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Multicomponent view of vocabulary acquisition: An investigation with primary grade children

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ABSTRACT

The role of working memory in vocabulary acquisition has been well established in the literature. In this study, we proposed and empirically tested the multicomponent view of vocabulary acquisition, which states that multiple language and cognitive skills are involved to facilitate phonological and semantic representations needed for vocabulary acquisition. Working memory and attention were hypothesized to be directly and indirectly related to vocabulary, whereas inference and morphosyntactic knowledge were hypothesized to be directly related to vocabulary (measured by the Picture Vocabulary Test of the Woodcock–Johnson III battery). Results from 262 kindergartners using path analysis revealed that all the multiple cognitive and language skills were directly related to vocabulary after controlling for age, gender, racial/ethnic backgrounds, socioeconomic status (as measured by free or reduced-price lunch eligibility), and each other. Furthermore, working memory and attention also made indirect contributions via inference and morphosyntactic knowledge. Total effects (beta weights), accounting for direct and indirect effects, were .33 for working memory, .23 for attention, .18 for inference, and .18 for morphosyntactic knowledge. These results indicate that although working memory is important, contributions of other language and cognitive skills should be considered in vocabulary acquisition. Theoretical and practical implications are discussed.

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Introduction

Vocabulary learning is an enormous task. According to one estimate, students are exposed to roughly 88,700 different word families in school between kindergarten and Grade 12 (Nagy & Anderson, 1984). Approximately half of these words are learned, on average, which translates to 3000–4000 new words per year, or 8–11 new words per day (Graves, 2006; Stahl & Nagy, 2006; White, Graves, & Slater, 1990). However, this estimate is an "average." Some children learn more than 3000–4000 words per year, whereas others learn fewer words. Given the importance of vocabulary in language and literacy acquisition (Kim, 2015, 2016, 2017; National Institute of Child Health and Human Development [NICHD], 2000; National Research Council, 1998), it is vital to have a clear understanding about factors involved in vocabulary acquisition.

One well-known factor for vocabulary acquisition is an environmental one, exposure frequency and quality. Vocabulary learning is essentially associative learning—associating sequences of sounds to meaning (McMurray, Horst, & Samuelson, 2012; Pressley, Mohan, Raphael, & Fingeret, 2007). Therefore, repeated and persistent stimulation is needed for the strength of association between phonological sequences and meaning. The effect of input or exposure frequency in vocabulary acquisition has been well demonstrated. For instance, Hart and Risley (1995) showed how frequency of vocabulary exposure in the home is strongly related to children's vocabulary size. This finding has been replicated in several studies (Hoff, 2003a, 2003b; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Pan, Rowe, Singer, & Snow, 2005). Of course, language acquisition does not solely depend on frequency of input. Language learning occurs with a goal of achieving communication goals in the context of social interactions (Rice, 1989; Snow, 1983). Therefore, quality of interaction, such as semantically responsive interactions where children's immediate interests are recognized and extended, is also important to vocabulary acquisition (e.g., Burchinal et al., 2008; Hirsh-Pasek et al., 2015; Hoff, 2003b).

Given these findings, it is not surprising that many vocabulary intervention studies have focused on effective ways to create opportunities for students to get systematic quality exposure to target vocabulary words (see Elleman, Lindo, Morphy, & Compton, 2009, and NICHD, 2000, for reviews). These studies have demonstrated that explicit instruction does help children to acquire vocabulary. Low-intensity instruction (e.g., providing definitions) can help children to learn approximately 22% of taught vocabulary words, whereas high-intensity instruction (e.g., in-depth discussion with various activities; Beck, Perfetti, & McKeown, 1982) can facilitate learning of 41–43% of taught words (Biemiller & Boote, 2006). However, there is one consistent and critical finding that has not received its due attention in these previous studies: large individual differences in the amount of words learned. As an example, in Jenkins, Stein, and Wysocki's (1984) study, fifth graders were exposed to target vocabulary words embedded in stories six times (i.e., incidental learning) and were asked to provide meanings of the target words. Large individual variations were observed across students' comprehension abilities, such that the standard deviation (28.9) was as large as the mean (29.4) for the low-comprehension ability group. Large variations in the amount of vocabulary learning have also been found in direct instruction of vocabulary. For instance, Coyne et al. (2010) provided direct and extended vocabulary instruction to kindergartners from high-poverty schools. In addition to the mean intervention effect, there were large variations across treatment conditions. Similar large variations around mean intervention effects have been reported in other studies (e.g., Silverman, 2007; Silverman & Hines, 2009; Townsend & Collins, 2009). Then, there are a couple of naturally rising critical questions. Why do some children learn more vocabulary words than others even when the amount of exposure is similar or the same? What child characteristics (i.e., cognitive and language factors) underpin vocabulary acquisition?

Working memory and vocabulary acquisition

Vocabulary acquisition requires storing sound sequences and mapping those to meaning. Therefore, the capacity in "encoding, maintenance, and manipulation of speech-based information," verbal working memory (also called phonological memory; Gathercole, Willis, Emslie, & Baddeley, 1992, p. 887), is essential in vocabulary acquisition. In the current study, we refer to this as the core working