An experimental comparison between rival theories of rapid automatized naming performance and its relationship to reading

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Abstract

Two studies investigated the degree to which the relationship between rapid automatized naming (RAN) performance and reading development is driven by shared phonological processes. Study 1 assessed RAN, phonological awareness, and reading performance in 1010 7- to 10-year-olds. Results showed that RAN deficits occurred in the absence of phonological awareness deficits. These were accompanied by modest reading delays. In structural equation modeling, solutions where RAN was subsumed within a phonological processing factor did not provide a good fit to the data, suggesting that processes outside phonology may drive RAN performance and its association with reading. Study 2 investigated Kail's proposal that speed of processing underlies this relationship. Children with single RAN deficits showed slower speed of processing than did closely matched controls performing normally on RAN. However, regression analysis revealed that RAN made a unique contribution to reading even after accounting for processing speed. Theoretical implications are discussed.
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Introduction

Since the seminal work of Denckla and Rudel (1974, 1976) during the 1970s that established the existence of a significant relationship between children's ability to perform well on rapid automatized naming (RAN) tasks and their reading development, extensive research has been carried out to investigate the nature of this relationship. RAN tasks require children to name arrays of familiar items—letters, digits, colors, or objects—as quickly as they can. Although performance on the colors and objects versions of the task is a useful predictor of reading achievement in preliterate children, the alphanumeric versions have been shown to be most strongly and enduringly related to reading. In fact, RAN performance rates alongside phonological awareness as one of the most powerful predictors of reading in the English language and as the strongest predictor of reading in shallow orthographies (Brizzolara, Chilosi, & Cipriani, 2006; Wimmer, 1993).

In addition to its predictive relationship with reading performance (for a meta-analysis, see Swanson, Trainin, Necoechea, & Hammill, 2003), performance on RAN tasks has also been shown to discriminate between good and poor readers (Ackerman & Dykman, 1993; Bowers, Steffy, & Tate, 1998; Denckla & Rudel, 1976) and can also distinguish children with dyslexia from age-matched, typically developing readers. As a result, several competing theoretical accounts have been developed to attempt to explain the relationship between RAN performance and both typical and atypical development. Consistent with the phonological processing deficit theory of developmental dyslexia (Hulme & Snowling, 1992; Snowling, 2002; Stanovich & Siegel, 1994), Wagner, Torgesen, and colleagues (e.g., Wagner & Torgesen, 1987) proposed that RAN tasks are an index of the speed with which phonological information can be accessed from memory and, thus, are best described as tapping into an aspect of phonological processing. In contrast, Wolf and Bowers (e.g., Bowers & Wolf, 1993; Wolf & Bowers, 1999) proposed that RAN tasks index processes that are, at least in part, independent of phonology and have put forward a double-deficit theory of developmental dyslexia. According to double deficit theory, reading disability can be caused either by phonological processing deficits, by RAN deficits, or (in the most severe cases) by a combination of both deficits. Although the mechanisms driving RAN performance have not yet been fully specified, Wolf and Bowers (1999) proposed that the cognitive deficits that lead to poor RAN performance affect reading by interfering with the quality of orthographic representations themselves and with the forming of links between orthographic and phonological representations that are crucial for reading.

A critical issue in discriminating between the two theoretical positions outlined above concerns how separable RAN performance deficits are from phonological processing deficits more generally. Given that RAN performance has generally been shown to correlate with phonological awareness, a pertinent question is whether RAN deficits occur in the absence of phonological deficits. Also critical is the question of whether a single RAN deficit can cause reading problems. Considerable research has investigated these issues, but the evidence so far remains equivocal. In support of double deficit theory, Bowers and Wolf (e.g., Bowers, 1995; Bowers & Wolf, 1993; Wolf & Bowers, 1999) provided evidence that RAN deficits can occur independently of phonological awareness problems. They identified separate subgroups of reading-disabled children with a single RAN deficit, children with a single phonological awareness deficit, and children with problems in both domains. As predicted, the children with a double deficit showed the most profound