Dyslexia—when spelling problems impair writing acquisition

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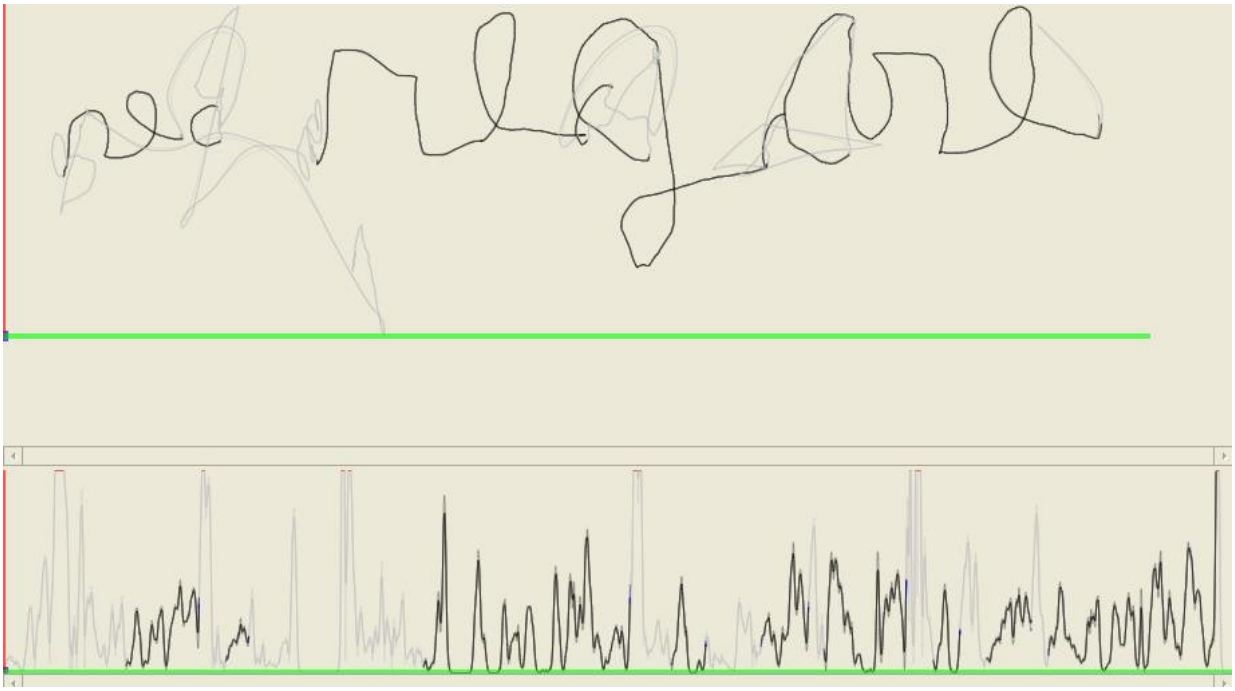

Black lines show what the child actually wrote on the page; grey lines, recorded by the tablet, show in-air movements when the child paused. This example shows that the child started to write; stopped, then continued. The result is an irregularly produced word which presents a spelling mistake at the end. Below: Evolution in speed over time. Grey lines show in-air movements recorded by the tablet. Credit: © Sonia Kandel for GIPSA-Lab (CNRS/Université Grenoble Alpes/Grenoble INP).

Dyslexia is a reading disorder that affects the ability to adopt the automatic reflexes needed to read and write. Several studies have sought to identify the source of the problems experienced by individuals with dyslexia when they read. Little attention, however, has been paid to the mechanisms involved in writing. CNRS Professor Sonia Kandel and her team studied the purely motor aspects of writing in children diagnosed with dyslexia. Their results show that orthographic processing in children with dyslexia is so laborious that it can modify or impair writing skills, despite the absence of dysgraphia in these children. The findings of this study are published in the November 2017 edition of *Cognitive Neuropsychology*.

Certain students have trouble mastering the writing process. Many of these children suffer from dyslexia, and despite presenting no motor disorders, experience greater difficulties in writing than in reading. A series of studies conducted at the GIPSA-Lab in Grenoble revealed that handwriting is not a simple manual process. The researchers especially focused on the relationship between learning how to spell and the physical writing process. For example, they observed that the gestures involved in writing M-O-N are easier to execute in a word that is pronounced as it is spelled, (e.g. "montagne") than in a word that is orthographically irregular (e.g. "monsieur").

Working with the CHU Grenoble Alpes and CERCA in Poitiers, the researchers then turned their attention to dyslexic children. Dyslexia weakens spelling skills, even when the child presents no motor problems. By varying the degree of word difficulty, researchers were able to analyse the impact of spelling process disorders on handwriting. Tests consisted of writing different categories of words—regular and irregular, common and rare, sensical and nonsensical words. To understand exactly how spelling affected handwriting, the researchers recorded the participants' writing gestures on digital tablets.

Analysis revealed that the act of writing irregular and pseudo words had a particularly noticeable impact on the hand movements of dyslexic children. Spelling became so difficult that it interfered with, and, in some cases, impaired their efforts to write. The children produced irregular, and sometimes, unreadable shapes. Often, such individuals are wrongly identified as "dysgraphic," a condition in which mechanical difficulties affect handwriting. Inaccurate diagnosis results in ineffective treatment therapies and can lead to discouragement in the child.

To provide effective support to dyslexic children, this research suggests that precise diagnosis is needed, along with a treatment protocol that combines spelling and motor aspects.

More information: Sonia Kandel et al, The impact of developmental dyslexia and dysgraphia on movement production during word writing, *Cognitive Neuropsychology* (2017). DOI: 10.1080/02643294.2017.1389706

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