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# The word length effect in children with language impairment<sup>☆</sup>

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## Abstract

Two types of serial word recall tasks (full verbal recall and probed recall) were administered to 11 children with language impairment and 22 language-normal children matched for productive language or chronological age. The methods were designed to take into account age-related differences in the use of subvocal rehearsal, as measured by the word length effect. The word length effect was significant for all three groups in full recall, but not in probed recall, supporting the hypothesis that children with language impairment demonstrate limited capacity for processing verbal output. Discussion focuses on the importance of considering developmental factors in measuring short-term memory effects in children with language impairment.

**Learning outcomes:** As a result of this activity, the participant will be able to describe the phonological loop hypothesis and discuss the interactions between working memory and language performance in children with language disorders.

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*Keywords:* Working memory; Phonological loop; Serial word recall; Rehearsal; Language impairment; Language disorder; Children

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In the past decade, there has been an accumulation of evidence supporting a positive relationship between the development of language abilities and short-term memory functioning in normally developing children (Adams & Gathercole, 1995; Gathercole & Baddeley, 1989; Gathercole, Willis, Emslie, & Baddeley, 1992; Leather & Henry, 1994; Michas & Henry, 1994; Speidel, 1993). Such studies indicate that performance on a range of short-term memory tasks tends to be better in children who are good readers (Leather & Henry, 1994), have good oral language skills (Speidel, 1993), have faster rates of articulation (Baddeley, 1986; Cohen & Heath, 1990; Stigler, Lee, & Stevenson, 1986), and good vocabulary skills (Gathercole & Baddeley, 1989; Gathercole et al., 1992; Michas & Henry, 1994).

Conversely, children who have difficulty learning language, such as language-impaired children, tend to do poorly relative to normally developing children on measures of short-term memory (Ellis Weismer, Evans, & Hesketh, 1999; Gathercole & Baddeley, 1990; Gillam, Cowan, & Day, 1995; Kirchner & Klatzky, 1985; Shear, Tallal, & Delis, 1992; Sininger, Klatzky, & Kirchner, 1989). Such correlations have led to the assertion that short-term memory skills are directly involved in language learning (Gathercole & Baddeley, 1990; Gathercole et al., 1992), and that language impairment may result from poor short-term memory function (Gathercole & Baddeley, 1990). The hypotheses advanced to explain the nature and source of the difficulties are numerous (see Windsor, 2002 for a review). In general, children with language impairment tend to recall less information; however, findings are inconsistent with respect to the reasons for this diminished performance. One explanation is that poor performance on both language and short-term memory tasks can be explained by general cognitive processing deficits, such as diminished processing capacity (Ellis Weismer et al., 1999) or decreased processing rate (Lahey, Edwards, & Munson, 2001). Another proposal is that language impairment results from a breakdown specifically in the short-term memory system that deals with auditory–verbal information (Gathercole & Baddeley, 1990).

The latter account is based on the working memory model developed by Baddeley and coworkers (Baddeley, 1976; Baddeley & Hitch, 1974; Hitch & Halliday, 1983; Vallar & Baddeley, 1984). This model consists of a three-part system, containing a central executive, which controls attention and selects and operates other relevant processes, a visuo-spatial sketchpad, for temporary storage and manipulation of visual information, and a phonological loop, for the temporary storage and manipulation of speech-based information. It is the phonological loop portion of this model that has been most closely associated with language development.

The phonological loop is composed of a phonological store and a rehearsal process, both of which are limited in capacity, and both of which deal exclusively with speech and speech-like information. Together, the phonological store and the rehearsal process form an information “loop,” allowing auditory information to be recirculated until it can be more deeply processed. Rehearsal, the process of subvocal repetition, refreshes memory traces by recycling information back into the phonological store.

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