



Memory functioning and mental verbs acquisition in children with specific language impairment

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ABSTRACT

Memory and language operate in synergy. Recent literature stresses the importance of memory functioning in interpreting language deficits. Two groups of 50 children each, ages 8–12 were studied. The first group included children with specific language impairment, while the participants in the second group were typically developing children. The two groups, which were matched on age, nonverbal intelligence and varied significantly in verbal ability were examined, using a test battery of four memory functioning (phonological, working and long-term memory) and five mental verb measures. The statistical analyses indicated that the two groups differed significantly in all language and memory measures; a logistic regression analysis revealed that within each main group existed nested subgroups of different developmental patterns with working and long-term memory measures as the most robust discriminate markers of classification. Language impaired children had more difficulties in the acquisition of mental verbs because they are less able to process and store phonological information in working memory and long-term lexicon.

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1. Introduction

The term specific language impairment (SLI) refers to a constellation of various deficits which cover a wide spectrum of disorders, such as phonology, lexicon, syntax, pragmatics, memory or a combination of these (Bishop, 1997; Leonard, 1998). More than three decades of intensive research has demonstrated that children with developmental language disorders display diminished language skills despite having normal non-verbal intelligence and hearing, and no signs of neurological impairments, behavioural or social. The present study aimed to investigate the relationship of memory functioning and mental verb acquisition in Greek-speaking children, providing evidence from another language and, thus, enriching the current literature relative to language disorders mostly confined to English-speaking children.

Research on SLI has accumulated a bulk of evidence which covers a wide spectrum of linguistic phenomena at receptive and expressive levels. A number of representative studies indicated that children with SLI are deficient in phonology (Munson, Kurtz, & Windsor, 2005); less able to acquire lexicon (McGregor, Newman, Reilly, & Capone, 2002; Moyle, Ellis Weismer, Evans, & Lindstrom, 2007); less apt to understand sentence structure and/or sentential semantics (Bishop & Norbury, 2002; Montgomery, 2004; van der Lely, 2005); less capable to use morphosyntactic information (Leonard, Eyer, Bedore, & Grela, 1997; Rice, Tomblin, Hoffman, Richman, & Marquis, 2004); not able to appreciate pragmatics (Bishop & Norbury, 2002); and less efficient at comprehending and retrieving text (Norbury & Bishop, 2003).

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The very few studies which appeared in the literature concerning Greek-speaking children with SLI show that children with SLI experience difficulties compared to typically developing children (TDC) in comprehending thematic roles, i.e. grammatical subject-object relations in complex main-relative clauses (Stavrakaki, 2001) and in using pro- and post-verb clitics (pronominals) relative to their peers (Petinou & Terzi, 2002). It has also been demonstrated that Greek-speaking children with SLI differed in appreciation of semantic and pragmatic properties linked with a class of mental verbs (Spanoudis, Natsopoulos, & Panayiotou, 2007).

Two schools of thought attempt to account for developmental language learning disorders (Ellis Weismer, Evans, & Hesketh, 1999; Ullman & Pierpont, 2005). According to competence-based accounts, language difficulties are directly associated with linguistic functioning, such as morphosyntactic rules (Rice, 2000). With respect to performance-based models, language difficulties in children with SLI lie out of modular boundaries of the linguistic 'system', and might be related to the cognitive system in general (Joanisse & Seidenberg, 1998). Pertaining to the second school, three different accounts have been proposed for language difficulties. The first argues that the problem lies in acoustic-perceptual level (Tallal, 2003); the second assigns language impairments to deficiency of memory functioning, especially working memory (Baddeley, 2003; Baddeley, Gathercole, & Papagno, 1998; Gathercole, 2006; Montgomery, Magimairaj, & Finney, 2010). The third approach theorizes that a slower speed of processing in language-disordered children compared to peers, could be considered as strong evidence of general processing capacity problems (Leonard et al., 2007; Miller, Kail, Leonard, & Tomblin, 2001).

Within the frame of the second approach, mentioned above, there have been two proposed models; one by Baddeley and colleagues and the second by a number of other researchers. The model by Baddeley and his colleagues (Baddeley, 2003; Baddeley et al., 1998) has been the most influential because it lends itself to the empirical study of language development in children with SLI. According to this model, the cause of linguistic deficits experienced by language impaired children lies in phonological working memory. The second model attributes the language and cognitive difficulties of these children to limitations in verbal working memory capacity (Ellis Weismer et al., 1999; Marton & Schwartz, 2003; Montgomery, 2000, 2003).

1.1. The role of phonological and verbal working memory in language learning

Recent findings suggest that inefficient functioning of working memory, reflecting possible impairment of the phonological store, is placed within the phonological loop (cf. Baddeley et al., 1998). This deficient functioning may also have atypical lexical development as a direct outcome and cause, in turn, disorders of grammatical and pragmatic development in children. Additional research data also indicate that difficulties in learning new words and sustaining sequences of words in working memory have often been observed in children with SLI (McGregor et al., 2002).

The evidence accumulated so far relative to phonological working memory functioning in children with language impairment resulted from performance on nonword repetition task, an experimental technique used extensively by Baddeley and his colleagues as an index of phonological memory weakness. There are findings (e.g., Conti-Ramsden, 2003) supporting the view that the nonword repetition task is a reliable phenotypic marker of developmental language impairment. However, a recent meta-analysis examining the sources of variability in mixed results with nonword repetition task revealed that test characteristics may differentially tax children with SLI compared to TDC (Graf Estes, Evans, & Else-Quest, 2007).

Going beyond the theoretical and psychometric significance of nonword repetition task, some investigators (Ellis Weismer et al., 1999; Marton & Schwartz, 2003; Montgomery, 2003) feel that the central executive mechanism may also be involved in language disorders. They emphasize the notion that the de-allocation of working memory resources to processing away from storage by children with SLI adversely affects their competence to deal with language incoming information. This, finally, ends up with a degradation of language output. For those investigators, however, who adhere to the connectionist approach (cf. MacDonald & Christiansen, 2002) the storage of language knowledge, namely long-term or semantic memory, is not distinct from the concept of working memory capacity as significant differences have been indicated in the recall of high vs. low frequency target words embedded in sentences, and in expressive and receptive language measures in children with SLI compared to TDC (Mainela-Arnold & Evans, 2005).

On the other hand, investigators who advocate for the involvement of verbal working memory in the manifestation of SLI, utilize verbal complex working memory tasks like reading or listening span tasks (cf. Daneman & Carpenter, 1983) in studying verbal working memory either as immediate or as long-term memory systems. Sentence recall is another measure of working memory increasingly used as a standardized and experimental index of verbal working memory capacity of children with language disorders. Alloway and Gathercole (2005) found that sentence recall tapping both short- and long-term memory is associated with language skills.

Very few studies have investigated the memory functioning of children with language impairment with high level language, such as narrative discourse. Comprehending narratives requires the ability to encode the meaning of speech flow and/or text, utilizing contextual information, conceptual and general inferential linguistic knowledge. According to Botting (2002) narratives have the advantage of being an ecologically valid measure of language and communicative ability. The current literature shows that SLI children's narrative ability is significantly lower than that of typical controls and is associated with poor verbal working memory (Bishop & Donlan, 2005; Dodwell & Bavin, 2008).

In a similar spirit, Adams and Gathercole (2000) stress the need for greater specificity of the fractionated working memory model, in order to investigate how working memory deals with stored linguistic knowledge (lexicon and grammar) when

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