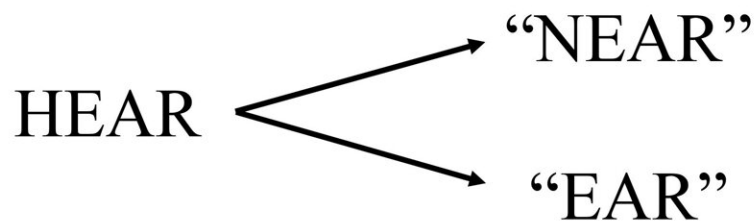


Researchers identify distinct mechanisms underlying reading errors in stroke survivors

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~~Thomas Edison is well known as having been the inventor of countless products, the most successful being the light bulb. But not every device he invented was a success. Edison developed an electric pen that was able to copy writing. It used an electric battery-operated motor to move a needle up and down and create a stencil of the words. The stencil was then put in a press and ink was pressed over the stencil, creating a copy. Edison and his team thought the electric pen was a great product that could be used by lawyers or bankers. The pen was praised by everyone who used it but hardly anyone was buying it. The biggest drawback of the electric pen was the messy acid batteries that people were not willing to deal with. But the electric pen was not completely useless. A few years after its invention an Irish immigrant converted the pen to the first tattoo machine and patented the invention.~~



The paragraph in the top panel depicts whole-word errors, ie, neglect of whole words on the left side. In the bottom panel are examples of within-word errors or unilateral paralexias, ie, where a letter is omitted or substituted. Credit: Kessler Foundation (T. Rich, J. Banks)

A new study has unveiled three distinct cognitive deficits contributing to reading difficulties in individuals with left-sided neglect dyslexia, a

condition that often follows a right hemisphere stroke.

These findings were reported by Timothy J. Rich, Ph.D., OTR/L, from Kessler Foundation and John Palmer, Ph.D., from the University of Washington, in their article titled, "[Neglect dyslexia: Whole-word and within-word errors with parafoveal and foveal viewing](#)." Published [open access](#) in *Experimental Brain Research* on September 29, 2023, the article details how reading accuracy can be differently affected based on the spatial position of a target word and distractor words in their visual fields, shedding light on potential ways to improve post-stroke reading difficulties caused by neglect dyslexia.

"This study is significant as it differentiates between the mechanisms of whole-word omissions and within-word letter errors, which can often be conflated in neglect dyslexia," said Dr. Timothy J. Rich, research scientist in the Center for Stroke Rehabilitation Research at the Foundation. "Understanding these distinctions is crucial for developing more effective rehabilitation techniques that are tailored to the specific deficits exhibited by each patient."

The study involved two [separate experiments](#) with ten stroke survivors experiencing left-sided neglect dyslexia, characterized by the omission of whole words on the left side of a page or the initial (i.e., left-sided) letters within individual words anywhere on the page. These experiments investigated the role of egocentric (viewer-centered) and allocentric (object-centered) spatial frames of reference in reading errors.

Skilled reading requires [information processing](#) of the fixated and the not-yet-fixated words to generate precise control of gaze. In eye movement research on reading, the word(s) adjacent to the fixated word are the parafoveal word(s), while the fixated word is referred to as the foveal word. In the first experiment, participants read words presented in their parafoveal vision, with and without distractor words.

The second experiment repeated the task with the target words presented in their foveal vision (directly in their line of sight). The experiments aimed to discern whether reading errors stemmed from the word's position relative to the viewer or its position within a two-word frame.

The findings reveal a clear distinction between the types of reading errors in neglect dyslexia. Whole-word errors were influenced by the word's egocentric position, with a significant number of errors involving intrusions from the distractor word.

However, this effect was eliminated when the target word was presented foveally, suggesting an egocentric spatial processing deficit. Conversely, unilateral paralysis (errors on the left-sided letters of words) remained consistent regardless of the word's spatial position or the presence of distractors, indicating an allocentric processing deficit within the word itself.

Moreover, the study identified a third deficit—a failure of selective attention—which resulted in whole-word intrusion errors. In the presence of distractors, individuals often reported the distractor word instead of the target word, a compelling demonstration of this attentional deficit.

The results suggest that while whole-word errors are subject to the spatial, distractor, and attentional effects, unilateral paralexias are not, indicating that different rehabilitative approaches are necessary to address each type of [error](#).

"Given the importance of reading ability to recovery after stroke," Dr. Rich emphasized, "there is a pressing need for further studies to develop and refine therapeutic interventions that consider the unique cognitive profiles of those affected by [neglect dyslexia](#)."

More information: Timothy J. Rich et al, Neglect dyslexia: whole-word and within-word errors with parafoveal and foveal viewing, *Experimental Brain Research* (2023). [DOI: 10.1007/s00221-023-06708-4](https://doi.org/10.1007/s00221-023-06708-4)

Data availability: <https://osf.io/7czse>

Provided by Kessler Foundation

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