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Investigation and Rehabilitation of a New Acquired Reading DisorderMcCloskey M.^{a,*}, Schubert T.^a, Rothlein D.^a, Rapp B.^a, Slonim D.^b, Van Den Heuvel K.^b^a Johns Hopkins University^b Westchester Institute for Human Development

We present two cases of a previously-undescribed reading disorder, in which letters and/or digits appear so blurred or distorted as to be unidentifiable, yet other visual stimuli are perceived normally. We propose an interpretation, and report successful rehabilitation results.

MTS is a 12-year-old girl who, at age 10, suffered a hemorrhage from a right basal ganglia arteriovenous malformation. Reading at grade level prior to the stroke, MTS was completely alexic thereafter. She is unable to identify, describe, or copy letters or digits, reporting that she sees only unidentifiable blurs (Fig. 1A). In contrast MTS is intact in identifying and copying geometric shapes, line drawings of objects, and non-alphanumeric symbols (e.g., #, %). These results rule out a low-level perceptual deficit and demonstrate the category specificity of the impairment.

RFS, a 61-year-old geologist suffering from cortico-basal degeneration, is unable to identify, describe, or copy Arabic digits, reporting that he sees an uninterpretable jumble of lines (Fig 1B). RFS also experiences milder perceptual distortion for some letters (Fig. 1C), leading to occasional letter confusion errors. Like MTS, RFS is intact in identifying and copying shapes, line drawings, and non-alphanumeric symbols.

Proposed Interpretation

The interpretive challenge posed by MTS and RFS is to explain why perception as well as identification of letter and digits is selectively impaired. We propose that this pattern results from disruption of feedback from impaired category-specific character recognition processes to earlier levels of visual representation. According to some theorists, feedback is necessary for visual awareness, and shapes the conscious perceptual experience. Disordered feedback from impaired letter and digit recognition processes might therefore lead to disordered perception limited to letters and digits. In developing this interpretation we discuss the relationship of the impairment exhibited by MTS and RFS to other forms of acquired alexia.

Rehabilitation

For both patients we created ‘surrogate’ characters to substitute for the characters affected by the disorder. MTS accurately perceives shapes resembling letters and digits, and is aware of the resemblance. For example, she could perceive two vertically-aligned circles separated by a small gap, and recognized that together they resembled an 8. This observation suggested the possibility of developing surrogate letters and digits different enough from the standard characters that MTS could

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perceive them without blurring, yet similar enough to the standard characters that she could use the resemblance to recognize them. We found that simply adding a double strikethrough to each letter and digit enabled MTS to perceive and identify them (Fig 1D). MTS now reads successfully on a laptop with double-strikethrough fonts installed, and also uses two custom-made iOS apps: a calculator app with double-strikethrough digits, and an app that enables her to photograph a page of text, and then adds strikethrough lines to the characters.

For RFS we created a set of surrogate digit symbols (Fig. 1E). We installed fonts with the new digits on his computer, and also provided a calculator app with the surrogate digits. RFS learned the new digits readily, and now uses them for all of his numerical work.

