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# Verbal Memory Impairments in Dyslexia

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*Although verbal memory deficits are frequently reported in reading disabled children, the specific mechanisms underlying these impairments have yet to be clearly defined. The present study used the California Verbal Learning Test-Children's Version (CVLT-C) to assess verbal learning in 57 dyslexic children and 114 controls matched for gender, age, and WISC-R Vocabulary score. Three areas of verbal memory were investigated: Recall and recognition, use of learning strategies, and interference effects. The dyslexic group learned the list items more slowly, recalled fewer words on the last learning trial and the delayed trials, and performed less well on the recognition condition. Dyslexics and controls displayed similar vulnerability to interference, but group differences were evident in serial position effects. Taken together, our data suggest that dyslexics have less efficient rehearsal and encoding mechanisms, resulting in deficient encoding of new information, but normal retention and retrieval. © 1999 National Academy of Neuropsychology. Published by Elsevier Science Ltd*

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Evidence documenting subtle language processing difficulties in disabled readers has been accumulating since the 1960s (Kinsbourne & Warrington, 1963). A range of language difficulties has been posited, including syntax (Vogel, 1974), phonology (Lieberman, Shankweiler, Fischer, & Carter, 1974), and rapid naming (Denckla & Rudel, 1976). In his comprehensive review of alternative explanations for reading disabilities, Vellutino (1977) concluded that the most compelling research evidence pointed to deficiencies in verbal processing as the probable etiology.

Consistent with their underlying difficulties with language processing, children and adults with developmental reading disability generally perform less well than controls on

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a range of verbal learning tasks, including story recall (Felton, Wood, Brown & Campbell, 1987; O'Neill & Douglas, 1991), paired-associate learning (Helfgott, Rudel & Kairam, 1986; Vellutino, Steger, Harding, & Phillips, 1975) and list learning (Douglas & Benezra, 1990; Felton et al., 1987; Kinsbourne, Rufo, Gamzu, Palmer, & Berliner, 1991; McGee, Williams, Moffitt & Anderson, 1989; Michaels, Lazar, & Risucci, 1997; Rudel & Helfgott, 1984). Importantly, these memory deficits seem to be restricted to the domain of *verbal* memory; children with dyslexia generally perform well on tasks requiring visual memory (Fletcher, 1985; Liberman et al., 1982; Nelson & Warrington, 1980).

The specific mechanisms underlying these verbal memory impairments have yet to be clearly defined. One area of debate concerns whether the primary difficulty is one of acquisition or retrieval. Although children with dyslexia often perform poorly when required to recall previously presented verbal information, this performance may reflect a deficit in the initial encoding and storage of the information or, alternately, a deficit in retrieving information that has been stored. Using a selective reminding paradigm, Fletcher (1985) found that subjects with reading and spelling deficits failed to differ from controls on a storage measure, but did perform significantly less well on a retrieval index, suggesting that the locus of memory impairment in reading disabilities is at the level of retrieval. On the other hand, Nelson and Warrington (1980) reported that dyslexic children have poorer performance than controls on a recognition memory test for words. Because recognition paradigms are thought to maximally aid retrieval, deficits in recognition memory are typically interpreted as indicating more of an encoding problem (Klatzky, 1980). In summarizing the results of several experiments, Nelson and Warrington (1980) concluded that dyslexic children had deficits in long-term verbal memory storage and were less proficient in the acquisition of new information, but were normal in the rate that they accessed information.

Other investigators have examined the possibility that the memory impairment in learning disabilities is related to less efficient encoding strategies. Active rehearsal is generally thought to aid acquisition and retention, and age-related growth in rehearsal is associated with superior performance on memory measures (Kail, 1990). To assess rehearsal in children with learning disabilities, Bauer (1977) examined serial position effects, positing that primacy items, by virtue of being presented early, would receive the most rehearsal and be most likely encoded into long-term memory. On the other hand, recency items are more likely to be retrieved from a short-term memory storage system. Bauer reported that the learning disabled group recalled fewer words than controls from the primacy region, but the same number of words as controls from the recency region. Cermak (1983) also found that although normal readers tended to rehearse several words simultaneously, subjects with dyslexia were more likely to rehearse only the word currently being presented. These findings invite the hypothesis that reading disabled children are deficient in their use of rehearsal strategies.

There have been few studies investigating whether or not children with reading disabilities exhibit increased vulnerability to interference on verbal memory tasks. Cermak (1983) found that learning disabled children recalled as many words as controls when the interval between item presentation and recall was filled with nonverbal tasks. When the distracting material was semantically related to the to-be-learned material, however, the learning disabled children recalled fewer words than controls, suggesting increased vulnerability to semantically related retroactive interference. Nelson and Warrington (1980) reported that their subjects with dyslexia demonstrated normal build-up and release from proactive interference. Although these findings suggest that children with impaired reading may be more vulnerable to particular types of interference, little is understood about interference effects in dyslexia.

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