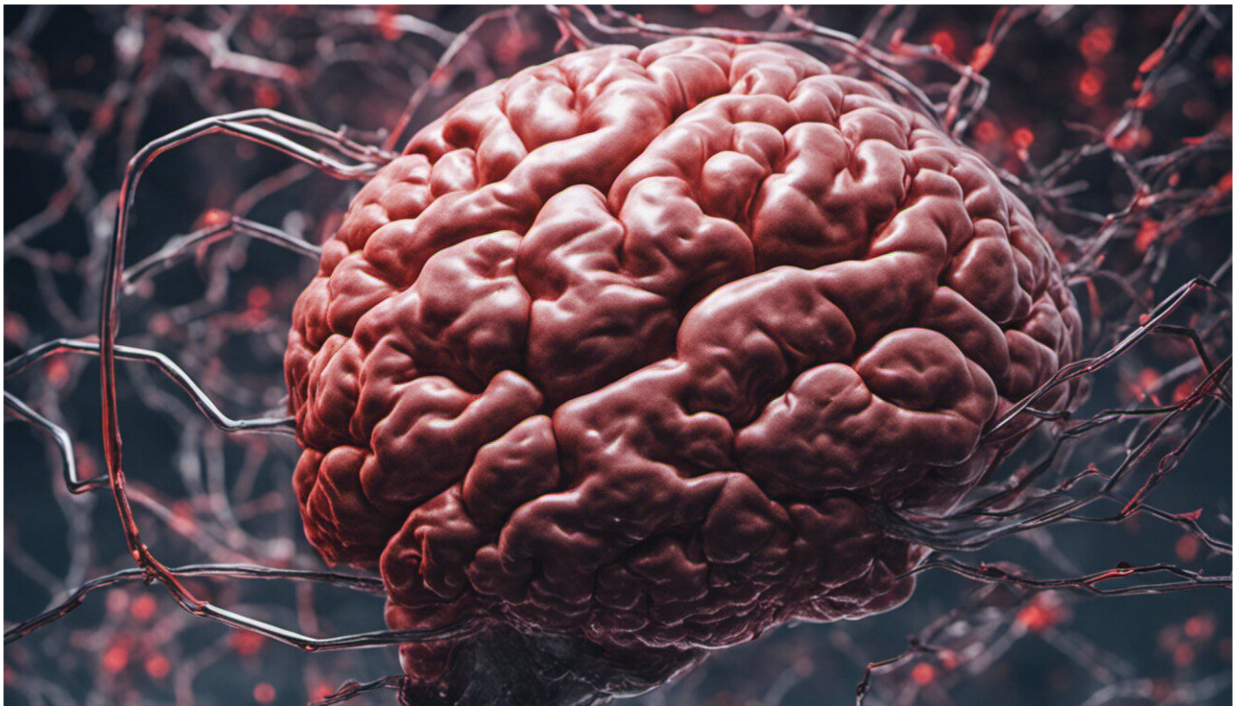
How the brain changes when we learn to read

May 11 2017, by Nicola Bell



Credit: AI-generated image (disclaimer)

Right now, you are reading these words without much thought or conscious effort. In lightning-fast bursts, your eyes are darting from left to right across your screen, somehow making meaning from what would otherwise be a series of black squiggles.

Reading for you is not just easy – it's automatic. Looking at a word and not reading it is almost impossible, because the cogs of written language processing are set in motion as soon as skilled readers see print.

And yet, as tempting as it is to think of reading as hard-wired into us, don't be fooled. Learning to read is not easy. It's not even natural.

The first examples of written language date back to about 5,000 years ago, which is a small fraction of the 60,000 years or more that humans have spent using spoken language.

This means our species hasn't had enough time to evolve brain networks that predispose us to learn literacy. It is only through years of practice and instruction that we have forged those connections for ourselves.

How the brain learns to read

Brains are constantly reorganising themselves. Any time we learn a new skill, connections between neurons that allow us to perform that skill become stronger. This flexibility is heightened during childhood, which is why so much learning gets crammed in before adolescence.

As a child becomes literate, there is no "reading centre" that magically materialises in the brain. Instead, a network of connections develops to link existing areas that weren't previously linked. Reading becomes a way of accessing language by sight, which means it builds on architecture that is already used for recognising visual patterns and understanding spoken language.

The journey of a word

When a skilled reader encounters a printed word, that information travels from their eyes to their occipital lobe (at the back of the brain), where it is processed like any other visual stimulus.

From there, it travels to the left fusiform gyrus, otherwise known as the brain's "letterbox". This is where the black squiggles are recognised as letters in a word. The letterbox is a special stopover on the word's journey because it only develops as the result of learning to read. It doesn't exist in very young children or illiterate adults, and it's activated less in people with dyslexia, who have a biological difference in the way their brains process written text.

Words and letters are stored in the letterbox – not as individually memorised shapes or patterns, but as symbols. This is why a skilled reader can recognise a word quickly, regardless of *font*, cAsE, or **typeface**.

Information then travels from the letterbox to the frontal and temporal lobes of the brain, to work out word meaning and pronunciation. These same areas are activated when we hear a word, so they are specialised for language, rather than just reading and writing.

Because information can travel so quickly across the skilled reader's synaptic highways, the entire journey takes less than half a second.

But what happens in the brain of a five-year-old child, whose highways are still under construction?

The growing brain

For young children, the process of getting from print to meaning is slow and effortful. This is partly because beginning readers have not yet built up a store of familiar words that they can recognise by sight, so they must instead "sound out" each letter or letter sequence.

Every time children practise decoding words, they forge new connections between the visual and spoken language areas of the brain, gradually adding new letters and words to the brain's all-important letterbox.

Remember, when a practised reader recognises a word by sight, they process the letters in that word, rather than its shape.

Literacy instruction can therefore support children's learning by highlighting the symbolic nature of letters - in other words, by drawing attention to the relationships between letters and speech sounds.

Here, evidence from brain imaging research and educational research converge to show that early phonics instruction can help construct an efficient reading network in the brain.

What might the future hold for literacy development?

As technology evolves, so too must our definition of what it means to be "literate". Young brains now need to adapt not only to written language, but also to the fast-paced media through which written language is presented.

Only time will tell how this affects the development of that mysterious beige sponge between our ears.

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