

51st Academy of Aphasia Proceedings

Consequences of reduced representational distinctiveness and of temporal instability on reading accuracy in patients with dysgraphia due to orthographic short-term memory damage: A new case and a literature review.

Zazio A.^a, Capasso R.^b, Miceli G.^{a,*}

^a *University of Trento*

^b *SCA Associates, Rome*

Introduction

Orthographic Working Memory (OWM) maintains graphemic strings active until the corresponding words/pseudowords are spelled. OWM damage yields segmental spelling errors on long stimuli, without lexical-semantic effects. In subjects with OWM damage, errors follow a bow-shaped or a linear-increase distribution. These contrasting patterns have been attributed to loss of distinct properties of orthographic representations in OWM. Reduced distinctiveness of elements in the representation mostly affects graphemes in central positions (hence, the bow-shaped distribution), and temporal instability of the orthographic string affects graphemes in proportion to distance from the word's beginning (hence, the linear error increase) (Costa et al., 2012). It has been proposed that the same OWM system is involved not only in word/pseudoword spelling, but also in reading pseudowords – but not words (Caramazza et al., 1996). This is because pseudoword reading, just like word/pseudoword spelling, requires an orthographic string to remain active while further processing stages are completed. In available reports, however, pseudoword reading accuracy is comparable to word reading in some cases, and disproportionately impaired in others. This leads to ask whether a shared OWM system, or distinct input (for reading) and output (for spelling) OWM systems better account for the data.

The hypothesis that orthographic representations in a shared OWM are characterized by representational distinctiveness and temporal stability predicts distinct effects of damage to one vs the other dimension also in reading. Pseudowords should be read poorly when representational distinctiveness is reduced (persistence of the written stimulus should not facilitate performance), and rather accurately when representations decay rapidly (persistence of the written stimulus should compensate for temporal instability). We report on a new case of the first type, and review previous cases.

Case report

FGI is a 73-year old right-hander who developed dysgraphia following a left-hemisphere CVA. Spelling performance was typical of OWM damage. He made segmental errors on 317/331 words (95.8%) and 72/73 pseudowords (98.6%). Performance accuracy was constrained uniquely by length (short vs long words/pseudowords: $p < .001$). Errors had a bow-shaped distribution (Figure 1). FGI

* Corresponding author.

E-mail address: gabriele.miceli@unitn.it.

was asked to read aloud words and pseudowords. He read incorrectly 12/272 words (4.4%), but 82/121 pseudowords (67.8%). All reading errors were segmental, and their distribution was indistinguishable from that of spelling errors (Figure 1).

Discussion

FGI's results conform to the prediction that following OWM damage, reduced representational distinctiveness (shown by bow-shaped error distribution) disproportionately affects pseudoword reading. Similar results emerge from a literature review (Jonsdottir et al., 1996; Caramazza et al., 1996; Tainturier & Rapp, 2003; Cantagallo & Bonazzi, 1996; Costa et al., 2012). In subjects with temporal instability (shown by linear error increase), word and pseudoword reading accuracy are comparable (Costa et al., 2012). Results support the hypothesis that one and the same OWM system is involved in word/pseudoword spelling, and in pseudoword reading.

