A promising approach to preventing developmental dyslexia

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David Mather, an Independent Researcher at the University of Victoria, has a promising approach to preventing developmental dyslexia. Discover more here

Studies suggest that left-eye dominant children may develop dyslexia by learning to write using pathways in the right brain hemisphere. Dr David Mather, a researcher associated with the University of Victoria, recently published a paper reviewing these findings. He outlines a proposed approach to teaching writing skills that could prevent these children from developing dyslexia. This approach involves teaching children to write when they are seven or eight years old when the human brain is better at mapping and memorizing entire words.

What is dyslexia?

Dyslexia is a developmental language learning impairment that affects approximately 10 to 15% of people worldwide. People diagnosed with dyslexia typically find it difficult to read and write, as they might struggle to remember letters, place them in a different order when writing words, or forget their pronunciation.

These difficulties with reading and writing can significantly impact the lives of affected individuals. They can slow down their progress in school and at university, preventing them from smoothly completing daily tasks that involve reading or communicating with others in written form.

Neuroscientists and psychologists have been trying to identify the root causes of dyslexia to design interventions that support dyslexic children. While there are now more resources designed to support people with dyslexia throughout education, most of these do not help affected individuals to fully overcome their linguistic difficulties.

Developmental dyslexia research

Dr David Mather recently published a paper that reviews recent research exploring the neural underpinnings of dyslexia and outlines a teaching approach that could reduce the risk that children will develop this language impairment.

In his paper, Dr Mather explains that dyslexia manifestations can be divided into two primary subtypes, known as phonologically deficient and phonologically proficient. People with the first type of dyslexia appear to decode language by looking at the shape of

letters. Therefore, they are more likely to use certain letters with similar shapes interchangeably – such as ‘d’ and ‘b’. People with the second type, on the other hand, appear to memorize letters and words primarily based on their sound.

Studies have shown that children who often confuse the shapes of letters and their order in words also have difficulty drawing continuous figure-eight loops, as they tend to involuntarily reverse the direction in which they are drawing. In both cases, the movement sensation is mirror-reversed to the visual input. Interestingly, when blindfolded and their hand movements initially guided by a teacher, their ability to draw figure-eight loops significantly improves.

According to Dr Mather, a new hypothesis has emerged in recent years about why some children might develop dyslexia. Just like some people are right-handed and others left-handed, individuals tend to innately rely more strongly on one of their eyes for vision. The left eye is connected to the right hemisphere of the brain, and the right eye is linked to the left hemisphere. The central argument is that the left eye/right hemisphere dominant beginning writers of English, in learning to write English, must cope with RH to left hemisphere (LH) corpus callosal innervation that is kinaesthetically reversed in order and orientation to the rightward direction of print.

The corpus callosum is a large set of nerves connecting the left and right hemispheres of the brain. In the right eye/LH dominants, its mirror-innervation is inhibited by letter-sound decoding. But in RH dominants, it is not. Studies show that children with a dominant left eye, who learn to write using the right hemisphere, can experience sequential letter (e.g., was/ saw) and spatial (e.g., b/d) mirror-writing that confuses and interferes with normal reading development.

A dominant right eye and the primary use of the brain’s left hemisphere while learning to write could allow children to compensate for the unfavourable position of this nerve-based structure, enabling them to learn reading and writing more easily from a young age. On the other hand, children with a dominant left eye, who primarily use the right hemisphere while learning to write, experience problems with reading and writing words from left to right.

A considerable amount of experimental evidence now supports this hypothesis. For instance, some studies found that dyslexic readers exhibit increased communication from the right to the left hemisphere through the corpus callosum. In contrast, others found that the structure of the corpus callosum itself differs significantly between dyslexic and non-dyslexic readers. These differences in the corpus callosum can become stable when children learn to write early, ultimately shaping the way they encode written language for the rest of their lives.

Yet, at the age of seven or eight, the human brain undergoes some crucial developments, which could allow children to better decode letters and words.

Before this age, most children primarily try to make sense of the world through ‘proprioception’, which describes the body’s innate ability to sense movements and its own position in space. After this age, however, the brain learns to better integrate proprioception with vision, which could facilitate a dyslexic child’s learning to read and write.

Dyslexia recommendations for the future

Based on these findings, Dr Mather recommends that children should be taught to read and write at the age of seven or eight to prevent those with a dominant left eye from developing dyslexia. This delayed education could also be beneficial for right-eye-dominant children whose first language is written from right to left, such as Hebrew.

Before such widespread changes to our education systems are possible,
Dr Mather hopes to inspire educators and language therapists to postpone reading and writing lessons for children who exhibit the early signs of developmental dyslexia.

Interestingly, young children with a dominant left eye have shown superior performance to their right-eye-dominant peers when learning Hebrew, which is written and read from right to left.

This is a summary of the paper ‘Preventing children from developing dyslexia: A premature writing hypothesis’, in Perceptual and Motor Skills.’

For further information, you can connect with Dr. David S. Mather at dmather@uvic.ca

Much of this article is based on a Podcast which you can listen to by clicking here.