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The Effects of Production Demands on Grammatical Weaknesses in Specific Language Impairment: The Case of Clitic Pronouns in Italian

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Abstract

Purpose—Extended optional use of direct object clitic pronouns (e.g., *la* in *Paula la vede* "Paula sees her") appears to be a clinical marker for specific language impairment (SLI) in Italian. In this study, we examined whether sentence production demands might influence the degree to which Italian-speaking children with SLI produced clitics.

Method—Preschool-age children with SLI (N = 15) and two groups of younger typically developing children (N = 15 each) participated. Production demands were varied through use of a syntactic priming task.

Results—The children with SLI were more likely than the comparison children to omit the clitic in a control condition in which they had to describe a target picture without the benefit of a preceding sentence prime. The children with SLI were also more likely to describe target pictures using a default clitic or a clitic that had appeared in the preceding prime sentence but was inappropriate for the target.

Conclusions—The findings suggest that children with SLI have difficulty generating a sentence containing a grammatical slot for a clitic when production demands are increased, and when they succeed in generating such a sentence, they often cannot at the same time retrieve the appropriate clitic form.

In recent years, there has been a significant increase in efforts to identify clinical markers of specific language impairment (SLI). In English and related languages, a reliable clinical marker for identifying children with SLI has been the optional use of tense and agreement morphemes, especially for the late preschool and early elementary school ages (Bedore & Leonard, 1998; Rice & Wexler, 1996, Rice & Wexler, 2001). At an age when typically developing children are using these morphemes consistently, many children with SLI continue to produce them on an optional basis.

For inflectionally rich languages, certain types of tense and agreement morphemes, notably verb inflections, do not serve as very useful clinical markers, as they do not provide a very sharp distinction between children with SLI and their typically developing peers. However, select morphemes do serve successfully as clinical markers in these languages. Direct object clitic pronouns serve as a good example, as they represent areas of special weakness in SLI

in such languages as Italian (Leonard & Bortolini, 1998; Leonard, Sabbadini, Volterra, & Leonard, 1988), Spanish (Bedore & Leonard, 2001), and French (Jakubowicz, Nash, Rigaut, & Gérard, 1998). These pronouns are commonly used in these languages and are applied when the direct object would normally be pronominalized in the sentence and is not a point of emphasis. An example from Italian appears in (1), using the third person feminine singular clitic, *la*:

(1)	Speaker 1:	Non vedo Gemma, e siamo giá in ritardo.
		I don't see Gemma, and we are already late.
	Speaker 2:	La vedo adesso!
		I see her now!

Young typically developing children acquiring Italian go through a brief period during which they show optional use of clitic pronouns. However, for Italian-speaking children with SLI, this period of optional use is prolonged. In the age range of 4 to 6 years, measures of direct object clitic use distinguish children with SLI from their same-age peers with high degrees of sensitivity and specificity (Bortolini et al., 2002, 2006). Children with SLI vacillate from producing the clitic to omitting it during this period, whereas typically developing children of the same age use clitics in well over 90% of obligatory contexts

Given the diagnostic importance of direct object clitic pronouns in Italian, we focus on children's use of these forms in the present study. We first review proposals that link the optional use of clitic pronouns to the broader literature on the optional use of tense and agreement morphemes in other languages. We then address the need to examine factors that might affect whether or not a child with SLI produces a clitic in the moment. We argue that the notion of optionality may be appropriate to characterize a (delayed) stage of grammatical development in SLI, but provides no special insight into why a clitic might be used in one particular utterance and not in another. To address this issue, we compare the direct object clitic pronoun use of Italian-speaking children with SLI with that of two comparison groups using a syntactic priming paradigm.

Sources of Difficulty with Clitic Pronouns

There are several possible reasons why direct object clitic pronouns should be difficult for children with SLI. First, clitics often immediately precede the finite verb of the sentence, as in (1) above. This placement deviates from the usual subject-verb-object order of Italian. Thus, whereas the Italian equivalent of "Anna eats the ice cream" shows the canonical order, as in *Anna mangia il gelato*, the Italian equivalent of "Anna eats it" is *Anna lo mangia* (literally, "Anna it-eats"), with the masculine singular clitic *lo* preceding the verb.

Another potential challenge to children is that, unlike in a language such as English where a contrastive/stressed direct object pronoun takes the same form as the non-contrastive/ unstressed pronoun, clitics are used only in the non-contrastive/unstressed context and differ in form from the contrastive/stressed pronouns of Italian. For example, in English, one can use the form *him* in both *Cristina sees him* and *No, Cristina sees HIM (not her)*. However, in Italian, the two forms are different, as in *Cristina lo vede* and *No, Cristina vede LUI (non lei)*. Of course, as in English, the non-contrastive form is much more frequent in the

language than the contrastive form, leading to many instances in which the clitic should be used by Italian speakers. The fact that clitics are a weakness for children with SLI, then, makes this a significant problem.

There may be a meaningful relationship between the difficulty that Italian-speaking children with SLI have with direct object clitic pronouns and the difficulty with tense and agreement morphemes experienced by children with SLI acquiring English and other Germanic languages. In an account employing the theoretical framework of Chomsky's (1995) minimalist program, Wexler (1998) has proposed that young typically developing children go through an early stage during which checking of a Determiner (D) feature can only occur at one functional category. Wexler refers to this as the "unique checking constraint." He assumes that for the adult grammar in a language such as English, the checking of the D feature must occur at the functional categories Tense (T) and Subject-Agreement (AGR-S) for realization of tense and agreement morphemes such as present third person singular *−s*, copula and auxiliary *be* forms, and auxiliary *do* forms. Given the unique checking constraint in young children's grammars, checking often occurs at only one functional category and, because most of these morphemes simultaneously involve both tense and agreement, they are often omitted. Through a maturation process, this constraint dissipates, and the children soon acquire an adult-like grammar.

In the case of children with SLI, Wexler (2003) has proposed that there is a protracted period during which the unique checking constraint is operational. As a result, these children go through an extended period of using tense and agreement morphemes on an optional basis.

Italian is a language that permits null subjects; that is, subjects can be omitted if the conversational and/or nonlinguistic context makes the subject of the sentence clear. According to Wexler (1998, 2003) in null subject languages such as Italian, checking is required only at T for verb inflections. However, for direct object clitic pronouns, checking must occur at two functional categories. Checking of the D feature must occur at the functional category of Object-Agreement (AGR-O) where accusative case is assigned, and then at a functional category called Clitic to allow for its pre-verb position. Because this entails two checking operations, the unique checking constraint is violated and the clitic is vulnerable to omission. For children with SLI, this period of vulnerability is extended in time. It can be seen, then, that Wexler's (1998, 2003) account argues that the same extended constraint in children with SLI is responsible for both the protracted period of optional use of tense and agreement morphemes in languages such as English and the protracted period of optional use of direct object clitic pronouns in a language such as Italian.

Wexler's (1998, 2003) proposal makes an important contribution in linking children's optional use of seemingly disparate morpheme types from different languages to a single source, a constraint against checking at more than one functional category. According to this account, this optional use reflects the maturational state of the child's grammar.

There may be an additional maturation-based factor at work in the extended optional use of clitic pronouns. In some languages, direct object pronouns can be omitted under particular

discourse conditions. Huang (1984) has proposed that the process is best characterized as reflecting a discourse oriented "zero-topic" parameter setting, somewhat akin to a null-subject parameter but specific to the omission of objects constituting the topic in discourse. Specifically, in such languages, a parameter allows the topic of a sentence to be deleted if it is identical to a topic in the preceding sentence – even if the preceding sentence is produced by another speaker.

Although Chinese is the most widely cited language with this characteristic, Portuguese – a language more closely related to Italian – also possesses this characteristic (Costa, Lobo, Caromona, & Silva, 2008; Huang, 1984). For example, whereas a response to a question such as "What's happening to the ice cream?" in Italian could be *Lo mangia* "[she] eats it," in Portuguese the answer to the same question could be produced without the direct object clitic. It seems plausible that Italian children with SLI might initially interpret their language as one that permits omission of direct objects when they serve as discourse topics, as in the above example. Because these are contexts that call for clitics in Italian, these zero-topic instances could be interpreted as clitic omissions.

However, whether an account of optional use is based on checking constraints or faulty parameter setting, such accounts are silent on whether a clitic will be omitted or produced by the child on any given occasion. Yet there is evidence that function words such as clitics are not produced or omitted in a haphazard fashion. One factor that seems to influence the likelihood of omission is prosody. This phenomenon has been documented for English function words by Gerken (1991, 1994) among others. The production of weak syllables by young children is facilitated if these syllables can immediately follow and be prosodically organized with a preceding strong syllable. Thus, the weak syllables in words such as *jelly* and *Gina* are more likely to be produced whereas those in *giraffe* and *Jeanette* are more vulnerable to omission. The latter are weak-strong syllable sequences. This prosodic effect is also seen at the phrase level. For example, the article in the phrase *a ball* forms part of a weak-strong sequence, rendering it susceptible to omission. However, Gerken found that if a weak-syllable function word can appear immediately after a strong syllable (e.g., *the* in *Jill pushed the car*) it is less likely to be omitted than if it occurs sentence-initially (as in *The car is red*) or immediately follows another weak syllable (as in *Jill pushes the car*). This is because in the *pushed the* context, the article can be prosodically organized with the preceding stressed syllable, resulting in a strong-weak syllable sequence.

McGregor and Leonard (1994) found the same pattern held for children with SLI, along with a more general tendency toward weak syllable omission than was seen in younger typically developing children. Leonard and Bortolini (1998) documented the same tendency in the production of function words by Italian-speaking children with SLI. Clitics seemed especially prone to omission. One possible reason for this is that they rarely appear immediately after a strong syllable. With subjects optional in Italian, a clitic often appears in sentence-initial position, as in (1) above. In addition, because many Italian words contain two or more syllables with the final syllable being a weak syllable, clitics often immediately follow another weak syllable when they are not the first word in the sentence. For example, in a sentence such as *Il gatto la vede* "The cat sees her," the clitic *la* follows the weak (second) syllable of *gatto*.

However, factors beyond prosody are likely to influence whether a direct object clitic pronoun is produced or omitted by children with SLI. There is growing evidence that sentence production demands influence the degree to which these children include optional elements in their speech. For example, Leonard et al. (2000) studied English-speaking children with SLI who showed optional use of auxiliary *is*. These investigators found that when the children heard and repeated a preceding (prime) sentence containing a slot for an auxiliary form (e.g., *The boys are washing the car*), they were more likely to include auxiliary *is* in their description of a target picture that immediately followed (as in *The horse is kicking the cow*). When instead the prime preceding the sentence had a syntactic structure quite different from the one needed for the target picture description (e.g., *The pig fell down*), the children were more likely to omit the auxiliary *is* (as in *The horse kicking the cow*). Similar results were seen in a subsequent study by Leonard et al. (2002). In the latter study, the prime condition that led to the greatest likelihood of auxiliary *is* omission was a condition in which the children heard sentences such as *We see the Grinch reading a book*. Note that the nonfinite clause in this prime sentence, *the Grinch reading a book*, resembles the kind of sentence that Wexler (1998, 2003) expects when checking fails to occur in more than one functional category. The Leonard et al. study suggests that even when children are operating with a single checking constraint, if a syntactic frame containing an auxiliary position has been activated through the prime sentence, children are more likely to overcome the constraint and produce the auxiliary form. Conversely, when the syntactic frame activated through the prime sentence works at cross purposes with auxiliary production, as when the prime contains a nonfinite clause with no auxiliary slot, children have greater difficulty formulating the proper description for the target picture, with the auxiliary falling prey to omission.

In the present study, we employ a syntactic priming paradigm to determine whether the tendency to produce or omit direct object clitic pronouns by Italian-speaking children with SLI will vary as a function of the sentence production demands placed on the children. To gauge whether any differences across conditions in degree of clitic use by the children with SLI are on par with those expected given their pre-experiment clitic use or average sentence length, we compare their performance to the performance of two different groups of younger typically developing children, one matched according to degree of pre-experiment clitic use, the other according to mean length of utterance (MLU). Based on previous studies, we expect that the children with SLI will make less use of clitics than the MLU-matched peers in the control condition. However, the performance profiles of the three groups might well differ across the three conditions, as these conditions vary in the demands they place on sentence production.

Method

Participants

Three groups of 15 children served as participants. Children with SLI constituted the first group. They ranged in age from 4;0 to 5;8 (M = 4;9). Two language criteria were used to include children in this group: (1) intervention status; and (2) performance on a measure of expressive morphosyntax (Bortolini et al., 2002, 2006). Regarding the first criterion, each

child had qualified for language intervention services on the basis of the evaluation done by speech-language therapists in one of two Health Services in the northeast of Italy. All 15 children had been diagnosed as SLI with an expressive or receptive-expressive deficit. Each child passed a pure-tone hearing screening bilaterally (20 dB HL) at 500 Hz, 1000 Hz, 2000 Hz, and 4000 Hz (American Speech-Language-Hearing Association, 1997). All children in this group showed age-appropriate cognitive abilities based on the performance scale of the Italian standardization of the Wechsler Preschool and Primary Scale of Intelligence–III (Fancello & Cianchetti, 2008). None of these children had a physical impairment, global developmental delay, neurological dysfunction, emotional problem, or had suffered environmental deprivation. At the time of this study, these children had not yet begun therapy although all had qualified for enrollment in speech-language services through the Health Service.

The clinicians had judged the children eligible for services on the basis of clinical judgment and the results from one or more tests of language ability used as clinical instruments in Italy. These tests covered the areas of vocabulary and morphosyntax. For receptive vocabulary, the tests were the Italian version of the PPVT-R (Stella et al., 2000) or the Test di Valutazione del Linguaggio (Cianchetti & Fancello, 2003). The tests used for receptive morphosyntax were the Prove di Valutazione della Comprensione Linguistica (Rustioni, 1994) or the Test di Comprensione Grammaticale per Bambini (Chilosi & Cipriani, 1995). For expressive vocabulary, the Test di Valutazione del Linguaggio (Cianchetti & Fancello, 2003) was used. Expressive morphosyntax was assessed through the sentence repetition task of Devescovi and Caselli (2007) and through analysis of the children's spontaneous language samples. These samples consisted of at least 100 utterances obtained when the children were looking at a picture book while interacting with the therapist. The children were encouraged to initiate topics and determine the direction of conversation. To maintain conversation, the examiner asked questions or made comments aimed at encouraging the children to continue. The sample was transcribed using the CHAT transcription format (MacWhinney, 2000). The children's MLUs in words averaged 2.74 (*SD* = 0.56; range = 1.88 – 4.00). According to Italian normative data (Cipriani et al., 1993), children with typical language reach this MLU range between age 3;0 and 3;6. Based on these tests, all 15 children exhibited deficits in expressive morphosyntax; seven of these children also displayed a deficit in receptive morphosyntax. Ten children in this group also showed a weakness in expressive and/or receptive vocabulary. A summary of the children's test results appears in Appendix A.

To ensure greater uniformity in the participant selection process, the second criterion for inclusion in the SLI group was a low score on a task administered to all children. This 16-item task assessed the children's use of third person direct object clitic pronouns (Dispaldro, Benelli, Marcolini, & Stella, 2009; Dispaldro, Deevy, Altoé, Benelli, & Leonard, 2011). These clitic pronouns are: *lo* "it/him" (masculine singular); *la* "it/her" (feminine singular); *li* "them" (masculine plural); and *le* "them" (feminine plural). Each of these clitic pronouns was assessed in four items. For each item, the experimenter described the first of two drawings and prompted the child to describe the second. For example, one item designed to elicit use of the masculine singular clitic *lo* involved the prompt: *Qui la bambina compra il*

gelato, e qui….(lo mangia) "Here the girl buys the ice cream, and here…([she] it eats = she eats it)"), This task has shown good sensitivity and specificity in distinguishing children with SLI from typically developing children in the age range studied here. Sensitivity has ranged from 86.67% to 90.91% and specificity has ranged from 93.33% to 100% (Bortolini et al., 2002, 2006).

All children selected for the SLI group showed low accuracy scores on this measure (*M* = 22.20, *SD* =15.71). However, because the optional use of clitics was the focus of this study, we included only those children who produced clitics to some degree. We calculated a "use" measure that was based on the number of correct clitic productions plus the number of productions of an incorrect clitic, divided by the number of items and multiplied by 100. This use measure served as the basis for matching with a third participant group, described below. For this use measure, the mean for the SLI group was 48.60% and the standard deviation was 17.45%, with a range of 13% to 73%. The items used in the task appear in Appendix B.

The second group of children consisted of 15 younger children exhibiting typical language development ranging in age from 2;9 to 3;6 (*M* = 3;2). These children were selected on the basis of their MLUs in words; MLUs ranged from 1.69 to 3.74 (*M* = 2.67, *SD* = 0.49). The MLUs of each child in this group was within 0.3 words of the MLU of a child in the SLI group. As a result, these two groups did not differ in this regard, t (28) = 0.33, p = .72. Hereafter, these children are referred to as the TD-MLU group. The children in the TD-MLU group were significantly younger than the children in the SLI group, t (28) = 10.74, p < .001. However, they also scored significantly higher in accuracy on the pre-experiment direct object clitic pronoun measure (*M* = 45.67, *SD* =17.25), t (28) = 3.89, p = .001. The TD-MLU group also showed higher scores than the SLI group on the use measure (*M* = 74.07, *SD* = 21.79, t (28) = 3.53, p = .001.

The third group also consisted of younger typically developing children. However, these children served as "grammatical" controls (hereafter, the TD-G group). These children ranged in age from 2;8 to 3;7 (*M* = 3;1); they were significantly younger than the children in the SLI group, t (28) = 10.94, p < .001. These children were selected on the basis of their scores on the pre-experiment direct object clitic use measure. Their use scores ranged from 10% to 75% (*M* = 50.80%, *SD* = 19.78%). Each child's use score was matched to within 10% of the use score of a child with SLI, resulting in very similar scores for the two groups, t (28) = 0.32, p = .75. However, the TD-G and SLI groups also did not differ in clitic accuracy (*M* = 33.20, *SD* = 15.97), t (28) = 1.90, p = .07, or in MLU (*M* = 2.78, *SD* = 0.46), t (28) = 0.23, p = .82.

The TD-G and TD-MLU groups did not differ in age, t (28) = 1.56, p = .14, or in MLU, t (28) = 0.65, p = .52. However, a group difference was found for both pre-experiment clitic accuracy, t (28) = 2.05, p = .05, and for overall clitic use (correct plus substitution), t (28) = 3.06, p = .005, with higher scores seen for the TD-MLU group on both measures.

The children in the TD-MLU and TD-G groups were recruited from nursery schools in Padua, Italy. Children were not included if they showed any language, articulatory, hearing,

neurological, or psychiatric deficit according to parent and teacher report. Normal hearing was documented by pure-tone hearing screening bilaterally (20 dB HL) at 500, 1000, 2000, and 4000 Hz (American Speech-Language-Hearing Association, 1997). The MLUs of the children in the TD-MLU and TD-G groups were appropriate for their age (Cipriani et al., 1993).

Experimental procedures were conducted according to the guidelines of the University of Padua for the protection of human participants. Parental consent was obtained for each child prior to inclusion in the study.

Materials

Forty prime-target sentence pairs with accompanying pictures were developed for this study. The prime-target items appear in Appendix C. The second picture in each pair represented the target picture. The target picture always illustrated either the character Mowgli or the character Baloo performing a transitive action on one or more objects, animals, or persons (e.g., Mowgli washing two bicycles) while the other character (e.g., Baloo) was simply standing nearby and looking in the opposite direction. As will be seen in the Procedure section, the target sentences most appropriate for describing these target pictures took the form of [subject] + clitic + verb (e.g., *[Mowgli] lo taglia* "[Mowgli] cuts it").

In cases in which the subject of the target sentence was produced by the children, it was important to control for prosodic factors. As noted earlier, as monosyllabic weak syllables, clitics can be vulnerable to omission by children, especially in sentence-initial position or when they are preceded by another weak syllable. For this reason, the two characters selected as subjects of the target actions differed in the prosodic characteristics of their name. "Mowgli" is produced with a strong-weak syllable pattern, whereas "Baloo" is produced with a weak-strong syllable pattern. Based on the work of Gerken (1991) and McGregor and Leonard (1994), the production of a weak-syllable function word is more likely following a strong syllable, as this context allows the child to reorganize the prosody into a strong-weak syllable pattern. Thus, if subjects were produced by the children, inclusion of the clitic would be more likely when Baloo served as the subject, assuming that prosody influenced the children's productions. If children omitted the subject altogether, the clitic would be in a prosodically vulnerable (sentence-initial) position, but this vulnerability would apply equally to all three conditions.

For 16 of the 40 picture pairs, the first picture in the pair (the prime picture) also showed a transitive action on a direct object with Mowgli or Baloo as the agent and the other character in a standing pose looking in the opposite direction. Both the action and the direct object of the first picture differed from those appearing in the target picture with which it was paired. These pictures were described by the experimenter with the same syntactic structure (e.g., *Baloo li conta* "Baloo counts them") that would be appropriate for the target picture that followed. However, the names of the direct objects used in the target picture differed in gender and/or number from the names of the direct objects used in the prime picture, thereby necessitating use of a different direct object clitic pronoun by the child. These 16 prime-target pairs formed what we refer to as the Same Syntactic Structure Prime (SSSP) condition. However, along with the identical syntactic frames used in the prime and target

sentences in this condition, other details shared by the prime and target could also play a facilitative role. Because the subject was always drawn from only two lexical items, retrieval of the name of the subject of the target sentence was facilitated. In addition, the thematic role of the subject of both the prime and the target sentence was that of agent, further assisting retrieval. Finally, the overlapping subjects in the prime and target could facilitate retrieval of the third person singular inflection required for the verb.

For another 16 pairs of pictures, the first picture in the pair showed Mowgli or Baloo performing a simple action (e.g., walking) with the other character standing nearby and looking in the opposite direction. The experimenter described these pictures with a subject + verb structure (e.g., *Mowgli cammina* "Mowgli walks"). These prime-target pairs are referred to here as constituting the Different Syntactic Structure Prime (DSSP) condition, because the syntactic structure needed to describe the target picture differed from the one used for the prime picture. However, as in the first condition, the overlap in subjects, thematic role, and identical third person singular verb inflection could serve a facilitative role.

The remaining eight items served as a control. Each picture preceding the target in this condition showed a group of identical objects (e.g., carrots) or animals (e.g., tigers) that the children were asked to count. These items formed the No Prime (NP) condition.

For the SSSP and DSSP conditions, each combination of characters was used in four prime-target pairs. That is, four items used the characters Mowgli and Baloo as the actors in the prime and target pictures, respectively, four used the opposite order of Baloo and Mowgli, another four depicted Mowgli as the actor in both the prime and target pictures, and four used Baloo in both pictures. For the NP condition, Mowgli was the actor in four target pictures and Baloo was the actor in the remaining four. Each of the four direct object clitics, *lo* (masculine singular), *la* (feminine singular), *li* (masculine plural), and *le* (feminine plural) was used in four target sentences in both the SSSP and DSSP conditions and in two target sentences in the NP condition.

Procedure

The pictures used in the experiment were presented on a laptop computer. The experimenter and child sat in front of a computer screen, with a second adult (the assistant) seated in back of the computer facing the child and experimenter. The child was told that they were to play a game in which the assistant would ask questions about the events on the screen, and the child and the experimenter would describe these events for the assistant.

The session began with a familiarization phase; each child was first shown a set of pictures of the characters, Mowgli and Baloo, who were to serve as the actors in subsequent pictures. All children successfully named the characters across four familiarization trials.

Following the familiarization phase, the game commenced. The child was told that the experimenter would assist the child in the description of some of the pictures, and the child was to provide the descriptions of the remaining pictures. For pictures presented in the SSSP condition, the assistant asked a question that would require use of a direct object clitic

pronoun, such as *Cosa succede alla televisione?* (“What’s happening to the television?”) The experimenter then leaned toward the child as if telling a secret and produced the prime sentence, such as *Mowgli la spegne* (“Mowgli turns it off”). The child then imitated the experimenter’s prime sentence. The target picture then appeared and the assistant asked another question obligating a clitic in the response, such as *Cosa succede al pane?* (“What’s happening to the bread?”). The child’s response to this question served as the main focus of interest.

Given the assistant’s mention of the direct object in the question (*pane* in this example), the inclusion of a direct object clitic (as in *[Mowgli] lo taglia* “[Mowgli] cuts it”) would be most appropriate. Production of the noun form (e.g., *[Mowgli] taglia il pane* “[Mowgli] cuts the bread”) would be redundant and uncharacteristic of an expected response in Italian. However, we were less certain about whether the children would produce the subject of the sentence in their description of the target sentences. Given the null subject nature of Italian, omission of the subject would not be unusual. However, the pragmatic scenario that we created was designed to render the inclusion of the subject quite appropriate. Specifically, the assistant who asked the question was facing the child but was in back of the computer screen and therefore could not see the pictures. In addition, each picture not only showed one of the characters performing the action on the direct object (Mowgli cutting the bread in this example) but also the other character (Baloo in this case) in a standing pose looking in the other direction. Because both characters were depicted and the assistant did not know which was performing the action, it would have been appropriate to include the subject.

For pictures in the DSSP condition, the procedure was the same, except that the assistant asked the question *Cosa succede?* (“What’s happening?”) upon presentation of the prime picture. The experimenter responded with a subject + verb prime sentence, such as *Mowgli corre* “Mowgli runs” that the child imitated. All prime pictures in this condition highlighted the simple actions of either Mowgli or Baloo rather than actions performed on direct objects. The questions used for the target picture that followed each prime sentence were identical in type to those used in the SSSP condition (e.g., *Cosa succede alla macchina?* “What’s happening to the car?”), prompting a response that contained a direct object clitic pronoun (e.g., [*Mowgli] la guida* “[Mowgli] drives it”).

For the NP condition, the picture preceding each target picture depicted several identical objects or animals, and the assistant asked the child how many there were, as in *Quante tigri ci sono?* “How many tigers are there?” The target pictures that followed and the accompanying questions were of the same type used in the other conditions, requiring a response containing a direct object clitic pronoun.

Scoring and Reliability

The principal interest in this study was the children’s use of the clitic pronouns across prime conditions. We assumed that the SSSP condition would most facilitate sentence production and thus inclusion of the clitic pronoun in the child’s response. However, for this to be the case, it was important to ensure that the syntactic frame of the prime contained a clitic pronoun. This was always true for the prime as produced by the experimenter. On the other hand, the children did not always include the clitic in their imitation of the experimenter’s

prime sentence. Previous studies with adults have reported priming effects when participants listened to, but did not produce the prime sentence. However, when children fail to produce the clitic of the prime sentence, it is not clear if a syntactic frame containing a position for the clitic pronoun has been activated. Accordingly, we required that a clitic was included in the children's imitation of the prime sentence. Similarly, we required the prime sentence in the DSSP condition to be repeated with the syntactic frame as produced by the experimenter (as a subject + verb frame as in *Mowgli corre* "Mowgli runs").

Responses to the target picture also had to meet particular criteria to be treated as scorable. The response had to include an obligatory context for a direct object clitic. Such contexts were productions of the depicted transitive verb along with a correct direct object clitic pronoun, an incorrect direct object clitic pronoun (e.g., producing *lo* instead of *li*), or the omission of the clitic pronoun. Production of a full noun phrase (e.g., *Legge il libro* "reads the book" instead of *Lo legge* "reads it") were treated as unscorable. Although such responses are not sensitive to the discourse context created by the experimenter's question, the response is not actually ungrammatical. Other unscorable responses included omissions of the verb, use of an intransitive or reflexive verb, or a response such as "I don't know." The mean percentage of scorable responses for each participant group in each condition is shown in Table 1. Percentages are presented because the NP condition had eight items whereas the SSSP and DSSP conditions had 16 items each. The lowest number of scorable responses for any child in any condition was 3. The percentage of scorable responses did not differ across groups, F (2, 42) = 1.55, p = .22, partial η^2 = .07, conditions, F (2, 84) = 0.42, p = .66, partial η^2 = .05, or the interaction between the two, F (4, 84) = 0.51, p = .73, partial η^2 = .02.

To assess interjudge reliability, audiorecordings from 15 randomly selected participants, five children from each group, were transcribed independently by a second trained listener. These transcriptions were then scored and compared to the original transcriptions to obtain two different measures of reliability. The first measure was the percentage of prime sentence imitations that were scored in the same way. For this measure, the mean percentage of agreement was 99% (range = 98% to 100%). The second measure was the percentage of target responses that were scored in the same way. The resulting mean percentage of agreement was 96% (range = 94% to 100%).

Results

Preliminary analyses of the data revealed that virtually all sentence productions by the children in all three participant groups were null subject sentences. We also determined that accuracy did not vary as a function of whether the character/subject in the prime also served as character/subject in the target or whether the character/subject changed from the prime to the target picture.

The children's percentages of correct use of direct object clitic pronouns were examined using a mixed-design ANOVA with participant group (SLI, TD-MLU, TD-G) as a between-subjects variable and prime condition (SSSP, DSSP, NP) as a within-subjects variable. We had expected more accurate use of the clitic in the SSSP condition because the target

sentence shared with the prime sentence the same syntactic frame, the subjects were always one of the same two characters, the thematic role of agent carried over from prime to target, and the third person singular verb inflection required for the target had also appeared in the prime. The DSSP condition was expected to result in an intermediate level of correct clitic use, as the syntactic frame needed for the target was not present in the prime, but the subjects in the prime and target were drawn from the same two lexical items and prime and target shared the same thematic role of agent and third person singular verb inflection. The NP condition was expected to be associated with the lowest level of clitic use. The children in the SLI group were expected to be weaker in clitic use than the TD-MLU and TD-G groups in the NP condition, but were expected to benefit from priming in the other conditions.

It was also possible that the differences across prime conditions would be attenuated because, in all conditions, the child's description of the target picture was prompted by the assistant's question *Cosa succede a _____?* ("What's happening to _____?"). In Italian, this question ordinarily promotes use of a clitic. However, if the children with SLI are treating their language as a discourse-oriented language, this would be precisely the context for deletion of the clitic, because the question promotes the clitic's referent to the level of discourse topic (Huang, 1984).

The results of the ANOVA showed a main effect for group, F (2, 42) = 9.11, p = .001, η^2 = .303. Post-hoc testing revealed a significant difference between the SLI and TD-MLU groups (24% vs. 56%, respectively, $p < .001$), as well as between the SLI and TD-G groups (24% vs. 45%, respectively, p = .028). No difference was found between the TD-MLU and TD-G groups (p = .447). Prime condition was also significant, F (2, 84) = 5.13, p = .009, η^2 = .109. Post-hoc comparisons revealed more correct use of clitic pronouns in the SSSP condition than in the NP condition (46% vs. 34%, respectively, p = .01). However, no difference was present between the SSSP and DSSP conditions (46% vs. 45% respectively, p = 1.00) or between the DSSP and NP conditions (45% vs. 34% respectively, p = .08). The interaction of participant group and prime condition was not significant F (4, 84) = 0.89, p = .47, η^2 = .041. The results are illustrated in Figure 1.

Given the differences across the three prime conditions, we sought to determine which condition, if any, led to accuracy levels that differed from those seen in the pre-experiment clitic task. The same four direct object clitic pronouns were assessed in the pre-experiment and priming tasks, and, for both tasks, a clitic + verb response (e.g., *la mangia*) by the children was sufficient to be scored as accurate. Higher scores for the SSSP and DSSP conditions than on the pre-experiment task would suggest facilitation on the part of these priming conditions. The findings were only partially consistent with such a facilitative effect. For all groups, accuracy was higher for the SSSP condition than on the pre-experiment task, ts ≥ 2.07, ps ≤ .05, as expected. However, only the TD-G and TD-MLU groups showed higher accuracy in the DSSP condition than on the pre-experiment task, ts ≥ 2.75, $p \leq .02$. For all three groups, accuracy levels for the NP condition were no higher than accuracy levels on the pre-experiment task.

When children produced an incorrect response, this error could have taken the form of an omission of the clitic or the production of a clitic of the wrong number and/or gender. Omission errors were especially important to examine further as they could constitute errors in which the proper syntactic frame was not activated. Accordingly, the children's percentages of clitic omissions across prime conditions were examined using a mixed-design ANOVA with participant group (SLI, TD-MLU, TD-G) as a between-subjects variable and prime condition (SSSP, DSSP, NP) as a within-subjects variable. A main effect for group was present, F (2, 42) = 4.12, p = .02, η^2 = .164. Post-hoc testing revealed a difference between the SLI and TD-MLU groups (45% vs. 19%, respectively, p = .02), whereas no difference was present between the two TD groups (TD-MLU 19% vs. TD-G 32%, p = .43) or between the SLI and TD-G groups (p = .52). Prime condition was also significant, F (2, 84) = 9.98, p < .001, η^2 = .192, with significantly fewer omissions of clitic pronouns in the SSSP condition than in the NP condition (23% vs. 42%, respectively, p < .001). No difference was present between the SSSP and DSSP conditions (23% vs. 31%, respectively, p = .17) or between the DSSP and NP conditions (31% vs. 42%, respectively, p = .09). Importantly, there was an interaction between participant group and prime condition, F (4, 84) = 3.95, p = .006, η^2 = .158, as illustrated in Figure 2. Paired sample t-tests showed that the omission of clitic pronouns by the children with SLI in the NP condition (67%) was higher than in both the DSSP condition (38%), t (14) = 3.24 p = .006, d = .88, and the SSSP condition (30%), t (14) = 5.90, p < .001, d = 1.10. No difference was present between the SSSP and DSSP conditions, t (14) = .82, p = .42. The omission of clitic pronouns by the TD-G group in the DSSP condition (36%) was higher than that seen in the SSSP condition (24%), t (14) = 2.35 p = .03, d = .42; no differences were present among the other conditions. No differences were found among the three conditions for the TD-MLU group. Finally, comparison among the groups showed that the omission of clitic pronouns in the NP condition was higher for the children with SLI (67%) than for both the TD-G group (37%), t (28) = 2.35, p = .03, d = .91, and the TD-MLU group (21%), t (28) = 3.97, p < .001, d = 1.37. No differences in omissions were apparent among the groups in the SSSP and DSSP conditions.

The pattern of clitic substitutions was also of interest. There were at least three possible substitution patterns available to the children. First, in the SSSP condition, they could have been unduly influenced by the clitic in the prime sentence such that they simply used this same clitic in the target sentence even though it did not reflect the correct gender and/or number. Second, the children might have had greater command of certain clitics and not others. For example, they might have been more accurate on singular clitics than plural clitics. Third, they might have relied on a type of default. If so, the likely choice would be *lo* as it is used not only for masculine singular referents but also to refer to facts or events (e.g., *Non lo so* "I don't know it").

The first possibility was pursued by comparing the actual percentage of clitic substitutions that (inappropriately) made use of the clitic in the prime with the percentage expected by chance. With three possible substitutes, chance was assumed to be 33%. Only the children with SLI used the clitic in the prime as a substitute with a percentage (60%) significantly greater than chance (p = .009).

The children with SLI were also more likely to produce a clitic substitute if the target clitic should have been plural (63%) than if it should have been singular (37%), $p = .02$. Neither the TD-MLU nor the TD-G groups showed a pattern of substitution related to the singular-plural distinction of the target clitic.

Finally, we determined whether one particular clitic was used as a substitute to a much greater extent than the others, possibly serving as a type of default. Table 2 shows the number of each type of clitic substitution for each target clitic. Visual inspection of Table 2 suggests that the clitic *lo* was more likely than the other clitics to be used as a substitute by the SLI group; 53% of their substitutions employed *lo* as the substitute. The corresponding percentages for the TD-G and TD-MLU groups were 31% and 23%, respectively. For the three clitic targets, *la*, *li*, and *le*, chi-square revealed a substitution distribution that differed significantly from the expected distribution. Standardized residuals were computed to determine the major contributors to this finding. The results revealed that the over-use of *lo* as a substitute by the children with SLI was the major contributor to the difference between observed and expected values.

Given that, in the SSSP condition, some productions of *lo* might have been cases of the child copying *lo* from the prime sentence, we did a separate examination of the children's use of *lo* in the DSSP and NP conditions. In these conditions, no clitic appeared in the prime sentence. Here, too, the SLI group used *lo* as the dominant substitute. In the DSSP condition, 59% of these children's substitutions involved *lo* as the substitute; for the NP condition, this figure was 75%. In each condition, *lo* was a substitute in plural contexts (DSSP = 17 instances, NP = 5 instances) far more frequently than was the other singular clitic, *la* (DSSP = 4 instances, NP = 0 instances).

Discussion

One unexpected finding in the present study was the uniform tendency on the part of all three participant groups to produce the target sentence without the subject. Of course, in a null subject language such as Italian, subjects can be omitted when the referent is clear from the context. The presence of the subject in the picture certainly made the name of the subject uninformative from the perspective of the experimenter and child who were viewing the picture together. However, in our task, the assistant asking the child the question (e.g., *Cosa succede al pane?* "What's happening to the bread?") was in back of the computer screen and could not see the picture. Furthermore, both characters were shown in each picture, even though only one of the characters was performing an action. We had expected that the assistant's lack of access to the visual information and the need to distinguish which of the two characters was performing the action would prompt the children to include the subject. However, this was not the case for the children in any of the three participant groups.

Although unexpected, the children's productions of null subject sentences did not create any confounds in the results. For the target sentences in all three conditions, a correct production with a null subject required the children to produce a sentence-initial clitic followed by a verb in present third person singular form (e.g., *Lo taglia* "Cuts it"). The clitic was

prosodically challenging because it constituted an initial weak syllable. However, this was true across all three conditions.

The difference in accuracy between the children with SLI and the TD-MLU children is consistent with earlier findings that clitics are especially difficult for Italian-speaking children with SLI (Bortolini et al., 2002, 2006; Leonard & Bortolini, 1998; Leonard et al., 1988). That is, these findings support earlier work in indicating that these children are weak in this area even relative to typically developing children approximately 18 months younger whose utterance lengths are similar.

The difference in accuracy between the children with SLI and the TD-G group is even more intriguing because these two groups were matched for their tendency to use direct object clitic pronouns on a 16-item pre-experiment probe task. The matching measure was a clitic use measure, which permitted substitution errors. However, even when scored in terms of accuracy, the pre-experiment task did not reveal a significant difference between these two groups. A hint of the source of this difference was seen when we compared the children's accuracy on the pre-experiment task with their accuracy in each of the prime conditions. All groups showed higher scores on the SSSP condition than on the pre-experiment task, but whereas the TD-G and TD-MLU groups had greater accuracy on the DSSP condition than on the pre-experiment task, the children with SLI did not. It is also the case that whereas the TD-G group was less accurate than the TD-MLU group on the pre-experiment task, their accuracy levels were highly similar to those of the TD-MLU group in the SSSP condition, as can be seen from Figure 1. These observations suggest that, relative to their pre-experiment levels of clitic use, the TD-G children gained more benefit from the SSSP and DSSP conditions than the children with SLI.

The difference between the SSSP and NP conditions is compatible with the idea of facilitative effects of a syntactic frame being activated (in the SSSP condition) that can benefit target sentence production. However, finding that accuracy in the SSSP condition was not significantly higher than in the DSSP condition suggests that the facilitative effects of the SSSP condition may not have been as precise as providing a syntactic structure containing a position for clitics. If it had been that precise, we should have found differences in accuracy between the SSSP and DSSP conditions favoring the former. It would seem that the sentence production benefits shared by the DSSP and the SSSP condition might have contributed to the non-significant differences between the two. In both conditions, the children's retrieval of the subject of the sentence probably benefitted from the overlap in subjects in the prime and target. In addition, the subject of the prime and target had the same thematic role of agent. The third person singular verb inflection, too, was shared by the prime and target in both the DSSP and SSSP conditions.

The main effect for prime condition in the analysis of clitic omissions bore a superficial similarity to the main effect seen for accuracy. In both analyses, the differences were between the NP condition (less accurate, more omissions) and the SSSP condition (more accurate, fewer omissions). However, beneath the surface, the omission analysis revealed some key differences. Clitics were much more likely to be omitted by the SLI group in the NP condition than in either of the other conditions, and these children were more likely to

omit clitics in the NP condition than were the TD-G children as well as the TD-MLU children. For the TD-G children, on the other hand, the chief difference in omissions was between the SSSP condition and the DSSP condition. For the TD-MLU children, omissions were comparable across all three conditions.

These differences in priming effects across groups suggest that at least three separable (though likely overlapping) factors were at work in the data. First, it seems that once typically developing children approach 50% accuracy or 75% in overall (correct plus substitution) use of clitics, the effects of priming may be difficult to detect, at least in the version of the task that we employed. This conclusion is based on the observation that the TD-MLU children, who averaged 46% correct use and 74% overall clitic use on the pre-experiment clitic task, showed no priming effects, even though their accuracy across prime conditions was only at 56% on average.

Second, the SSSP condition may have provided different types of benefits for clitic use for the two groups who were less proficient with clitics from the outset – the TD-G and SLI groups. One benefit took the form of providing a prime with the same syntactic structure and clitic slot needed for the target. This rather specific facilitative effect was seen in the data for the TD-G group, as these children showed significantly fewer clitic omissions in the SSSP condition than in the DSSP condition.

However, for the SLI group, it was difficult to isolate such a specific effect, as can be seen from an inspection of the small and non-significant differences between the SSSP and DSSP conditions in Figure 1. Much clearer in the SLI data was the difference between the NP condition and the other conditions, which was especially dramatic in the omission data.

The essential difference between the NP and DSSP conditions was that, in the latter, the children heard and repeated a sentence (e.g., *Mowgli salta* “Mowgli jumps”) that reflected the action of particular characters (Mowgli or Baloo). The details of the structure in these sentences did not match those needed for the target. However, the agent-action thematic proposition reflected in these sentences may have provided the children with a starting point, especially given that the same two lexical items occupied the subject position in both the DSSP primes and the target sentence. Once this starting point was provided, retrieval of a specific frame containing a clitic slot may have been less onerous. In contrast, verbalizing non-propositional content such as providing only the number of objects or animals on the screen (as in the NP condition) seemed to offer no benefit to these children. Omissions of the clitic were especially high in this condition.

These findings seem consistent with previous reports that the degree of optional forms can be systematically varied in children with SLI (e.g., Leonard et al., 2002; Leonard et al., 2000). Providing the number of objects or animals on a screen as in the NP condition would seem to offer very little assistance to the child in producing a target sentence containing an already-weakly established form such as a direct object clitic pronoun. In contrast, an agent-action proposition involving (at least) overlapping subjects and shared verb inflections might provide some assistance in the retrieval of a syntactic frame when the target picture

appeared. Once retrieval is directed toward the syntactic expression of propositional content, the likelihood of locating the appropriate syntactic frame might be increased.

One alternative interpretation introduced earlier is that the SLI group's difficulties with clitics stemmed from their grammar allowing zero objects, as in Portuguese. Recall that our task led the clitics of the target sentences to have the status of topics – precisely the type of discourse element that can be deleted in such a language.

However, one observation renders this interpretation less likely. The questions used to obtain the children's descriptions of the target pictures (*Cosa succede a _____?* "What's happening to _____?") were the same across conditions. For all items in all conditions, the clitic in the target sentence would serve as the already-established topic. Therefore, the only way the differences in clitic use across conditions could be explained would be to assume that the prime sentences in the SSSP and DSSP conditions somehow dampened the children's tendency to employ the zero-object option. This assumption may, in fact, be correct. Yet such an assumption would nevertheless have to ascribe an important role to the prime sentences. In this instance, rather than the SSSP and DSSP primes facilitating full sentence production and thus increasing the likelihood of clitics appearing in the target sentence (as we have assumed), it would be assumed that these primes served to weaken the discourse ties between the question (e.g., *Cosa succede al pane?* "What's happening to the bread?") and the children's target sentence description. Presumably this weakening would have the effect of suppressing the zero-object option.

The notion of optionality might be refined as a result of the findings presented here. In particular, even if the variable use of clitics is largely due to a yet-to-emerge maturational process (as in our TD-G group) or to an especially delayed maturational process (as in our SLI group) (Wexler, 2003), there appear to be factors that influence the tendency to omit the clitic on any given occasion. Our findings suggest that when sentence production demands are greatest, this tendency is increased. Thus, optionality may be an appropriate characterization of the state of these children's grammars, but to understand more completely the moment-to-moment tendency to produce or omit a vulnerable form, the particular demands on sentence production must be taken into account.

Finally, the clitic substitution data revealed that, even when the children with SLI managed to include a clitic in their target sentence, weaknesses were often apparent. These weaknesses were seen in three ways. First, the children with SLI were more likely than the other children to rely (inappropriately) on the clitic that appeared in the prime when formulating the target sentence. Second, target sentences obligating a plural clitic seemed to be an obstacle for the children with SLI in particular, resulting in more substitutions for plural clitics than for singular clitics. Third, the children with SLI differed from the other children in over-using the clitic *lo* as a substitute, in all conditions. The latter two tendencies are not wholly independent, as difficulties with plural clitics would logically lead the child to use a singular clitic as a substitute, and *lo* is one of the two clitics that would be available for this purpose. However, *lo* was used as a substitute more frequently than the feminine singular clitic, *la*, even when the target sentence obligated the feminine plural clitic *le* (see

Table 2). In this case, the children not only selected a singular over a plural form but also failed to preserve the proper gender when selecting *lo* as the substitute form.

The clitic *lo* is reasonably viewed as the most basic clitic form, as it is used not only for masculine singular objects and persons but also to refer to whole events. For example, if a child is asked to clean off the table, a possible response is *Lo faccio piú tardi* "I'll do it later", where *lo* "it" refers to cleaning off the table. The frequent appearance of this clitic form in the language may be the reason that *lo* is also the dominant substitute for very young typically developing Italian children, younger than the children in our TD-G and TD-MLU groups. Given the over-use of *lo* by very young children, Dispaldro, Caselli, and Stella (2009) have suggested that this form might initially function as a proto-clitic, that is, as essentially a grammatical place holder, rather than a form with all of the grammatical features (singular, masculine) reflected in the adult grammar. The findings of the present study suggest that this may also be true for older children who exhibit SLI.

The interpretation of a clitic form serving as a grammatical place holder seems inconsistent with the idea that optional clitic use reflects the workings of a zero-topic parameter setting. That is, in our task, the question that prompted the child's target picture description served to put the clitic's referent in the role of topic. Therefore, it would seem that almost all errors should have taken the form of deletions, reflecting zero topics. With a zero-topic option available in this discourse context, there would appear to be no need for children to insert into the sentence an overt yet inaccurate clitic form such as *lo*.

Combining the findings for clitic substitution with those reported for omission leads to the conclusion that weaknesses in clitic use can be manifested in two ways. First, especially when sentence production demands are greatest, children with SLI might produce a sentence that lacks an obligatory slot for a clitic pronoun. However, there are also occasions in which these children retrieve a sentence frame that contains a position for a clitic, but they insert an inappropriate clitic form in that slot. The nature of this substitution requires further study. One possibility is that the children retrieve a sentence frame with a clitic slot but their relatively limited knowledge of the clitic system leads them to either rely on the clitic that had appeared in the prime, or to insert a type of default form, *lo*. This possibility suggests that the substitution primarily or solely reflects a limitation in grammatical knowledge.

An alternative possibility is that to successfully retrieve a syntactic frame with a clitic slot the children had to bypass the grammatically guided retrieval of the proper clitic and instead simply copy the clitic form just heard in the prime or insert a more readily available default form that lacked the relevant grammatical features. This second possibility is more in line with our interpretation that omission errors reflect sentence production limitations along with a weakness in grammatical knowledge. Specifically, generating a sentence frame with a clitic slot may be burdensome for children with SLI. Sometimes they do not succeed, resulting in a frame with no clitic slot, and hence the clitic is absent from their production. However, if they are to succeed in generating a sentence with a clitic slot, they often must rely on reducing the effort in another respect – by inserting a clitic form that has not been grammatically analyzed. In either case, the findings serve to fine-tune our notion of optional use of clitics by children with SLI. Unlike cases of tense/agreement use in SLI in a language

such as English where children either produce the form correctly or produce a form that lacks tense/agreement altogether, the Italian-speaking children with SLI in our study had a third option, that of generating a sentence that could accommodate the proper constituents but filling one of the slots with a form that failed to match the adult grammar.

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Appendix A

Summary of test scores for the children with SLI

Child	Age	PIQ	Expressive Language					Receptive Language			
			Lexicon		Grammar			Lexicon		Grammar	
			TVL-E	SR	EM	MLU in words	Clitic Accuracy	PPVT	TVL-R	TCGB	PVCL
1	5;0	91	1°		S	1,875	13	70		10°	
2	5;8	85	1°		M	2,857	30	72		25°	
3	4;1	96	1°		S	2,538	31		15°	10°	
4	4;9	90	1°		S	1,875	30		45°	10°	
5	4;11	91	15°	19	M	2,950	0		65°	50°	
6	5;8	105	25°		S	3,308	0	83			HM
7	4;10	96	25°		M	3,389	27		45°	50°	
8	4;4	106	1°		S	2,969	20		5°	10°	
9	5;1	85	1°		S	2,625	20		25°	75°	
10	4;4	87	35°		S	2,864	8		45°	50°	
11	4;1	106	15°	12	S	2,547	55		95°	75°	
12	4;0	100	5°	5	S	2,281	17		15°		LM
13	4;7	95	1°		S	2,510	50		1°	25°	
14	4;9	85	1°	2	S	2,444	15		15°	10°	
15	5;4	87	1°	0	S	4,000	17		1°	10°	

Note. AGE is expressed in years;months. PIQ = Performance IQ, WPPSI-III, *M* = 100, *SD* = 15. TVL-E = Test di Valutazione del Linguaggio, Expressive subscale; results are expressed in 11 centile points (1°, 5°, 15°, 25°, 35°, 45°, 55°, 65°, 75°, 85°, 95°). SR = Sentence Repetition; number of sentence correctly repeated; 4-years-olds have a *M* of 23.55 (range 12-27) and *SD* of 4.33. EM = Expressive morphosyntax; Evaluated by therapists through elicited narration with single images and/or vignettes and a spontaneous speech sample as Adequate, Mildly Impaired (M), or Severely Impaired (S). Clitic Accuracy = Percentage correct on pre-experiment clitic task. PPVT-III = Peabody Picture Vocabulary Test – III, Italian standardization; *M* = 100, *SD* = 15. TVL-R = Test di Valutazione del Linguaggio, Receptive subscale; results are expressed in 11 centile points (1°, 5°, 15°, 25°, 35°, 45°, 55°, 65°, 75°, 85°, 95°). TCGB = Test di Comprensione Grammaticale per Bambini; results are expressed in 5 centile points (10°, 25°, 50°, 75°, 95°). PVCL = Prove di Valutazione della Comprensione Linguistica; results are expressed in 6 classes (I = insufficient, P = poor, LM = low middle, M = middle, HM = high middle, G = good, VG = very good)

Appendix B

The pre-experiment task for assessing the children's production of third person direct object clitic pronouns. The clitic pronouns and English translations appear in upper case letters.

I bambini lavano i piatti e poi..LI asciugano.	The boys wash the plates and then..they dry THEM.
Le bambine comprano il gelato e poi..LO mangiano.	The girls buy the ice-cream and then..they eat IT.
Il bambino lava la macchina e poi..LA spinge.	The boy washes the car and then..he pushes IT.
I bambini raccolgono le mele e poi..LE mangiano.	The boys pick the apples and then..they eat THEM.
La bambina lava la macchina e poi..LA spinge.	The girl washes the car and then..she pushes IT.
Le bambine lavano i piatti e poi..LI asciugano.	The girls wash the plates and then..they dry THEM.
La bambina raccoglie le mele e poi..LE mangia.	The girl picks up the apples and then..she eats THEM.
Il bambino compra il gelato e poi ..LO mangia.	The boy buys the ice cream and then..he eats IT.
Le bambine lavano la macchina e poi..LA spingono.	The girls wash the car and then..they push IT.
Il bambino raccoglie le mele e poi..LE mangia.	The boy picks the apples and then..he eats THEM.
Il bambino lava i piatti e poi..LI asciuga.	The boy washes the plates and then..he dries THEM.
La bambina compra il gelato e poi..LO mangia.	The girl buys the ice cream and then..she eats IT.
Le bambine raccolgono le mele e poi..LE mangiano.	The girls pick up the apples and then.. they eat THEM.
La bambina lava i piatti e poi..LI asciuga.	The girl washes the plates and then..she dries THEM.
I bambini lavano la macchina e poi..LA spingono.	The boys wash the car and then.. they push IT.
I bambini comprano il gelato e poi..LO mangiano.	The boys buy the ice cream and then..they eat IT.

Note: LO = masculine singular; LA = Feminine singular; LI = masculine plural; LE = Feminine plural.

Appendix C

The prime - target pairs used for each item.

Prime	**Target**
Same Syntactic Structure Prime (SSSP) Condition	
1. Mowgli LA spegne (televisione)	Mowgli LI asciuga (capelli)
Mowgli turns it off (television)	*Mowgli dries them (hair)*
2. Baloo LA versa (aranciata)	Mowgli LE lancia (pietre)
Baloo pours it (orange juice)	*Mowgli throws them (stones)*
3. Mowgli LO infila (filo)	Baloo LI alza (tavoli)
Mowgli threads it (cotton thread)	*Baloo lifts them (tables)*
4. Baloo LI saluta (leoni)	Baloo LA beve (acqua)
Baloo greets them (lions)	*Baloo drinks it (water)*
5. Mowgli LE ruota (trottole)	Mowgli LO appende (quadro)
Mowgli spins them (tops)	*Mowgli hangs it (picture)*
6. Mowgli LE intervista (mucche)	Baloo LA bacia (bambina)
Mowgli interviews them (cows)	*Baloo kisses her (girl)*
7. Mowgli LO cavalca (cavallo)	Mowgli LE lava (biciclette)
Mowgli rides it (horse)	*Mowgli washs them (bicycles)*
8. Baloo LE apre (finestre)	Baloo LO aggiusta (motore)
Baloo opens them (windows)	*Baloo repairs it (motor)*

Prime	Target
9. Baloo LA scrive (lettera)	Baloo LI spinge (elefanti)
Baloo writes it (letter)	*Baloo pushs them (elefants)*
10. Mowgli LI indica (pulcini)	Mowgli LA suona (tromba)
Mowgli points at them (chicks)	*Mowgli plays it (trumpet)*
11. Baloo LI conta (biscotti)	Mowgli LO taglia (pane)
Baloo counts them (biscuits)	*Mowgli cuts it (bread)*
12. Baloo LO veste (pagliaccio)	Baloo LE tira (corde)
Baloo dresses it (clown)	*Baloo pulls them (ropes)*
13. Mowgli LI insegue (tori)	Baloo LE abbraccia (pantere)
Mowgli follows them (bulls)	*Baloo hugs them (panthers)*
14. Mowgli LA ascolta (radio)	Baloo LO legge (libro)
Mowgli listens to it (radio)	*Baloo reads it (book)*
15. Baloo LO incolla (adesivo)	Mowgli LA butta (immondizia)
Baloo sticks it on (adesive)	*Mowgli throws it away (garbage)*
16. Baloo LE chiude (porte)	Mowgli LI tocca (coltelli)
Baloo closes them (doors)	*Mowgli touchs them (knives)*
Different Syntactic Structure Prime (DSSP) Condition	
1. Mowgli cade	Mowgli LA pettina (bambola)
Mowgli falls down	*Mowgli combs her (doll)*
2. Baloo ride	Mowgli LE porta (scatole)
Baloo laughs	Mowgli carries THEM (boxes)
3. Baloo canta	Baloo LI rompe (bicchieri)
Baloo sings	*Baloo breaks them (glasses)*
4. Mowgli corre	Mowgli LO pesca (pesce)
Mowgli runs	*Mowgli catches it (fish)*
5. Baloo apparecchia	Mowgli LI accarezza (gatti)
Baloo prepares	*Mowgli pets them (cats)*
6. Ballo guarda	Baloo LE mangia (mele)
Baloo looks	*Baloo eats them (apples)*
7. Mowgli scende	Baloo LO accende (fiammifero)
Mowgli climbs down	*Baloo lights it (match)*
8. Mowgli lavora	Baloo LI costruisce (castelli)
Mowgli works	Baloo builds them (castles)
9. Mowgli cammina	Mowgli LE prende (caramelle)
Mowgli walks	*Mowgli takes them (candies)*
10. Mowgli dorme	Baloo LA punge (pecora)
Mowgli sleeps	*Baloo pricks it (sheep)*
11. Ballo balla	Baloo LO apre (regalo)
Baloo dances	*Baloo opens it (present)*
12. Baloo gioca	Baloo LA buca (ruota)
Baloo plays	*Baloo bursts it (wheel)*
13. Baloo piange	Mowgli LA guida (macchina)

Prime	Target
Baloo crys	*Mowgli drives it (car)*
14. Baloo telefona	Mowgli LO lecca (gelato)
Baloo phones	*Mowgli licks it (ice-cream)*
15. Mowgli salta	Baloo LE soffia (candele)
Mowgli jumps	*Baloo blows them out (candles)*
16. Mowgli nuota	Mowgli LI strappa (fogli)
Mowgli swims	Mowgli tears them (papers)
No Prime (NP) Condition	
1. (Child counts watches)	Baloo LA cucina (pasta)
	Baloo cooks it (pasta)
2. (Child counts tigers)	Mowgli LO calcia (pallone)
	Mowgli kicks it (ball)
3. (Child counts keys)	Baloo LI sgrida (cani)
	Baloo scolds them (dogs)
4. (Child counts combs)	Mowgli LE fotografa (farfalle)
	Mowgli photographs them (butterflies)
5. (Child counts carrots)	Mowgli LI annaffia (fiori)
	Mowgli waters them (flowers)
6. (Child counts rabbits)	Mowgli LA morde (gamba)
	Mowgli bites it (leg)
7. (Child counts washing machines)	Baloo LO pittura (muro)
	Baloo paints it (wall)
8. (Child counts toothbrushes)	Baloo LE gira (viti)
	Baloo turns them (screws)

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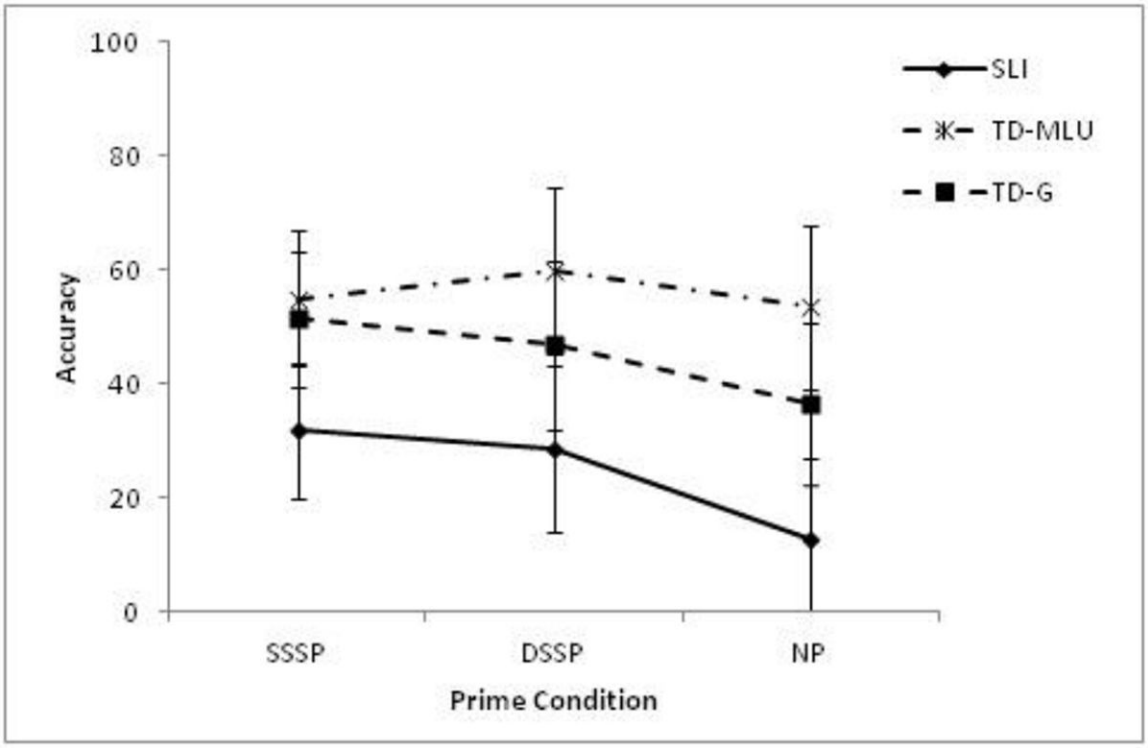

Figure 1.
Mean percentages of correct productions of clitic pronouns and 95% confidence intervals as a function of group and prime condition.

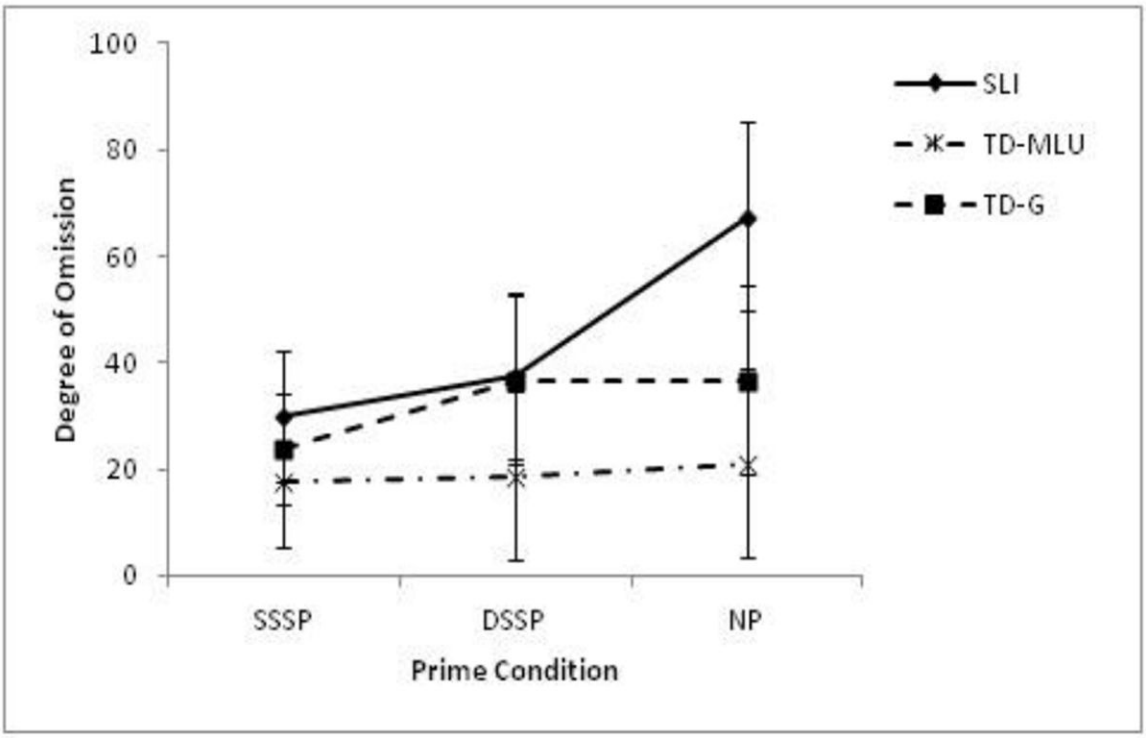

Figure 2.
Mean percentages of omission and 95% confidence intervals for clitic pronouns as a function of group and prime condition.

Table 1

Mean percentage of scorable responses (and standard deviations) for each participant group in each prime condition.

	Group		
Prime Condition	**SLI**	**TD-MLU**	**TD-G**
SSSP	53 (15)	57 (16)	51 (18)
DSSP	49 (19)	60 (21)	52 (17)
NP	48 (9)	58 (16)	50 (14)

Table 2

The frequency of clitic substitution errors committed by each participant group.

	Target Clitic											
	la			**lo**			**le**			**li**		
	Produced			**Produced**			**Produced**			**Produced**		
	lo	**le**	**li**	**la**	**le**	**li**	**la**	**lo**	**li**	**la**	**lo**	**le**
SLI	**13**	3	2	12	4	4	5	**17**	6	6	**23**	5
TD-G	**8**	5	5	6	4	3	5	**8**	12	4	**6**	5
TD-MLU	**8**	7	14	8	5	5	6	**7**	15	2	**5**	6

The use of *lo* as a substitute is indicated in bold.