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Working memory and comprehension in children with specific language impairment: what we know so far

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Abstract

Many children with specific language impairments (SLI) demonstrate deficits in the areas of verbal working memory and language learning/processing. In this article, evidence is reviewed suggesting that the lexical/morphological learning and sentence comprehension/processing problems of many of these children are associated with their deficient working memory functioning. Evidence is also reviewed for the possibility that deficient working memory provides a clinical marker of SLI. A number of potentially useful assessment and intervention techniques are offered, as well as several directions for future research.

Learning outcomes: The reader will be introduced to two prominent models of verbal working memory (phonological working memory model, functional working memory) and how each model potentially relates to (a) various language abilities in typically developing children, (b) the morphological and lexical learning abilities in children with specific language impairment (SLI), and (c) the sentence comprehension of children with SLI. The reader will also be provided a variety of clinical suggestions on how to assess and treat the working memory and language processing problems of children with SLI. Finally, some suggestions for future research will also be offered.

Keywords: Specific language impairment; Children; Working memory; Comprehension

It has only been within the past 12 years or so that researchers have begun to examine the potential role of working memory (WM) on the language learning

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and processing abilities of children with specific language impairment (SLI) (e.g., Ellis Weismer, 1996; Gathercole & Baddeley, 1990a; Montgomery, 1995b, 2000a, 2000b, 2002). While there are two prominent models of working memory, the phonological loop model (Baddeley, 1986) and the capacity theory of comprehension (e.g., Just & Carpenter, 1992), much of the research with children, including children with SLI, has been dominated by Baddeley's phonological loop model. In this article, the extant literature on what is known about the association between WM and language learning and processing in these children will be reviewed.

Working memory according to Baddeley (1986) is a multicomponent, capacity-limited system that comprises a controlling "central executive" and that includes an articulatory loop system. The central executive, the component that is not well understood, is thought to regulate information flow within WM, retrieval of information from other memory systems, and the processing and storage of information. The articulatory loop, the better understood component, includes a capacity-limited phonological short-term store and an articulatory control process (verbal rehearsal) that acts to refresh and maintain speech material in the store for a brief period. The articulatory loop's function is to store verbal input temporarily, especially novel phonological input (Baddeley, Gathercole, & Papagno, 1998), while other cognitive tasks such as auditory comprehension take place. The ability to temporarily store novel material also allows the listener the opportunity to create long-term phonological representations of that material (Baddeley et al., 1998). This view of WM will hereafter be referred to as phonological working memory (PWM).

In most studies, typically developing preschool and young school-age children's PWM ability has been assessed using a nonword repetition task in which they were asked to repeat nonwords varying in length from one to four or five syllables. Because the task uses unfamiliar content, such a task can serve as an unbiased measure of language processing that assesses the functions of the phonological loop (Campbell, Dollaghan, Needleman, & Janosky, 1997; Ellis Weismer et al., 2000). The typical pattern is that children have no difficulty repeating one and two syllable items but by three syllables, repetition accuracy begins to decrease, reflecting the capacity-limited nature of the phonological store. Children with "greater" PWM capacity than those with less capacity show better accuracy for longer items. The logic behind the task is that poor performance reflects a basic language-related processing ability that should be critical to the processing and learning of language. Indeed, many studies report a positive relation between children's PWM and word learning (Avons, Wragg, Cupples, & Lovegrove, 1998; Gathercole & Baddeley, 1989, 1990b; Gathercole, Service, Hitch, & Martin, 1997; Gathercole, Willis, Emslie, & Baddeley, 1992) and expressive skills (Adams & Gathercole, 1995). Although there are no direct data yet, it has been argued that PWM may also play an important role in children's grammatical and morphological learning (Nelson, 1987; Plunkett & Marchman, 1993; Speidel, 1993).