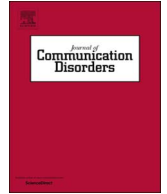




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# Direct object pronoun sentence processing in Spanish-English children with/without Specific Language Impairment and adults: A cross-modal priming study



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### ABSTRACT

**Purpose:** This paper examines whether bilingual children with Specific Language Impairment (SLI) showed limited comprehension of Direct Object (DO) pronoun sentences and/or morphosyntactic priming compared to children with Typical Language Development (TLD) and adults. We analyzed the relation of these morphosyntactic processes to other psycholinguistic abilities, according to the MUC (Memory-Unification-Control) model.

**Method:** Ten bilingual native Spanish-speaking children with SLI (8;3–10;6) and 10 age-matched children with TLD (7;6–10;10) received a psycholinguistic evaluation in Spanish-English. The 20 children and 10 adults (19–34) performed an on-line cross-modal pronoun task. They listened to long distance animate DO pronoun sentences, and filler sentences without any pronoun. At the offset of the pronoun in each pronoun sentence, a picture of an animal for the antecedent (match condition), another animal for the second noun (mismatch), or an unrelated object (neutral) was displayed on the screen. In the filler sentences, a picture of an object that depicted the first noun, appeared at the offset of another later noun. Participants decided whether that pictured item was “alive”/“not alive” by pressing two keys on the computer keyboard. Immediately after, they answered an oral comprehension question about the DO pronoun sentence.

**Results:** Bilingual children with SLI showed significantly poorer comprehension of DO pronoun sentences than bilingual children with TLD. Pronoun sentence understanding in the overall children correlated significantly with oral sentence completion, expressive vocabulary abilities, auditory story comprehension, and the non-word repetition task, all in Spanish. Adults showed significantly the highest pronoun sentence comprehension, and the fastest animacy decisions across conditions; it was the only group showing a significant behavioral morphosyntactic priming effect. All groups exhibited high accuracy in the animacy decisions across conditions, although children with SLI showed lower accuracy and more variability.

**Conclusion:** Bilingual Spanish-English children with SLI showed significant limitations in understanding long distance animate DO pronoun sentences. The deficits were also related to weak morphosyntactic, lexical, and/or phonological representations stored in their memory. These processes may be harder to combine in the unification process, and also to control for answering the comprehension questions. Clinical and educational implications are discussed.

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## 1. Introduction

Research on sentence processing deficits and new markers of Specific Language Impairment (SLI) are still critically needed for bilingual speakers of Spanish-English, as we will explain below (Girbau, 2017a). Spanish and English are the second and third most widely used native languages worldwide respectively. The present paper analyses limitations in processing and comprehension of long distance Direct Object (DO) pronoun sentences for bilingual Spanish-English children with SLI, as compared to children with Typical Language Development (TLD) and adults. DO pronouns are an extraordinarily common grammatical structure in Spanish-English languages. In Spanish these pronouns encode gender and number through suffixation in relation to an antecedent/noun with gender and number markers too. In the English language, the *noun* marker is number, but not gender, although DO pronouns encode both in singular forms but not plural (e.g., them).

### 1.1. Specific Language Impairment

Children with SLI have receptive and/or expressive language abilities that are significantly below those of age-matched children with TLD, in the absence of hearing/developmental deficits, autism, and severe neurological impairment (Bishop & Leonard, 2014; Leonard, 2014; Schwartz, 2009). Children with SLI usually show significantly limited vocabulary, errors in verbal tense, and difficulties recalling sentences/pseudowords, understanding sentences, and/or understanding/telling stories. Some previous research also supported a generalized slow processing pattern in children with SLI (e.g., Kail, 1994; see Girbau, 2014, for a brief review). These deficits have varyingly been attributed to cognitive deficits in central processes underlying language production/understanding, such as working memory, executive functions, or resource capacity (Bishop & Leonard, 2014; Leonard, 2014; Schwartz, 2009). As we will detail later, children with SLI may show some difficulties establishing long-distance grammatical relations for sentence comprehension/production, including anaphors as direct object and reflexive pronouns (e.g., Bedore & Leonard, 2001, 2005). More recent studies have found that the deficits in SLI are associated to neural limitations. For example, MRI (Magnetic Resonance Imaging) research has revealed some gray-white brain matter and cerebrospinal fluid volume alterations, especially lower gray matter volume at the right postcentral parietal gyrus, in children with SLI (e.g., Girbau, Garcia, Marti, & Schwartz, 2014). More investigation is needed to better understand the psycholinguistic markers and neural architecture behind SLI.

### 1.2. Direct object pronoun sentence production and understanding in Spanish children with SLI

While there is some research on production of DO pronoun sentences by children with SLI in Romance languages such as Spanish (e.g., Bedore & Leonard, 2001, 2005), little is known about comprehension (e.g., Girbau, 2017b). A salient difference between the use of the DO pronouns in Spanish and English is their placement. While English DO pronouns are placed where the original object was (e.g., 'is watching him'), in Spanish these pronouns are placed in front of the verb (e.g., 'lo está mirando'). The present research will focus on the processing of sentences with third person DO pronouns in Spanish, which are the following ones: 'lo' (him/it), 'la' (her/it), 'los' (them), 'las' (them). 'DO pronouns' have also been studied using other terms like 'object proclitics' or 'accusative clitics'.

Thus, in Spanish (and Romance languages), all DO pronouns agree with their antecedent nouns in number and gender. This particular morphosyntactic element seems very vulnerable to errors, which appear to be part of a larger pattern of morphosyntactic errors including articles (with number and gender markers), in Spanish/Italian-speaking children with SLI (e.g., Arosio, Branchini, Barbieri, & Guasti, 2014; Bedore & Leonard, 2001, 2005; Eng & O'Connor, 2000; Gutiérrez-Clellen, Restrepo, & Simón-Cerejido, 2006; Jacobson & Schwartz, 2002; Leonard & Dispaldro, 2013). In general, preschool Italian-speaking children with SLI omit DO pronouns more often than age-matched typically developing children (e.g., Guasti et al., 2016).

According to a study on a heterogeneous group of Spanish-speaking monolingual preschoolers living in Colombia, DO pronoun production and sentence complexity [e.g., *la peina*. ((She) combs her.)] are largely determined by vocabulary growth (Pérez-Leroux, Castilla-Earls, & Brunner, 2012). Furthermore, the percentage of DO pronoun omissions declined progressively from 3 through 4 and 5 years of age. Likewise, preschool Spanish-speaking children with SLI living in USA (who were unbalanced bilinguals exposed to English) also made some substitution errors when producing DO pronouns (Bedore & Leonard, 2001, 2005). These errors usually involved substitution of a single feature, e.g., number or gender, whereas the second feature of the target was maintained.

At the comprehension level, native Spanish adults and highly proficient late English-Spanish bilinguals showed a P600 effect for violations of both gender and number occurring at the clitic pronoun in the sentence (Rossi, Kroll, & Dussias, 2014). The sentence comprehension has been also assessed through some questions, as for example in some studies in English and Hebrew about sentence processing *without* any DO pronouns (e.g., Deevy & Leonard, 2004; Friedmann & Novogrodsky, 2011). They found that preschool and primary school children with SLI were less accurate on object (but not subject) Wh-questions than control participants. Subject and object Wh-questions will be used in the present study.

### 1.3. Neurocognitive model of language including pronoun sentence processing

Clearly, the DO pronoun, which replaces a noun in the sentence, allows the speaker to reduce redundancy. However, the DO pronoun may only function as such if, for example, the speaker and listener can track the object through Working Memory (WM). Indeed, WM has been found to be one of the crucial cognitive processes in anaphor resolution (Autry & Levine, 2014). Certainly, auditory pronoun sentence processing requires the temporary storage of the antecedent in WM to avoid its decay, so it can be retrieved later upon listening to the pronoun. This may challenge children with SLI, who have often been found to exhibit

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