



# The impact of lexical frequency on sentence comprehension in children with specific language impairment



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## ABSTRACT

Children with SLI generally exhibit poor sentence comprehension skills. We examined the specific impact of grammatical complexity and lexical frequency on comprehension performance, yielding contrasting results. The present study sheds new light on sentence comprehension in children with SLI by investigating a linguistic factor which has attracted little research interest: the impact of the lexical frequency of known words on sentence comprehension. We also examined the impact of grammatical complexity and sentence length by independently varying these two factors. Fifteen children with SLI, 15 age- and IQ-matched controls, and 15 controls matched on lexical and grammatical skills, performed sentence comprehension tasks in which three linguistic factors were manipulated: lexical frequency (sentences containing words of either low or high lexical frequency), grammatical complexity (sentence containing either a subject relative clause or an object relative clause) and sentence length (either short or long sentences). Results indicated that children with SLI performed more poorly overall compared to age- and IQ-matched children and to lexical and morphosyntactic age-matched children. However, their performance was not more affected by either sentence length or clause type than that of control children. Only lexical frequency affected sentence comprehension to a greater extent in children with SLI relative to the control groups, revealing that SLI children's sentence comprehension abilities are particularly affected by the presence of low-frequency but familiar words.

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## 1. Introduction

Children with SLI exhibit major morphosyntactic deficits, which have led to the hypothesis that grammatical impairments are the core deficit in SLI (e.g., van der Lely, 2005). In recent years, sentence comprehension has emerged as a topic of increasing research interest. Two potential causal factors have been adduced in an effort to explain comprehension problems in children with SLI: grammatical complexity and sentence length. However, surprisingly few studies have dealt with the impact of lexical processing on sentence comprehension in children with SLI, despite the lexical problems often seen in this patient population (McGregor, 1997). The aim of the present study is to provide a detailed analysis of sentence comprehension deficits in children with SLI by assessing the impact of three linguistic factors on sentence comprehension: sentence length, grammatical complexity (as assessed by clause type) and the lexical frequency of constituent words.

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### 1.1. Sentence comprehension in children with SLI: where do we stand?

Children with SLI consistently show deficiencies in the comprehension of transitive sentences. They exhibit difficulties in interpreting reversible transitive passive and active sentences, especially in instances when semantic or pragmatic knowledge cannot guide them (Bishop, Bright, James, Bishop, & van der Lely, 2000; van der Lely, 1998; van der Lely & Harris, 1990). Short passive sentences also appear to be particularly difficult to process for SLI children, insofar as they exhibit a strong preference for adjectival passive interpretations (Norbury, Bishop, & Briscoe, 2002; van der Lely, 1996). Difficulties in assigning reference to pronouns and reflexives have also been reported (Bishop et al., 2000; van der Lely, 1998; van der Lely & Stollwerck, 1997). van der Lely and Stollwerck (1997) showed that when ascribing a pronoun to its antecedent, children with SLI were especially sensitive to semantic-conceptual lexical knowledge.

Studies with Hebrew-speaking children have shown that children with SLI manifest specific impairments in processing sentences that contain an object relative clause (Friedmann & Novogrodsky, 2004, 2007). The impairments underlying their difficulties in processing subject relative clauses are less clear. Friedmann and Novogrodsky (2004) (see also Levy & Friedmann, 2009) found that children with SLI did as well on processing subject relative clauses as they did on processing simple SVO sentences. However, Stavrakaki's (2001) study of SLI Greek-speaking children showed that this patient population sometimes performed at the same level as, and sometimes worse than, language-matched children on sentences with a subject relative clause. Davies (2002) also found that English-speaking children with SLI show deficits in judging the grammaticality of a range of negative constructions, in comparison to both language-matched and age-matched control children. This was true both for declarative sentences and subject questions, but the deficit was particularly marked for object questions. Finally, Levy and Friedmann (2009) observed that comprehension over a wider range of reversible sentences, i.e., sentences in which the canonical order of arguments is not maintained, may also be impaired in children with SLI.

These various sentence comprehension difficulties have generally been explained in terms of a selective impairment of the grammatical system. It has been further proposed that children with SLI have specific difficulties in building hierarchical grammatical structures when nonlocal syntactic dependencies have to be computed and no semantic or pragmatic cue is available (van der Lely, 2005; van der Lely & Harris, 1990). Others have proposed that the assignment of thematic roles itself, rather than the ability to construct a given grammatical structure, is impaired in children with SLI. This hypothesis would account for specific problems observed when the argument order is non-canonical, as in object relative clauses (Friedmann & Novogrodsky, 2004, 2007; Levy & Friedmann, 2009).

### 1.2. The impact of sentence length on sentence comprehension in SLI

Other authors suggest that children with SLI suffer from difficulties in processing complex information rather than from a core impairment at the level of grammatical structures. Studies that pursue this line of argument have explored factors affecting sentence complexity, such as sentence length, and their impact on sentence comprehension abilities in children with SLI. A number of studies have revealed that children with SLI have specific difficulties in comprehending long sentences relative to age- and vocabulary-matched control children. Montgomery (1995, 2000a, 2000b) showed that children with SLI are particularly poor at comprehending long redundant sentences, i.e., sentences containing elements which are nonessential to sentence interpretation. However, in these studies, sentence length might have been confounded with grammatical complexity. Montgomery lengthened the sentences in various ways, most notably through the addition of a single embedded subject relative clause and the addition of a double embedded subject-and-object relative clause. It would be difficult to assert that comprehension deficits in children with SLI are to be explained exclusively in terms of increased sentence length, given that, in the Montgomery study, longer sentences were also of greater grammatical complexity. This is further corroborated by previous studies which have shown that children with SLI have problems in processing relative clauses (Friedmann & Novogrodsky, 2004; Stavrakaki, 2001). Other studies have demonstrated that syntactic complexity (presence/absence of a relative clause; subject/object relative clause) rather than sentence length might account for SLI children's poor performance in the comprehension of long sentences (Marton & Schwartz, 2003; Montgomery, Evans, & Gillam, 2009; Robertson & Joanisse, 2010). Moreover, Marton, Schwartz, Farkas, and Katsnelson (2006) have observed that the lengthening of sentences in some languages may be associated with an increase in morphological complexity, which can explain difficulties in processing long sentences. A more recent study assessed how a specific increase in sentence length, without modifying sentence structure, affects SLI children's sentence comprehension (Leonard, Deevy, Fey, & Bredin-Oja, 2013). No significant impact of increased sentence length on performance in children with SLI was observed when the added adjectives were semantically superfluous; however, a significant impact was noted when the added adjectives had to be retained in order to provide the correct response. The impact of sentence length on sentence comprehension in children with SLI thus remains unclear.

### 1.3. The impact of lexical frequency on sentence comprehension

Various studies have revealed the significant impact of lexical variables on sentence processing (MacDonald, 1997). Adults are generally slower at reading sentences containing words of low lexical frequency than sentences containing words of high lexical frequency (Keller, Carpenter, & Just, 2001; Prat, Keller, & Just, 2007). This effect has also been observed in

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