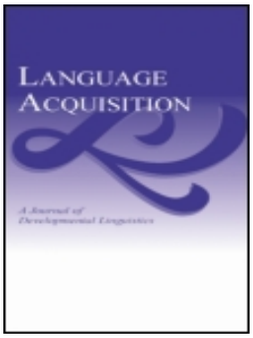

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Object Clitic Omission in Child Spanish: Evaluating Representational and Processing Accounts

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This study explores the widely documented difficulty children have with object clitics in the acquisition of Romance languages. It reports on two experiments: a production task and a comprehension task. Results from the elicitation task confirm that object omission occurs at nonnegligible rates in 2- and 3-year-olds. Findings from the sentence-picture matching task show that children do not sanction a grammar with referential null objects, as suggested by previous research, and that children do not always assign a transitive interpretation to clitic constructions. Further analysis reveals that both the frequency of object omissions in production as well as the results in the clitic conditions of the receptive task are strongly negatively correlated with an independent measure of verbal working memory (nonword repetition task), consistent with the hypothesis that object clitic omission is affected by linguistic processing and short-term memory limitations.

1. INTRODUCTION

The study of object clitic omission arose from observations of persistent clitic optionality among typically developing French-speaking children (Clark 1985). Numerous subsequent studies confirmed that the consistent use of object clitics is late not only in French (Grüter 2006; Müller, Crysmann & Kaiser 1996; Pérez-Leroux, Pirvulescu & Roberge 2008a) but also in other Romance languages, including Italian (Bottari, Cipriani & Chilosi 1993/1994; Guasti 1993/1994; Schaeffer 1997; Tedeschi 2009), Romanian (Avram 2000; Babyonyshev & Marin 2004), and Catalan (Gavarró, Torrens & Wexler 2010; Wexler, Gavarró & Torrens 2004). Investigations of Spanish are less consistent, with some finding clitic omission (Bedore & Leonard 2001; Castilla & Pérez-Leroux 2010; De la Mora 2004; Fujino & Sano 2002), and others not (Lyczkowski 1999; Wexler, Gavarró & Torrens 2004; Torrens & Wexler 2010).

There is also wide agreement concerning a protracted development of object clitics in other learner populations, including children with Specific Language Impairment (Bedore & Leonard 2001; De la Mora 2004; Jakubowicz et al. 1998; Paradis 2004), simultaneous bilingual children (Pérez-Leroux, Pirvulescu & Roberge 2009; Pérez-Leroux, Cuza & Thomas 2011; Pirvulescu, Pérez-Leroux & Roberge 2012), as well as child and adult second language learners (Grüter & Crago 2012; Herschensohn 2004; White 1996). Nevertheless, and despite the extensive

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literature investigating this phenomenon, the accounts proposed to date continue to be debated. Explanations generally fall into two classes, those that attribute the difficulty with object clitics to the competence domain and those that attribute it to the performance domain.

The goal of the present study is to contribute new evidence relevant to this question by investigating the production and comprehension of object clitics in Spanish-speaking children aged 2–4. In the following sections we will present an overview of the descriptive facts regarding object clitics and object omission in adult Spanish (section 1.1) and in child Spanish (section 1.2). Section 1.3 presents a brief review of the different accounts that have been proposed for object clitic omission and their respective predictions with respect to production and comprehension. Section 2 presents an empirical production study designed to (i) clarify the extent to which children omit object clitics in Spanish, a language for which the literature offers conflicting reports; and (ii) investigate the relationship between object clitic omission and independent measures of linguistic development and verbal working memory. The second study (section 3) aims to (i) assess whether Spanish-speaking children accept referential null objects in a receptive task, a question that has not yet been tested in Spanish; and (ii) examine the differences in comprehension between transitive structures with full DP objects, preverbal clitics, and postverbal clitics. The implications of the findings of these two studies will be discussed in section 4. Section 5 will include the conclusion as well as some brief remarks for future investigations.

1.1. Direct Object Clitics in Adult Spanish

In Romance languages, when a direct object denotes a definite or specific referent that is salient in the discourse, it is typically expressed with an object clitic. Clitics are characterized by being "weak," unstressed pronouns, which, unlike the "strong" forms, cannot be the complement of a preposition; cannot be used in isolation; cannot receive contrastive stress; and cannot be modified, conjoined, or topicalized (Kayne 1975). In Spanish, clitics are marked for gender and number of the corresponding noun phrase, and their distribution is limited to the positions immediately preceding a finite verb (1a, 1b); or immediately following a progressive participle, infinitive, or imperative (1c, 1d, 1e).

(1) a. El niño *la* abre.
The boy cl-fem-sg opens
'The boy opens it.'

b. La mamá *los* está mirando.
The mom cl-masc-pl is looking
'The mom is looking at them.'

c. La niña está leyéndo*la*.
The girl is reading-cl-fem-sg
'The girl is reading it.'

d. El papá va a despertar*lo*
The dad going to wake-up- cl-masc-sg
'The dad is going to wake him up.'

e. Búsca*las*
Search-cl-fem-pl
'Look for them!'

Crucially, object clitics are obligatory when a specific referent is denoted; therefore, object clitic omission in (2a) is ungrammatical. Conversely, given a generic interpretation of the DP, as in (2b), a null object is allowed, but not an object clitic.

(2) a. ¿Tiene el tigre la pata rota?
'Does the tiger have a broken leg?'

Sí,	sí	que	*(*la*)	tiene.
yes	yes	that	*(cl-fem-sg)	have

'Yes, it has (one).'

b. ¿Tienen rayas los tigres?
'Do tigers have stripes?'

Sí,	sí	que	(**las*)	tienen.
yes	yes	that	(*cl-fem-pl)	have

'Yes, they have (them).'

Another important aspect of Spanish clitics is that they allow clitic doubling and even demand it in some cases. Doubling is obligatory in all dialects of Spanish when the direct object is a strong pronoun, as exemplified in (3a), or when the object has undergone left dislocation, as in (3b). Doubling a full DP object in the canonical postverbal position is possible only in certain dialects, such as River Plate Spanish (Jaeggli 1982), as exemplified in (3c).

(3) a.

*(*lo*)	busco	a[1]	él.
*(cl-masc-sg)	search	to	him

'I'm looking for him.'

b.

A	José	*(*lo*)	vi	ayer.
To	Joseph	*(cl-masc-sg)	saw	yesterday

'Joseph, I saw (him) yesterday.'

c.

(*lo*)	vi	a	José.
(cl-masc-sg)	saw	to	Joseph

'I saw Joseph.'

This pattern has been taken to support the base-generation analysis of clitics in preverbal position rather than deriving them by movement from the argument position, as had been suggested by Kayne (1975). Under the base-generation analysis, the canonical object position (when not occupied with a doubled full DP object) contains an empty category, *pro* (Jaeggli 1986), to which the verb assigns a theta-role. It follows from this that clitics do not have argumental status; instead

[1]Differential object marking with *personal a* is required for animate direct objects.

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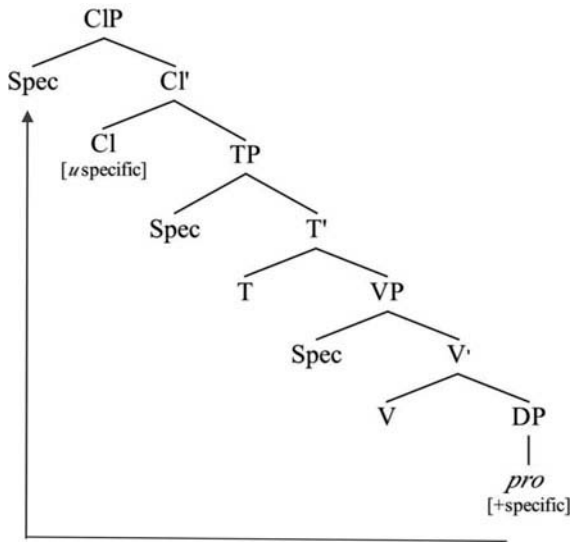
they should be treated as verbal agreement morphemes (Uriagereka 1995). Sportiche (1996) proposed that clitics head an independent functional projection and that these select a [+specific] DP as their specifier, thus triggering movement of *pro* to this position, where the feature of specificity is eliminated from the head.[2] This derivation entails a clause structure like that in (4).

(4)



Sportiche's analysis of cliticization has been adopted in a number of acquisition studies, some of which will be discussed in section 2.

1.2. Direct Object Clitics in Child Spanish

The literature on object clitic omission in Spanish-speaking children offers divergent results concerning the rate of object omission at the early stages, both for naturalistic speech and for elicitation studies. In unpublished work, Lyczkowski (1999, cited in Wexler, Gavarró & Torrens 2004) studied the spontaneous productions of three monolingual Spanish-speaking children: María (1;08–3;11, from Spain); Juan (2;06–4;11, from Spain); and Koki (1;07–2;11, from Mexico) from the CHILDES database (MacWhinney 2000). Results showed that these children very rarely omitted object clitics (on his account, only 20 omissions, 1.96% of clitic contexts, were found). The same children, studied by Fujino and Sano (2002), showed significantly higher rates of illicit object omissions during the null object stage (42.6%) and a substantial decrease in infelicitous omissions around 2;05, coinciding with an increase in clitic production. Gavarró,

[2]We will not address how the accusative case is checked in Spanish. For different analyses, see Kayne (1993), Wexler (2002), Tsakali & Wexler (2004).

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Torrens & Wexler (2010) attributed this discrepancy to differences in the counting procedure—whereas Fujino and Sano included repetitions in their analysis, Lyczkowski did not. It is unknown to what extent repetitions of utterances containing clitics or full DPs counterbalanced the inclusion of repeated omissions[3]; however, this methodological difference may have altered the count of clitic omission cases. More importantly, the age ranges were not identical in both studies. Fujino and Sano's (2002) results correspond to María, 1;07–2;00; Juan, 1;09–3;05; and Koki, 1;07–2;03; while Lyczkowski (1999) included transcripts in which the children were older, a factor that is not noted in Gavarró, Torrens & Wexler (2010).

Results from elicitation studies also offer an unclear picture. Wexler, Gavarró & Torrens (2004) tested 28 monolingual Peninsular Spanish children aged 2 (mean age = 2;03), 3 (mean age = 3;06), and 4 (mean age = 4;06) using a method comparable to Schaeffer (2000). As we can see in (5), the elicitation task comprised a story performed with puppets, where an experimenter introduced the specific referent that would allow the felicitous use of the clitic. A second experimenter gave an incorrect statement about the story, which the child was to correct.

(5) Object clitic elicitation task in Wexler, Gavarró & Torrens (2004)

Experimenter 1: *Aquí está Caperucita Roja. El rey la encuentra y piensa "¡Mira qué despeinada está!" Y como tiene un peine, mira qué hace.*
Experimenter 2: *Yo sé qué hace: lava a la Caperucita.*
Experimenter 1: *¡No! Díselo tú: ¿Qué le hace el rey a la Caperucita?*
Expected response: La *peina.*
Experimenter 1: Here we have Little Red Riding Hood. The king finds her and thinks: "Look what a mess her hair is!". And because he has a comb, look at what he does.
Experimenter 2: I know what he does: He washes Little Red Riding Hood.
Experimenter 1: No! You say it to her: What is the king doing to Little Red Riding Hood?
Expected response: He is combing her.

The results in the simple present condition showed virtually no object clitic omissions in Spanish (0%–2.5%). The present perfect condition (e.g., *La ha peinado* 'She has combed her') exhibited higher rates of omission for the youngest group (15.62%), but Wexler, Gavarró & Torrens (2004) found no instances of omission in the two older groups. A potential confound for these results is the presence of direct object clitics in the short introductions and the prompts, which could have facilitated their retrieval (see 6a). The omission rates found for Spanish are surprisingly low compared to the ones reported for Catalan in the same study. Whereas Spanish-speaking 3-year-olds (mean age = 3;06,07) omitted object clitics at a rate of 2.5% in the simple present, and 0% in the present perfect, the Catalan-speaking 3-year-olds (mean age = 3;07,14) omitted them 25% in the simple present, and 19% in the present perfect. We are not aware of any study investigating the extent to which hearing direct object clitics in the prompt can

[3]Omission rate was calculated by dividing the number of object omissions in obligatory contexts by the total number of clitics, full DPs, and object omissions.

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prime direct objects in the answers. However, if the prompts did in fact influence their responses, differences in the phonetic salience of clitics in these two languages could have benefitted the Spanish-speaking group, since Catalan has contractible clitics, while Spanish does not:

(6) Prompt example from Wexler, Gavarró & Torrens's (2004) elicitation task.

a. Díse*lo* tú. (Spanish)
Tell- DatCl-3sg-AccCl-masc-sg you
'You say it to him.'

b. Digues-*l*'hi tu. (Catalan)
Tell- AccCl-3sg-DatCl-3sg you
'You say it to him.'

More recently, Castilla & Pérez-Leroux (2010) used a slightly different procedure to study a group of 103 Colombian-Spanish-speaking children. Children were presented with short introductions followed by the prompt question "What did x do to y?" used to elicit direct object clitics. Questions were presented directly to the children, and no puppet was involved. Results indicated that 3-year-olds were producing 35% of the obligatorily transitive structures without an object, and 4- and 5-year-olds were producing 16% and 13% respectively. A possible explanation for these high rates is the regional variety of Spanish under investigation. Referential null objects in adult speech have been documented in some South American varieties in contact with Quechua, including Argentinian, Bolivian, Colombian, Ecuadorian, Paraguayan, and Peruvian Spanish (see Campos 1999 and Schwenter 2006 for surveys). Notably, the adult controls in their study produced virtually no cases of null objects in the elicitation task (3.8%). However, since the authors do not provide any details about the sociolinguistic background of the adults, dialect differences should not be ruled out.

Using a hybrid between Wexler, Gavarró & Torrens's (2004) and Castilla & Pérez-Leroux's (2010) procedure, De la Mora (2004) studied object clitic omission in typically developing and language-delayed monolingual Mexican-Spanish-speaking children (Mexican Spanish does not allow referential null objects). In their task, children had to evaluate an incorrect assertion, and the target correction required an object pronoun. If the child failed to produce the target sentence, the experimenter asked the question prompt "What did *x* do to *y*?" De la Mora reported low rates of omission for both trial and prompt answers (5%) for the MLU control group (mean age = 3;08, range = 3;02–5;03). On the other hand, in another clinical study, Bedore and Leonard (2001) found higher rates of omission for Mexican-Spanish-speaking children in San Diego, California. In a sentence completion task, where the child was asked to complete a sentence such as *El niño compra el helado y luego* . . . 'The boy ought an ice-cream and then . . . ,' the younger control group (range = 2;04–3;10, mean age not reported), produced 12.5% of direct object omissions (45/360). Yet again, the potential disparity in the age of the participants may have been the cause of these differences. Although we do not have the complete age information of either study, it seems that the children in De la Mora's study may have been older, accounting for the lower rates of omission. Moreover, Bedore and Leonard's protocol was more open-ended and gave rise to a larger number of "unscorable" responses (approximately 7%), a methodological factor that could have skewed the number of omissions, altering the overall rate. On the other hand,

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it must be noted that the children under investigation in these studies did not experience uniform language-learning situations. The children in De la Mora's (2004) study were monolingual Mexican Spanish speakers, while the ones in Bedore and Leonard's (2001) were predominantly exposed to Mexican Spanish, but also to English. According to a study carried out by Gutiérrez & Silva-Corvalán (1993) on clitic usage in Los Angeles Spanish, object clitic omission in Mexican Spanish–English contact situations is rather uncommon. In their study, rate of clitic omission never surpassed 6%, even in the case of third-generation speakers, that is, speakers who were born in the United States and had parents who were also born in the United States or had migrated to the country before age 6. Thus, they conclude that the clitic system in Mexican Spanish is very resilient. However, differences in the language-learning situations in Bedore and Leonard's study and the one in De la Mora could certainly also account for some of the discrepancies in the results of the studies described.

Summarizing, the data on object clitic omission in child Spanish form a continuum ranging from essentially no cases of omission in 3-year-olds in the study by Wexler, Gavarró & Torrens (2004), to 35% omissions in Castilla & Pérez-Leroux (2010), and to 5% and 12.5% omissions in the study of De la Mora (2004) and Bedore and Leonard (2001) respectively. Several suggestions have been offered to account for these differences: the counting procedure in the case of naturalistic data, the difference in age ranges, the experimental method used in elicitation tasks, the dialectal differences concerning the acceptability of null objects, and the different language-learning situations. One of the primary goals of the present study will be to provide new elicitation results taking these confounds into consideration.

1.3. Developmental Accounts of Object Clitic Omission

Within the past 15 years, a number of theoretical explanations have been developed to account for this inconsistent use of object clitics among Romance-speaking children. These are mainly divided into two classes: grammatical accounts and processing accounts.

1.3.1. Grammatical Accounts

Grammatical accounts claim that the child's early grammar is distinct from the adult grammar in that it contains the means for syntactically representing a sentence with a referential null object. Müller, Crysmann & Kaiser (1996) and Müller & Hulk (2001) propose a hypothesis based on parameter missetting, a paradigm introduced by Hyams (1983, 1986). They suggest that early Romance grammars allow referential null objects in the same way topic-drop languages like Chinese do, that is, by having a null topic in the left periphery binding the variable in argument position.

In another representational account, Pérez-Leroux, Pirvulescu & Roberge (2008a) propose that children's overgeneration of referential null objects results from their failure to restrict the null structure to the appropriate context, i.e., nonreferential contexts. Pérez-Leroux, Castilla & Brunner (2012) distinguish two separate classifications children must consider in order to learn the distribution of null objects:

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(i) verb typology: lexical knowledge about object optionality across verbs, i.e., optional *eat* but obligatory *devour*.
(ii) language typology: syntactic and pragmatic knowledge about the distribution of null objects across languages—some of which license referential null objects, e.g., Chinese, as opposed to some that do not, e.g., Spanish.

These authors hypothesize that the argument structure of each particular verb needs to be established *before* the discourse factors are learned—first children must learn that a verb like *read* is optionally transitive, and then they have to learn that null objects are only allowed in certain contexts in their language, i.e., nonreferential ones in the case of Romance languages. Based on their account of how transitivity is learned, they claim to make two predictions: Vocabulary growth will be a determinant factor in acquiring the adult distribution of null objects, and the rate of clitic omission will be inversely correlated with average levels of sentence complexity, as measured by average sentence length and subordination rates. In a related account, Castilla and Pérez-Leroux (2010) argue that since children are sensitive to lexically related variability, i.e., the frequency with which they hear each particular verb without an overt object, children will omit object clitics in obligatory contexts more frequently with optionally transitive verbs like *eat* than with obligatorily transitive verbs like *devour*. [4]

A very different approach to children's object omissions is taken in the influential work of Wexler, Gavarró & Torrens (2004), who argue that this phenomenon can be explained under the assumption of a *Unique Checking Constraint* (UCC; Wexler 1998), a maturational constraint that limits the number of checking operations that the child can perform. Wexler, Gavarró & Torrens (2004) argue that in a participle agreement language, such as French, *pro* has two D-features against which it must check: one in AgrO ([ACC]), and one in Cl ([+specific]). In a given derivation, if double checking occurs, the UCC is violated (and the clitic then surfaces as in the adult grammar). Conversely, if UCC is not violated and no double checking occurs, the derivation cannot converge with two unchecked uninterpretable features in ClP and AgrOP: The only way for the derivation to converge is that one of the functional categories is not projected. On the other hand, an accusative DP in a language without participle agreement, such as Spanish, only has to check an uninterpretable feature ([*u*specific]) in ClP, so *pro* raises through AgrO onto ClP where the feature is eliminated, and the derivation converges. The authors thus predict Spanish-speaking children should not drop object clitics at any stage.[5] However, as discussed in section 1.2., the results obtained in a number of studies challenge this view and suggest that child Spanish does show clitic omission (Bedore & Leonard 2001; Castilla & Pérez-Leroux 2010; Fujino & Sano 2002; Pérez-Leroux, Castilla & Brunner 2012, inter alia).

Finally, I would like to discuss briefly a pragmatic account proposed by Schaeffer (1997, 2000). The author attributes the delayed acquisition of clitics to a missing concept in the child's pragmatic system, the Concept of Non-Shared Knowledge, the idea that speaker and hearer

[4]In a corpus study of French, Pérez-Leroux et al. (2006) found that children tend to approximate the transitivity patterns of their parents. Nevertheless, their conclusions were based on very few tokens: Five out of the six verbs they analyzed occurred less than 10 times in the child data.

[5]For criticisms of this account see Hyams & Schaeffer (2008) and Grüter (2006).

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knowledge are independent. Schaeffer claims that this concept is crucially involved in the encoding of the feature [specific], and that in utterances where it is not marked, no clitic will be produced, due to the absence of Clitic Voice, and *pro* will remain in its base position. Thus, the author argues that children may produce utterances with neither a full DP object nor a clitic until the Concept of Non-Shared Knowledge is on place, by roughly the age of 3 (Schaeffer 2000:100).[6]

1.3.2. Processing Accounts

Other authors have argued that object clitic omission in children should be taken as evidence of their computational limitations or their immature performance system and not attributed to a divergent grammatical representation or constraint. Findings from a range of studies converge on the view that children's memory and processing capacities are quantitatively and qualitatively different from those of adults (Gathercole & Adams 1993; Gathercole et al. 2004; Trueswell et al. 1999). In line with this idea, Jakubowicz & Rigaut (2000), Jakubowicz & Nash (2001), and Prévost (2006) argue that the placing of (preverbal) clitics in a noncanonical argument position creates computational problems in children, hence the inconsistent use of object clitics in (French-speaking) children during the early stages. Appealing to this account, Grüter, Hurtado & Fernald (2012) entertain the question of whether postverbal clitics should be easier to process in comprehension, given that they meet children's expectations of where to find the constituent that fulfills the patient theta role in terms of linear order, i.e., postverbally. This prediction will be addressed in our second study.

Combining key aspects of psycholinguistic models of language production, such as incremental, left-to-right, language processing, Grüter & Crago (2012) presented an account assuming a Tree-Adjoining Grammar (TAG; Joshi et al. 1975) based on Ferreira's (2000) processing model. Under this framework, elementary trees are built in a derivational system like the one in Chomsky (2000), but the combination of trees into larger clausal structures are considered to be governed by two different types of operations: substitution and adjoining (Ferreira 2000; Frank 1998, 2002, 2006). The substitution operation inserts an auxiliary tree into a peripheral node of a tree. The adjoining operation inserts one structure into another, with the additional requirement that the inserted structure have a node with a label identical to that of the root above which it will be attached. Thus, it has been posited that children may experience more difficulties with adjoining than with substitution because it requires more effort to insert a tree into the middle of another than to simply attach a tree to the bottom of another (for an overview of late-acquired constructions involving adjoining see Frank 1998).

Clitic constructions require the retrieval of a multicomponent tree set containing two tree fragments, one projected by the object clitic, and the other by the empty category *pro*. Each component requires a different simultaneous operation, the ClP is adjoined, and *pro* is substituted.[7] An adaptation of Grüter & Crago's (2012:545) TAG derivation is exemplified in (7).

[6]Note that our study was not designed to test this particular pragmatic account. We will, however, discuss it in more detail in section 4.

[7]This is allowed under an extension of TAG, tree-local multicomponent TAG (TL-TAG), see Kulick, Frank & Shanker (2000).

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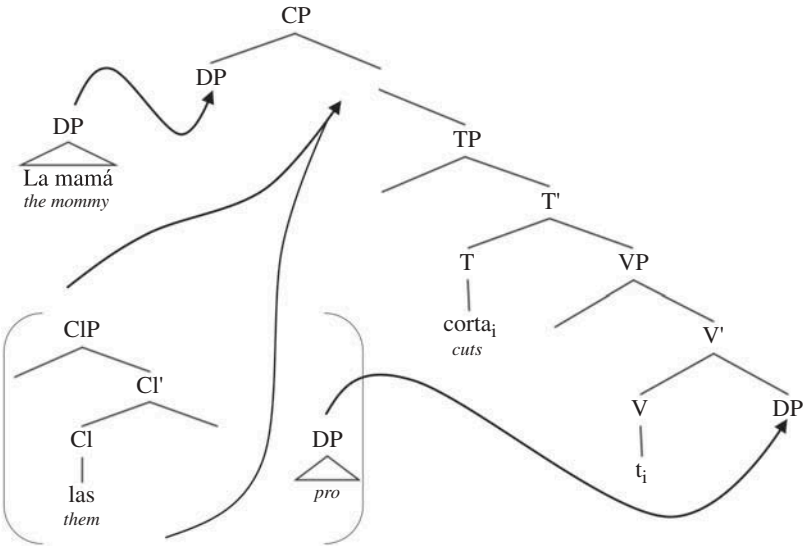
(7)



The authors argue that when speakers produce a clitic construction, all three elementary trees (ClP, *pro*, CP) must be retrieved and held concurrently active in the working memory before any combinatorial processes can take place. Because of the high working memory demands and the increased complexity of adjoining over substitution, the authors propose that the child may skip the adjoining operation, produce the subject and the verb, and attach *pro* to the right periphery by substitution.[8] Grüter and Crago thus claim that their account (as well as other processing-based accounts) predicts that frequency of object clitic omission should be negatively correlated with performance on independent measures of working memory capacity (e.g., nonword repetition span).

Requirements imposed by working memory are also reflected in Jakubowicz's (2005, 2011) Computational Complexity Hypothesis. As in most processing accounts, this account shares the claim that in order to alleviate processing, children may use more economic derivations (e.g., Bloom 1990). In particular, some authors have proposed that young children prefer Merge over Move (or copy and displacement), less over more instances of Merge, and less over more Move, and that more generally, while adults prefer a more dense information packaging in PF, children prefer a PF that is closer to LF (Jakubowicz 2005, 2011; Kampben 1997; Soares 2003, 2006). Jakubowicz discusses this hypothesis in the context of data from the *wh*-copying strategy in child language, i.e., when the *wh*-phrase is spelled out twice, once in the left periphery of the matrix clause and once in the periphery of the embedded clause. The author argues that this strategy

[8]It is important to notice that the authors must be assuming that the subject is retrieved before the object, and that movement to Spec-CP occurs before the ClP is substituted. This may not come as a surprise: Both theoretical and experimental linguists have long noted that the subject of a sentence is privileged, and in accordance with the principle of incrementality, the external argument position must be processed before the internal argument (Bianchi & Chesi 2006; Bock 1986; Ferreira 2000; Keenan & Comrie 1977; Levelt 1989; Phillips 1996).

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may help keep the *wh*-phrase alive in working memory, particularly in cases where the number of phases that the *wh*-phrase needs to go through on its way to the left edge of the matrix CP exceeds the limits of processing resources.

This claim may seem problematic in light of cyclic computation, where once a phase is transferred, it should be mapped directly to the interface and then "forgotten" (Chomsky 2005). However, Jakubowicz (2011) explains that these operations may be costless at the semantic interface. At the phonetic interface, two requirements are in conflict: (i) ease of processing, and (ii) minimization of computation. Processing will be eased if all copies remain, but minimization of computation requires deletion of all but one copy, "so the phonological component can forget all but one copy."

Under these assumptions, one could argue that clitic constructions impose a heavier working memory burden than full DP objects because they require more instances of Merge (Cl and *pro*), and Move takes place across a considerable distance, i.e., across the position where the subject is base generated and across at least one phase boundary (vP). This would cause the activation of the relevant features of *pro* to "decay" by the time Cl is merged and lead to a construction with no overt object. Experimental findings have shown that the distance between two related elements in a sentence (e.g., head-dependent or pronoun-antecedent) crucially affects the speed and accuracy with which that sentence is parsed, with greater distance leading to decreasing performance (Gibson 1998, 2000; McDaniel, McKee & Garrett 2010; Vigliocco, Butterworth & Garrett 1996; Vigliocco & Nicol 1998, Wagers & Phillips 2013). Therefore, under this account, we would expect difficulties with clitic constructions not only in production, but also in comprehension, particularly when the distance between ClP and *pro* is increased.

Crucially for this study, however, one can infer that both grammatical and processing approaches make specific predictions with regards to the comprehension of null object structures. Explanations at the competence level contend that clitic omission results from an option available in the child's grammar. Therefore, children in this stage should not only omit clitics in production but also accept referential null objects in comprehension.[9] Under the performance accounts, clitic omission is due to processing or working memory limitations that affect the syntactic encoding process during production. Therefore, according to Grüter (2006) and Grüter and Crago (2012), children who omit clitics should reject referential null objects in comprehension.[10]

Some recent studies have tried to investigate this question in Italian (Tedeschi 2009), English (Grüter 2006; Pérez-Leroux, Pirvulescu & Roberge 2008b), and French (Grüter 2006), and have come up with inconsistent findings. Pérez-Leroux, Pirvulescu & Roberge (2008b) used a truth-value judgment task to test if English-speaking children (mean age = 4;10, range = 3;06–5;06)[11] accept referential null objects under the scope of negation, in sentences like (8):

(8) 'Oh look, the cat got the fish, so the mother is not cooking (Ø).'

Given that the accompanying picture shows the mother cooking eggs, this sentence can only be true if children allow a referential interpretation of the null object, i.e., 'the mother is not

[9]The predictions of Wexler, Gavarró & Torrens's (2004) UCC account are not clear in this regard.

[10]Other performance-based accounts (Jakubowicz & Nash 2001; Prévost 2006) do not make explicit predictions with regard to the comprehension of null object structures.

[11]Notice this is a rather old group. Most studies investigating object clitic omission in Romance languages report illicit omission to be consistently below 10% by approximately age 4;00 (see Grüter 2006 for a complete overview).

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cooking *it,*' namely, the fish. Results showed that English-speaking children accepted sentences like (8) more than 64% of the time. Adults performed better, but they still accepted it 39% of the time. Tedeschi (2009) replicated the experiment in Italian, obtaining similar results: Children (mean age = 3;11) accepted sentences like (8) 46% of the time, and adults also accepted them at a rather high rate (30%). Tedeschi concluded that, given the infelicitous use of null objects "children and adults could be trying to accommodate the meaning of the sentence, in order to make it a plausible answer to the question under discussion." In other words, the results were the consequence of a faulty methodology and so they do not bear on the question of whether children go through a null referential object stage.

Grüter (2006) employed a different methodology, using causative-inchoative verbs to build grammatical sentences that would have a transitive interpretation if null objects were allowed. Consider (9a) and (9b):[12]

(9) a. 'Caillou plonge (Ø) dans la piscine.' (French)
'Caillou is diving/plunging (a [+specific] object, e.g a toy) into the pool.'

b. 'Dora is hiding (Ø) under the sofa.' (English)
'Dora is hiding (a [+specific] object, e.g. a bag) under the sofa.'

In a truth-value judgment task, Grüter found that very few children accepted sentences in the "null object condition," that is, they did not accept intransitive sentences when paired with transitive scenes. The levels of acceptance ranged from 10% for English-speaking children to 16% for French-speaking children, and no statistical difference was found between the two groups, suggesting that children do not have a referential null object representation.

In section 3 we present the results of a similar receptive task with Spanish-speaking children, a linguistic population that has not previously been tested with respect to object clitic comprehension. In the following section we first present a new elicited production study with Spanish-speaking children.

2. STUDY 1. PRODUCTION

One of the primary goals of our production study is to evaluate whether children acquiring a variety of Spanish where object drop is unattested omit object clitics in production. An elicitation task with the prompt question "What is *x* doing to *y*?" will be employed for this purpose. The results of this study have implications for different accounts of object clitic omission, as outlined in (10):

(10) Predictions for production:

a. Wexler, Gavarró & Torrnes's (2004) UCC account of clitic omission predicts that only languages with participle agreement will show clitic omission. Thus, Spanish-speaking children should not show a significant amount of object clitic omission at any stage.

[12]The potential object was mentioned in a pretrial in order to make the use of the clitic felicitous.

b. Castilla & Pérez-Leroux (2010) predict that since children are sensitive to lexically related variability in the input, the proportion of object omission of each particular verb will be correlated with that found in adult speech.
c. Given Pérez-Leroux, Castilla & Brunner's (2012) assumption that lexical knowledge is a prerequisite for children to acquire the appropriate licensing contexts for null objects, they anticipate that the child's relative rate of clitic omission will be predicted by his vocabulary development, as measured by expressive vocabulary. They also predict that children who can produce more-complex sentences will omit clitics less frequently.
d. According to Grüter & Crago (2012), processing accounts predict that performance on a task that measures verbal working memory should be a good predictor for the relative frequency of object clitic omission.

2.1. Participants

Thirty-two Spanish-speaking children participated in this study. Data from an additional 15 were excluded from the analysis because of the following factors: less than 50% of exposure to Spanish ($n = 3$), a diagnosed language delay ($n = 2$), failure to provide verbal utterances in more than 50% of the trials in the elicitation task ($n = 5$), and failure to answer correctly to all six controls in the comprehension task ($n = 5$, see section 3.2). The children were recruited from five day care centers located in Los Angeles, California. Children were grouped into three age categories: 2-, 3-, and 4-year-olds in a cross-sectional design. In addition, 10 native Spanish-speaking adults participated in this study. The breakdown of the participants by age is given in Table 1.

All children included in this study were considered to have normal hearing, vision, and language development, and none of them had direct exposure to any of the dialects where null objects have been attested, i.e., Argentinian, Bolivian, Colombian, Ecuadorian, Paraguayan, or Peruvian Spanish. The vast majority of child participants were speakers of Mexican Spanish (25/32), three spoke Guatemalan Spanish, and four spoke Salvadorean Spanish, and most parents were immigrants from Spanish-speaking countries who did not speak English. All families reported Spanish as the main language spoken at home, and according to parental reports, children's overall exposure to the language ranged from 50% to 90% ($M = 70.6$, $SD = 8.16$).

The adults in the study were teachers at the day care centers where the children were enrolled. The dialectal and physical requirements were the same as those for children. Adults with corrected vision ($n = 4$) were also included in the study. They were all native speakers,

TABLE 1
Participants by Age Group

Age group	*n*	*Age range*	*Mean age*
2-year-olds	10	2;04,27 to 2;11,27	2;10,05
3-year-olds	10	3;00,12 to 3;11,27	3;05,27
4-year-olds	12	4;01,18 to 4;10,18	4;05,27
Adults	10	19;07,18 to 57;05,18	41;06,24

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reported Spanish to be their dominant language, and used it at least 50% of the time ($M = 68.5\%$, $SD = 19.3$). The adult data were collected to serve as a baseline against which child performance could be compared.

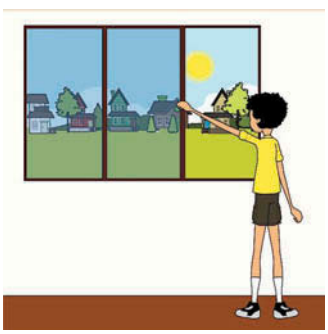
2.2. Materials and Method

2.2.1. Elicitation Task

Participants were presented with short stories illustrated by a picture, as shown in (11). This was followed by the prompt question "What is *x* doing to *y*?" used to elicit object clitics. The method and stimuli used are as in Castilla (2008) and Castilla and Pérez-Leroux (2010), except that in our protocol the stories and questions were recorded by a female native Mexican Spanish speaker and played using a pair of HP Multimedia Speakers UC-236. Questions were always in simple present, and they were repeated up to three times. Prior to testing, participants were presented with three training items to familiarize them with the task. Errors were not corrected. The actual test consisted of eight items balanced for number and gender, totaling four conditions (2 FemSg, 2 MascSg, 2 MascPl, 2 FemPl) and used the following verbs: *abrir* 'to open,' *cortar* 'to cut,' *lavar* 'to wash,' *leer* 'to read,' *meter* 'to put (inside),' *soplar* 'to blow out (a candle),' *mirar* 'to look at,' *peinar* 'to comb (someone's hair).' These verbs vary with respect to how frequently they appear with an overt object in adult speech, from highly optional *leer*, to obligatorily transitive *peinar* (Pérez-Leroux, Castilla & Brunner 2012).[13]

Each participant was arbitrarily assigned one of the three random trial orders. The complete experimental stimuli are given in Appendix A.

(11)



Trial: *El día está muy soleado y el niño quiere mirar hacia afuera. ¿Qué hace el niño con la ventana?*
'The day is sunny and the boy wants to look outside. What does the boy do to the window?'
Child: La *abre.*
'He opens it.'
**Abre.*
*'(He) opens Ø.'

Responses were recorded in writing by the experimenter, a native Spanish speaker, and the task was audiotaped using the software Audacity® version 2.0.2. with a CAD U37 condenser microphone. An independent native Mexican Spanish speaker transcribed the child's responses from the audio record. In conflicting cases ($n = 2$), the experimenter and the research assistant listened to the recordings together and searched for cues in the spectrograms of the recordings

[13]However, in the elicitation contexts they all required an overt object clitic.

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using software specialized in acoustic analysis (Praat; Boersma & Weenik 2013). An agreement was reached in all cases.

2.2.2. Corpus Study

Given that the answers of the elicitation task only consisted of contexts where referential null objects are not allowed, we analyzed several Mexican Spanish corpora (ColMex, Hess, JacksonThal, Montes, and Romero from CHILDES, MacWhinney 2000; Habla Popular and Habla Culta (Lope Blanch 1971, 1976)[14] to obtain the approximate frequency with which adult native speakers may produce different transitive verbs without an overt object (in referential and nonreferential contexts). The data were collected by hand and would be later compared to the children's proportion of object clitic omission with each particular verb.

2.2.3. Verbal Working Memory: Nonword Repetition Task

We developed a verbal working memory test paralleling that of Gathercole and Adams (1993). A set of 15 nonwords was constructed, five with one syllable, five with two, and five with three. The complete list is shown in (12).

(12) Nonword tokens (accent marks stress):
1: *ma, fu, bi, pim, ton*
2: *píma, tédi, cúme, bólta, labón*
3: *bapósa, miráco, lubóna, nibángue, tománso*

Although some of the items contained clustered consonants, they were all heterosyllabic and were constructed as far as possible to be low in phonological complexity (see Barlow 2005). Syllables were taken from Dale and Fenson's (1996) Mexican Spanish Cross-Sectional Productive Vocabulary CDI study, level 1 (8–18 months) with some minor substitutions (/m/ for /n/ and /n/ for /r/) to avoid repetitions or to facilitate production. All words contained lexical stress to facilitate memorization (Archibald & Gathercole 2007). Each participant was arbitrarily assigned one of the three random trial orders.

In contrast to Gathercole & Adams's (1993) study, where each nonword was spoken by the experimenter, who covered her mouth while producing the item, in this experiment the items were recorded by a native Mexican Spanish monolingual speaker and were played using a pair of HP Multimedia Speakers UC-236. Responses were recorded in writing by the experimenter, who had direct visual access to the children's articulations. The task was also audiotaped using the software Audacity® version 2.0.2. with a CAD U37 condenser microphone. An independent native Mexican Spanish speaker transcribed the child's responses from the audio record. For conflicting transcriptions, we followed the same procedure.

[14]Only the adults from the CHILDES (MacWhinney 2000) corpora were directing their speech to children. The other two corpora (Lope Blanch 1971) were included not only to increase the volume of data but also due to the reported significant effect of overheard speech in language acquisition (see Akhtar, Jipson & Callanan 2001; Au et al. 2002; Knightly et al. 2003, inter alia).

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The children were told that they would hear a made-up word and that they should try to copy it, "like parrots." Responses were scored as incorrect if the experimenter judged that the child produced a sound that differed phonemically from the target nonword or if the child omitted a sound completely. In cases in which it was apparent from earlier speech that a child systematically substituted a particular phoneme for another, the child was given credit if he substituted them in the same way in the test. The total number of correctly produced tokens was manually calculated for each child. Adults did not participate in this task.

2.2.4. Linguistic Development: Story Retelling Task

We also collected a language sample from each child in order to obtain four additional measures of linguistic development:

(i) Mean Length of Terminable Units in Words (MLTU; Gutiérrez-Clellen et al. 2000). A Terminable Unit (T-unit) is a main clause plus all its subordinated clauses (Hunt 1965). The T-unit Spanish adaptation suggested by Gutierrez-Clellen & Hofstetter (1994) was used to segment the sample into T-units. In this procedure, coordinated sentences that were subjectless, e.g., *Saltó y se escondió en la chaqueta* '(It) jumped and hid in the pocket,' are considered as separate T-units.
(ii) Number of T-units (NU-TU) is the count of T-units per narrative.
(iii) Subordination Index (SUB-I; Paul 2001) is the number of T-units plus the number of subordinated clauses divided by the total number of T-units.
(iv) Number of different words (NDW) is the number of different words produced during story retelling (as opposed to the number of different roots).

As in Castilla (2008) and Pérez-Leroux, Castilla & Brunner (2012), the present study employed the wordless picture book *Frog Goes to Dinner* (Mayer 1974) to elicit the language sample. The script had an MLTU of 9.54, 48 T-units, a SUB-I of 1.54, and 218 unique words. The script is provided in Appendix B.

The experimenter read the story to each child using the script while pointing at the relevant objects on each page. Once the story was finished, the examiner asked the child to retell the story while looking at the pictures. During the story retelling the examiner asked questions such as *¿y entonces qué pasó?* 'and then what happened?' and *¿y que más?* 'what else?' when the child did not provide a description of an image.

The children's narratives were recorded and transcribed by the experimenter and by an independent native Mexican Spanish speaker. Each transcription was segmented and coded using an adaptation of the SALT coding protocol for Spanish (Miller & Chapman 1996). Words that were unintelligible ($n = 3$) or those where both transcribers did not agree ($n = 1$) were excluded from the NDW count but not from the MLTU count.

2.3. Results

Responses obtained from the elicitation task were classified into one of the following four categories: (a) responses containing an accusative object clitic, e.g., *la abre* 'he opens it'; (b) responses containing a full DP, e.g., *abre la ventana* 'he opens the window'; (c) responses with a transitive verb ungrammatically lacking a direct object, e.g., *abre* 'he opens'; and (d) none of

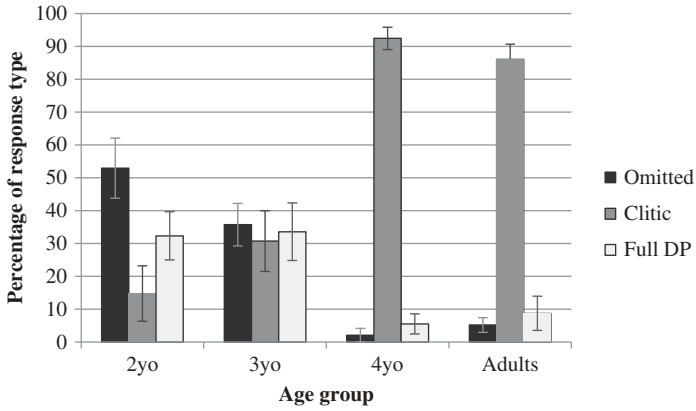

FIGURE 1 Elicitation task: rate of clitic omission, clitic production, and full DPs.

the above. Responses of type (d) accounted for 6.72% of the data overall and included unintelligible responses, verbless utterances, as well as utterances with an intransitive verb, such as *está jugando* '(he) is playing.' Given that none of these cases could provide evidence regarding the acquisition of direct object cliticization, they were excluded from further analysis. As mentioned in section 2.1, children with more than 4/8 "other" answers were excluded from the whole study ($n = 5$). The omission mean of each child was 52.92% for the 2-year-olds, 35.71% for the 3-year olds, 2.08% for the 4-year-olds, and 5.18% for the adults. Figure 1 provides the overall scorable responses to the elicitation task.

As the percentage of omission decreases, the percentage of object clitic production increases. Two- and 3-year-old children produced 14.76% and 30.71% clitic pronouns respectively; 4-year-old children produced 92.41%. Adults produced object clitics at a rate of 86.07%. Full DP responses also decrease considerably after age 3, from 32.32% and 33.57% in the 2- and 3-year-old groups to 5.51% and 8.75% in the 4-year-old and adult groups.

We were also interested in seeing whether the frequency with which particular verbs appear with null objects in adult input influenced the omission rate in children in our elicitation task. We analyzed a number of Mexican Spanish corpora (ColMex, Hess, JacksonThal, Montes, and Romero from CHILDES, MacWhinney 2000; Habla Popular and Habla Culta (Lope Blanch 1971, 1976) to obtain the approximate frequency with which children may hear each verb be used without an overt object. In order to obtain more reliable results, we only included the seven verbs that were produced by the children at least 10 times during the elicitation task. The omission rates across the different verbs are given in Table 2.

No significant correlation was found between the children's rates of omission for the most frequently elicited verbs and that of the adult corpora, Spearman's $r = -0.11$, $p = .82$, even when excluding *soplar* 'blow' due to its low frequency in the adult corpora, Spearman's $r = 0.43$, $p = .4$.

In the nonword repetition task, 2-year-olds were able to correctly repeat an average of 8.2/15 (mean = 54.67%) nonwords, compared to the 3-year-olds, who correctly repeated an average of 9.7/15 (mean = 64.67%) words from the list, and the 4-year-olds, who did the best with an

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TABLE 2
Percentage of Verb Use without an Overt Object

	Children	*Adults*
abrir	33.33% (10/30)	19.66% (23/117)
cortar	17.65% (6/34)[a]	11.63% (5/43)
dormir[b]	26.67% (4/15)	55.25% (100/181)
lavar	40.74% (11/27)	40.79% (31/76)
leer	27.78% (5/18)	46.84% (37/79)
peinar	23.08% (6/26)	7.14% (1/14)
soplar	9.09% (2/22)	75% (6/8)

[a]The reason why there are 34 productions of *cortar* 'cut' even though there were only 32 child participants is because Subjects 21 (3;11,27) and 22 (3;08,24) used the verb *cortar* in two different trials.

[b]*Dormir* is the only verb in the list that can have a causative and an inchoative reading in Spanish (i.e., 'to sleep'/'to make someone sleep'). The adult analysis included both uses. No transitive uses were found without an overt object.

.

TABLE 3
Nonword Repetition Task Correct Responses in Percentages

	1 syllable	*2 syllables*	*3 syllables*	*Total*
2-year-olds	82%	54%	28%	54.7%
3-year-olds	74%	76%	44%	64.7%
4-year-olds	88.3%	91.7%	86.7%	88.9%

TABLE 4
Story-Retelling Task

	NU-TU	*MLTU*	*SUB-I*	*NDW*
2-year-olds	11.00	3.05	1.02	31.80
3-year-olds	18.70	4.07	1.03	43.60
4-year-olds	21.58	5.91	1.13	59.08

average of 13.33/15 (mean = 88.89%) of correctly repeated nonwords. The results are shown in Table 3.

The story-retelling task also shows an improvement with age. The results are given in Table 4 for each of the linguistic measures discussed earlier (section 2.2.3).

In order to investigate the relationship between object clitic omission in the elicitation task and the five other independent linguistic measures, we used a mixed effects logistic regression model with age, verbal working memory score (VWM), NU-TU, MLTU, SUB-I, and NDW as independent variables, and random intercepts for subject and item. Only one factor showed a significant effect: verbal working memory, $p < .001$. The rest of the variables were far from significant. This result indicates that the score obtained in the nonword repetition task was the

TABLE 5
Results from the Mixed Effects Logistic Regression Model with 237 Observations, 32 Child Subjects, 8 Trials

Fixed effects	*Estimate*	*SE*	*z value*	*p (>|z|)*
(Intercept)	14.080	5.287	2.663	.008**
Age	−0.058	0.040	−1.464	.143
VWM	−0.069	0.018	−3.866	.000***
NU-TU	−0.010	0.051	−0.189	.850
MLTU	−0.427	0.399	−1.070	.284
SUB-I	−8.125	5.111	−1.590	.112
NDW	0.050	0.038	1.336	.181

**$p < .01$. ***$p < .001$.

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only significant predictor for the rate of object clitic omission in the elicitation task. The complete results are given in Table 5.

When the significant variable, verbal working memory, is taken out of the model, log-likelihood ratio test results show a significant decrease in the fit, $\chi^2(1) = 14.234$, $p < .001$. A more intuitive measure of the quality of this model can be given with a pseudo-R^2, which would be an approximate percentage of the variance in the data that can be accounted for with those variables (Jaeger 2008). The full model evaluated against an ordinary intercept model shows a Nagelkerke $R^2 = 0.467$. Given that the variable of verbal working memory alone obtained an outstandingly close goodness of fit, Nagelkerke $R^2 = 0.434$, this implies that the variable *verbal working memory* can account for virtually all the omissions predicted by the model.

In sum, the results from this study have shown that in elicited production, Spanish-speaking 2- and 3-year-olds omit clitics at a rate of 53% and 36% respectively, whereas 4-year olds behave like adults, omitting clitics only 2% of the time. Similarly, the use of full DPs also decreases after age 3, from above 30% in the two younger groups to less than 10%. When investigating the occurrence of each particular verb without an overt object, no correspondence was found between the child and adult rates. Finally, examining the predictive nature of five independent linguistic measures (VWM, NU-TU, MLTU, SUB-I, and NDW) and age, we found that the one significant variable, *verbal working memory*, alone predicted 43% of the variance, only 3% less than our full mixed effects logistic regression model.

3. STUDY 2. COMPREHENSION

The second experiment was designed to investigate the comprehension of null object sentences as well as object clitic constructions. The predictions we tested are included in (13):

(13) Predictions for comprehension

a. Most representational accounts predict that children should accept referential null objects in a comprehension task, given their assumption that the child grammar contains a convergent syntactic representation of referential null objects.

b. Processing-based accounts may predict that the longer the sentence, the more elements must be computed, thereby increasing the chance of failure (Bloom 1990). Thus, children may be expected to perform worse in sentences with an additional constituent (i.e., AdvP or PP) than in those without. Similarly, Jakubowicz's (2011) account may predict that they will do worse with periphrastic verbal forms (i.e., present continuous) than with simple verbal forms (i.e., simple present).
c. Based on the object clitic omission account of Jakubowicz & Rigaut (2000), Jakubowicz & Nash (2001), and Prévost (2006), Grüter, Hurtado & Fernald (2012) conjecture that preverbal clitics could be more difficult to process than postverbal clitics, given that canonical full DP objects also occupy a postverbal position.

3.1. Participants

The same 32 children and 10 adults who participated in Study 1 completed Study 2. See Table 1.

3.2. Materials and Method

In this study, children were presented with sentence-picture pairs. We selected three high-frequency verbs that allow a causative-inchoative alternation: *volar* 'fly'/'make something fly,' *dormir* 'sleep'/'put someone to sleep,' and *correr* 'run'/'kick someone out.' A crucial characteristic of these verbs is that the agent of the intransitive construction is performing a different action from that of the transitive construction. Thus, (14b) does not entail (14a); in the former example an object (a kite) is flying, while in the latter, Diego is flying.

(14) a. Diego vuela.
Diego flies
'Diego flies.'

b. Diego lo vuela.
Diego cl-masc-sg flies
'Diego flies it.'

The test consisted of an adaptation to Spanish of the truth value judgment task carried out by Grüter (2006) and Costa & Lobo (2009). However, we modified it into a sentence-picture matching task for two main reasons: (i) our participants were considerably younger (range = 2;04–4;05, mean = 3;07) than those in Grüter (range = 3;06–4;10, mean = 4;04) and Costa and Lobo (range = 3;02–5;10, mean = 4;04), and Grüter acknowledges that the three youngest participants, aged 3;01, 3;03 and 3;07, did not seem to understand the task (2006:141); (ii) immediately before this task, our subjects had participated in the elicitation task and the nonword repetition task described in Study 1, which could aggravate any potential fatigue or boredom.

As in Costa and Lobo (2009), at the beginning of each trial, participants were presented with a lead-in that introduced the character and the potential direct object in order to ensure there was an expectation that *x* may do something to *y*. However, while Costa and Lobo used the lead-in "Let's see what *x* did to *y* . . . Look!" in some of the null object conditions, we used a more neutral

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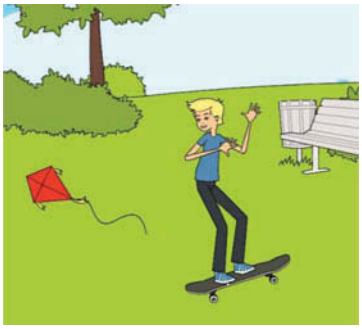
lead-in that would not bias the subject toward either the transitive or the intransitive interpretation, as shown in (15).

(15)

Lead: *¡Mira! Aquí está Diego patinando, ¡y hay un papalote en el suelo! Y ahora . . .*
'Look! Here's Diego skating and there's a kite on the floor. And now . . . '



Each trial was accompanied by two images: one depicted a transitive scenario and one an intransitive scenario. The child was then asked to point to the image that matched the sentence he had heard. Sentences were played through a pair of HP Multimedia Speakers UC-236 and were repeated up to three times. A transitive and an intransitive trial are shown in (16):

(16) a. Trans. Trial: *¡Diego lo vuela muy alto*!
'Diego flies it very high!'
Target: *points at intransitive picture (B)
points at transitive picture (A)

b. Intrans. Trial: *¡Diego vuela muy alto*!
'Diego flies very high!'
Target: points at intransitive picture (B)
*points at transitive picture (A)

(A)

(B)

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TABLE 6
Comprehension Study Conditions

Condition	*Verb length*	*Verb type*	*Clitic position*	*Final AdvP*	*Example*
1. Test	Simp. Pres.	Intrans.	N/A	yes	*Diego vuela muy alto* 'Diego flies very high'
2. Test	Simp. Pres.	Trans.	preverbal	yes	*Diego lo vuela muy alto* 'Diego flies it very high'
3. Test	Pres. Cont.	Intrans.	N/A	yes	*Diego está volando muy alto* 'Diego is flying very high'
4. Test	Pres. Cont.	Trans.	preverbal	yes	*Diego lo está volando muy alto* 'Diego is flying it very high'
5. Test	Pres. Cont.	Trans.	postverbal	yes	*Diego está volándolo muy alto* 'Diego is flying it very high'
6. Test	Pres. Cont.	Trans.	postverbal	no	*Diego está volándolo* 'Diego is flying it'
Control	Simp. Pres.	Trans.	Full DP	yes	*Diego vuela el papalote muy alto* 'Diego flies the kite very high'
Control	Simp. Pres.	Trans.	Full DP	yes	*Diego está volando el papalote muy alto* 'Diego is flying the kite very high'

The task was designed so that the target sentences would acquire a transitive interpretation if null objects were grammatically sanctioned. For example, the sentence (16b) is compatible with the picture in (16A) if a null object interpretation is possible.

We included six conditions for each of the three verbs, totaling 18 test items plus six control items, forming a total of 24 trials. The control conditions contained a full DP, three were in the simple present and three in the present continuous. In addition, three training trials were included to verify the child understood the task. These were equivalent to the simple present control condition. The test conditions are given in Table 6.

The two intransitive conditions (1 and 3) were designed to test prediction (13a), namely, whether children assign transitive interpretations to intransitive constructions. Comparing the children's performance in the simple present (2) and present continuous preverbal clitic conditions (4) will allow us to determine if verb complexity plays a role in interpreting clitic constructions (simple vs. periphrastic), as discussed in (13b). Similarly, comparing the present continuous postverbal clitic condition (5) to the shorter present continuous postverbal clitic condition (6) will shed light on the role of sentence length, with the additional factor that the postverbal clitic is in final position in (6), a more perceptually salient position. Finally, comparing the present continuous preverbal clitic condition (4) with the corresponding postverbal clitic condition (5) will address prediction (13c), that is, whether postverbal clitics are easier to process given that canonical full DP objects also appear postverbally.

Responses were recorded in writing by the experimenter, and the task was audiotaped. As in the tasks in Study 1, each participant was arbitrarily assigned one of the three random trial orders. The complete experimental stimuli are given in Appendix C.

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3.3. Results

The most relevant result we obtained in this study was that all child groups performed comparably to adults in the two intransitive conditions (1. simple present and 3. present continuous). That is, children did *not* choose transitive pictures when the sentence did not have an overt object. This is shown in Figure 2.

At the individual level, no single child scored less than 5/6 in the intransitive trials except for one 4-year-old, who scored 3/6. His rate of omission in the elicitation task was 0/8, and he correctly produced 6/8 clitics. Therefore, neither group nor individual performance allows us to establish a relationship between clitic omission and the availability of referential object *pro*.

On the other hand, children sometimes assigned an intransitive meaning to sentences with object clitics. In other words, they seemed to ignore the clitic. On average, the 2-year-olds correctly matched the clitic sentences to the transitive scenes 55.83% of the time, 3-year-olds 60%, and 4-year-olds 77.78%. The rate of correct responses collapsing the four clitic conditions (2. Simp. Present preverbal clitic, 4. Present Cont. preverbal clitic, 5. Present Cont. postverbal clitic, and 6. Present Cont. postverbal clitic with no AdvP/PP) is shown in Figure 3.

Given that there were 12 clitic trials and that each of them yielded success with a probability of 0.5, a correct response rate between 25% and 75% would indicate chance performance (95% confidence interval). In other words, children who obtained a score between 25% and 75% may have been guessing. This would include seven 2-year olds, five 3-year-olds, and four 4-year-olds. No individual child performed below 33%.

Since children's rate of correct transitive responses for clitic constructions was strongly negatively correlated with their proportion of clitic omission, Pearson's, $r = -0.61$, $p < .0005$, we investigated whether any of the variables discussed in Study 1 could also predict the results of this study. We generated a new mixed effects logistic regression model with age; condition;[15] VWM, NU-TU, MLTU, SUB-I, and NDW as independent variables; and verb and subject as

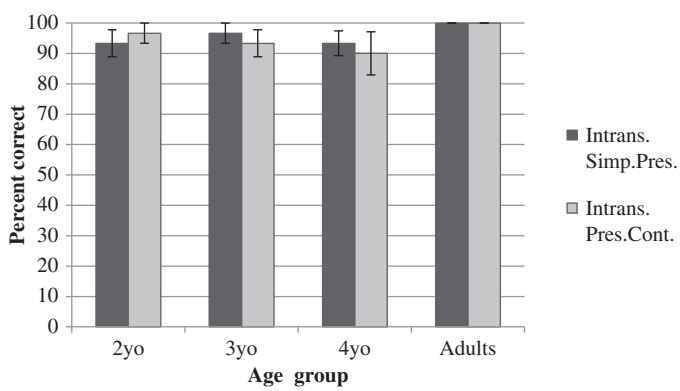

FIGURE 2 Average correct responses for the two intransitive conditions by age group.

[15]Conditions were dummy coded. Baseline condition was the preverbal simple present condition.

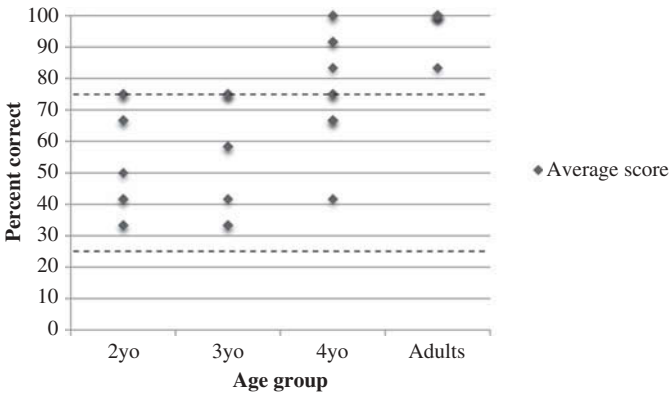

FIGURE 3 Average percent of correct responses per participant in the clitic conditions by age group. Dashed line indicates chance performance.

TABLE 7
Results from the Mixed Effects Logistic Regression Model with 384 Observations, 32 Child Subjects, 3 Verbs

Fixed effects	*Estimate*	*SE*	*z value*	*p (>|z|)*
(Intercept)	−3.779	2.203	−1.715	.086•
Preverbal pres. cont	−0.629	0.342	−1.841	.066•
Postverbal pres. cont.	−1.412	0.338	−4.175	.000***
Postverbal pres. cont. no AdvP/PP	−0.415	0.346	−1.200	.230
Age	−0.025	0.025	−1.016	.309
VWM	0.028	0.011	2.603	.009**
NU-TU	−0.006	0.034	−0.172	.863
MLTU	0.361	0.234	1.544	.123
SUB-I	3.561	2.341	1.521	.128
NDW	−0.021	0.021	−1.007	.314

• = $p < .1$. ** $p < .01$. *** $p < .001$.

random intercepts. Among the variables included in Study 1, verbal working memory (VWM) again turned out to be the only significant predictor, $p < .01$. The complete results are included in Table 7.

When the variable *verbal working memory* is taken out of the model, log-likelihood ratio test results show a significant decrease in the fit, $\chi^2(1) = 6.32$, $p = .01$. The full model evaluated against an ordinary intercept model shows a Nagelkerke $R^2 = 0.2$. A model with VWM as the only fixed effect renders a Nagelkerke $R^2 = 0.1$.

The results we obtained from this model also showed a significant difference between the baseline condition (i.e., the preverbal clitic simple present condition) and the postverbal clitic present continuous condition, as well as a marginal difference between the preverbal clitic simple present condition and the preverbal clitic present continuous condition. Later we provide a detailed comparison between the relevant paired conditions by age group.

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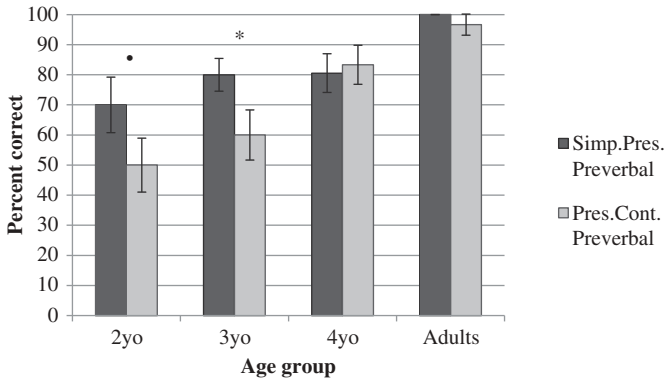

FIGURE 4 Average of correct responses for the preverbal simple present and preverbal present continuous conditions by age group. Asterisks indicate $p < .05$ in McNemar test. Dots indicate $p < .06$.

Figure 4 shows that children were more likely to choose the transitive scene in the simple present preverbal clitic condition than in the present continuous preverbal clitic condition. In other words, all else being equal, they "ignored" the clitic more often when the verb was periphrastic (17b) than when it was simple (17a).

(17) a. Carla *lo* duerme en su cama.
Carla cl-masc-sg sleeps in her bed
'Carla puts him to sleep in her bed.'

b. Carla *lo* está durmiendo en su cama.
Carla cl-masc-sg is sleeping in her bed
'Carla is putting him to sleep in her bed.'

Given that two of the three verbs underwent stem changes (*vuela*~*volando* and *duerme*~*durmiendo*), we ran a one-way ANOVA to estimate if children performed significantly better with the regular verb (*corre*~*corriendo*). We found no statistically significant difference between the three verbs as determined by one-way ANOVA, $F(2, 93) = 1.45$, $p > .05$.

Figure 5 shows that children were generally better with shorter sentences where the postverbal clitic was in sentence final position than when the postverbal clitic was followed by an additional constituent (AdvP/PP). The sentences in (18) are examples of these two conditions.

(18) a. Carla está durmiéndo*lo* en su cama.
Carla is sleeping-cl-masc-sg in her bed
'Carla is putting him to sleep in her bed.'

b. Carla está durmiéndo*lo*
Carla is sleeping-cl-masc-sg
'Carla is putting him to sleep.'

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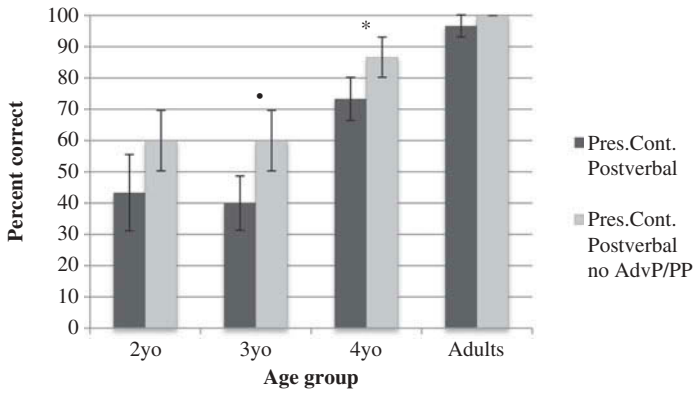

FIGURE 5 Average of correct responses for the postverbal present continuous + AdvP/PP condition and the postverbal present continuous sentence-final condition by age group. Asterisks indicate $p < .05$ in McNemar test, dots indicate $p < .06$.

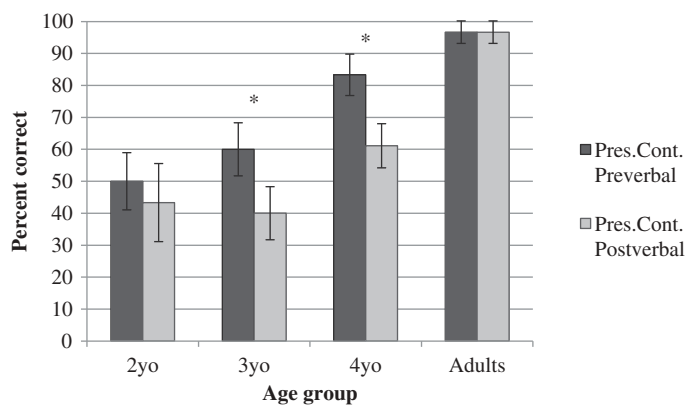

FIGURE 6 Average of correct responses for the preverbal clitic present continuous and postverbal clitic present continuous conditions by age group. Asterisks indicate $p < .05$ in McNemar test.

Children were also more likely to correctly assign a transitive meaning to sentences with preverbal clitics than sentences with postverbal clitics all else being equal, as we can see in Figure 6. The examples in (19) illustrate the two constructions.

(19) a. Carla *lo* está durmiendo en su cama.
Carla cl-masc-sg is sleeping in her bed
'Carla is putting him to sleep in her bed.'

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b. Carla está durmiéndo*lo* en su cama.
Carla is sleeping-cl-masc-sg in her bed
'Carla is putting him to sleep in her bed.'

We can conclude from the comprehension study that despite the high omission rates in the elicitation task, Spanish-speaking children practically never assign a null object interpretation to intransitive sentences, with all child groups performing above 90% in the two intransitive conditions. Notably, children did not always show they had analyzed the object clitic, a fact reflected in the overall poorer performance in the clitic conditions as compared to the intransitive conditions. Once again, verbal working memory seemed to play a role in predicting the comprehension of clitics in children, as expressed in the results of our regression model. Additionally, children's success in the different clitic conditions showed a bias towards: (i) simpler structures (i.e., preverbal simple present vs. preverbal present continuous); (ii) shorter sentences where the clitic is in a perceptually salient position (i.e., postverbal present continuous sentence final vs. postverbal present continuous followed by AdvP/PP), and (iii) preverbal clitic constructions (i.e., preverbal present continuous vs. postverbal present continuous).

4. DISCUSSION

In the following sections we will discuss the significance of the results obtained from our two experimental studies.

4.1. Study 1. Production

The results obtained on the elicited production task show a substantial rate of clitic omission in the 2- (52.92%) and 3-year-old (35.71%) groups, replicating earlier findings from spontaneous and elicited production reported in monolingual studies such as Bedore & Leonard (2001), Castilla & Pérez-Leroux (2010), De la Mora (2004), and Fujino & Sano (2002). Overall, the results obtained in this task indicate that the production of object clitics is clearly deficient in child speakers of Spanish varieties where referential null objects are not allowed, i.e., Mexican, Salvadorean, and Guatemalan Spanish. These results are incompatible with Wexler, Gavarró & Torrens's (2004) *Unique Checking Constraint* account discussed in section 1.3.1., which predicts that only child learners of languages with participle agreement (i.e., Italian, French, or Catalan, but not Spanish) should show object clitic omission (prediction 10a). Note that even though the children in our study were strongly Spanish dominant and mostly children of immigrants from Spanish-speaking countries, they were also exposed to English (see section 2.1), and even though English does not allow referential null objects, it could somehow result in structural changes in Spanish.[16] Other considerations could be differences in the frequency of *non*referential null objects in the input of Mexican- and Peninsular-Spanish-learning children. It has been reported that the rate of propositional null objects in Mexican Spanish is greater than in Peninsular Spanish (Reig 2008). However, frequency of input is not expected to play a role under the UCC account.

[16]For criticisms against this hypothesis see Berger-Morales, Salustri & Gilkerson (2005), Meisel (1989), Paradis & Genesee (1997).

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Our results also failed to support Castilla & Pérez-Leroux's (2010) prediction that the child's rate of object clitic omission for each particular verb should be correlated with the adult's rate of null object use with those same verbs (prediction 10b). No child–adult correspondence was found with respect to the seven verbs we analyzed. Although the data was obtained through different methods (i.e., elicitation task and corpus study), we were meticulous in selecting the transcripts: The adult speakers were all Mexican Spanish speakers, five of the seven corpora we analyzed involved parents of young children and included child-directed speech (ColMex, Hess, JacksonThal, Montes, and Romero from CHILDES, MacWhinney 2000), and the other two reflected a varied range of styles (Habla Popular, colloquial speech and Habla Culta, cultivated speech, Lope Blanch 1971, 1976). Assuming that the child participants of this study had comparable input, the results suggest that children are not modeling their production choices after their input.

In a separate theoretical account, Pérez-Leroux, Castilla & Brunner (2012) claimed that vocabulary growth plays a crucial role in acquiring the adult distribution of null objects. Thus, they contended that as expressive vocabulary develops, children's rate of illicit object omission should decrease. These authors further claimed that children with higher average sentence length (MLTU) and subordination rate (SUB-I) would exhibit lower use of ungrammatical null objects (prediction 10c). Even though verbal working memory was the only significant predictor for rate of omission in our regression model ($p < .001$), some potential differences in these studies could account for this finding, such as the disparity in sample size (103 in Pérez-Leroux, Castilla & Brunner and 32 in ours), and the fact that our participants had exposure to English, which could have had an effect by constraining their vocabularies. The pattern of results we obtained in the comprehension study also failed to support the predictions of this account, as we will discuss in section 4.2. However, we may not be able to dismiss Pérez-Leroux, Castilla & Brunner's account with confidence on the basis of our production study results alone.

Our pattern of results would also pose problems for Schaeffer's (1997, 2000) pragmatic account, briefly discussed in section 1.3.1. The idea that children below 3 have not yet acquired the Concept of Non-Shared Knowledge does not account for the high rates of object clitic omission in our 3-year old group, which was far from being adultlike (see Figure 1). The fact that other developmental phenomena, such as the overgeneration of definite articles, or out-of-the-blue use of pronouns, occur during the same stage of development as object clitic omission may have a pragmatic explanation, but whether these phenomena correlate with object clitic omission is still an open question. Moreover, this pragmatic theory, like other representational accounts, did not make predictions with respect to the role of working memory, which, as we showed, plays an evident role in the production of object clitics in Spanish. In order to test this pragmatic theory, one would want to compare clitic omission rates with results obtained from an independent test that evaluated children's ability to distinguish their own beliefs from the hearer's, such as a Theory of Mind test (e.g., Sally-Anne test developed by Baron-Cohen, Leslie & Frith 1985). Alternatively, one could develop a more specific test that measured the Concept of Non-Shared Knowledge. Either remains to be done.

Grüter & Crago (2012) and Jakubowicz (2011) hypothesized that since clitic omission is affected by working memory limitations, children's ability to create clitic constructions should be predicted by their score in a verbal working memory task (prediction 10d). Our regression analysis revealed that children's nonword repetition score was indeed the only significant predictor for

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their omission rates in the elicitation task. This finding presents the first empirical evidence for performance accounts linking object clitic omission to working memory limitations.

An additional crucial finding was that the data obtained from the elicitation task showed a very high rate of infelicitous full DPs in the early stages.[17] On average, 2-year-olds provided full DP answers 32.32% of the time; 3-year-olds at 33.57%; 4-year-olds at 5.51% and adults at 8.75%. Under some null object accounts (Müller, Crysmann & Kaiser 1996, Müller & Hulk 2001), children would use referential null objects in the context in which adults would use object clitics. Thus, they predict a trade-off between object clitic omission and clitic production and a constant rate of full DP object answers. However, our data shows greater use of infelicitous full DPs during the first stages, followed by a precipitous drop as clitics begin to be used consistently (see Figure 1).

One possibility with regards to this overuse of full DPs is that children have not yet mastered the discursive conditions underlying the use of object clitics, a property located at the interface between syntax and pragmatics, argued to be inherently difficult to acquire (Belletti, Bennati & Sorace 2007; Müller & Hülk 2001; Margaza & Bel 2006, Serratrice, Sorace & Paoli 2004, inter alia). However, there is a lot of work on null subject languages showing that children have early knowledge of the pragmatic constraints on pronouns and null subject use (see Hyams 2011 for a full review).

Another possibility is that children have early knowledge of object clitics but fail to produce them systematically due to processing or working memory limitations, and so they would use full DPs as a compensatory strategy. This strategy has been suggested to account for parallel results in studies of L2 French (see Paradis 2004; White 1996), an interesting symmetry, given the suggestion that linguistic processing is more costly for second language learners compared to adult native speakers (e.g., Hopp, 2010; Scherag et al. 2004, Grüter & Crago 2012). In what follows we briefly discuss a general production model that has the potential to account for some of these findings.

According to most existing models for adult production (Bock 1987; Dell 1986; Garrett 1980; Levelt 1989; Levelt, Roelofs & Meyer 1999), there are three levels of representation and processing: a level at which a conceptual, nonlinguistic message is prepared; a level of grammatical encoding at which lexical units (lemmas) are selected with their bundles of grammatical features and structured hierarchically according to their syntactic dependencies; and a level of phonological encoding at which the form of the words (lexemes) is retrieved together with the prosody and other surface characteristics of the sentence. Studies investigating language processing in adults and children (Bernstein 1981; Bloodstein, 1974; McDaniel, McKee & Bernstein 1998; McKee & McDaniel, 2001; McDaniel, McKee & Garrett 2010; Wall, Woodruff Starkweather & Cairns 1981) attribute children's processing limitations to the factors outlined in (20):

(20) Factors that have been suggested to affect language processing in children:
  a. limited memory resources: their ability to hold planned chunks for a required time span, a factor we mentioned when discussing some processing accounts for clitic omission in section 1.3.2.

[17] We observed two types of infelicity: repeating the DP mentioned in the question (36/53), and using a different DP, such as a demonstrative, a numeral, or a different noun (17/53).

b. limited ability to sustain concurrency of processing at different levels of planning: children have difficulties planning phrase X+1 (grammatical encoding) while they are uttering phrase X (phonological encoding).
c. limited realistic knowledge of the limits of their own capacity: according to McDaniel, McKee & Garrett (2010) children will rush in whereby adults would pause.

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In line with these processing limitations, according to Grüter & Crago's (2012) TAG account, children may omit object clitics because they cannot successfully hold all the elementary trees that form the complete clause in memory (the verbal projection and the clitic construction: ClP and *pro*). Under Jakubowitz's (2011) Computational Complexity Hypothesis, clitics are susceptible to omission because clitic constructions require more Merge instances and a long-distance Move operation that cannot be completely computed when working memory is taxed. This causes children to precipitate in phonologically encoding the verb, and as a result, the first part of the clitic set is unable to merge into the verbal projection, although presumably *pro* will still be present in the syntactic representation, fulfilling the argument requirements of the verbal projection. Occasionally, children may be able to revise their syntactic integration as they utter the verb and repair it by retrieving and adding a full DP object postverbally (at the expense of violating pragmatic rules). This would suggest that coordinating activity across levels might be less demanding than planning over longer spans. Finally, children with a more developed verbal working memory capacity will be able to utter the complete syntactic construction with the appropriate object clitic.

4.2. Study 2. Comprehension

The interpretation we offer for the production results is compatible with the data obtained in our comprehension study. The most prominent prediction of most representational accounts was that children who omit clitics in production should accept referential null objects in a receptive task, given their assumption that the child grammar contains a syntactic representation of null objects comparable to that of adult Chinese grammars. Our task relied on the potential ambiguity of verbs that allow a transitive/intransitive alternation, such as *volar* 'to fly'/'to make something fly.' Thus, in a grammar that allows referential null objects, the intransitive construction should be ambiguous.

Results from the sentence-picture matching task showed that when presented with intransitive sentences, children assigned them the correct intransitive interpretation to the same extent as adults, with all child groups performing above 93% on average. The transitive interpretation did not seem to be available to any of the children, regardless of their rate of omission in the elicitation task. Children performed significantly above chance, all scoring at least 5/6. Only one exception was found: a child (age = 4;06,15) who scored 3/6 in the intransitive conditions despite the fact that he did not omit any objects in the elicitation task and even supplied object clitics in 6/8 trials. Although all children included in the analysis were required to perform at 100% in all the control trials, lack of attention during some particular trials could account for his data. These results could be interpreted as evidence against most accounts that seek an explanation for clitic omission at the representational level. If children omit object clitics as a result of a nonadult grammar, we

would expect a strong correspondence between a child's rate of clitic omission in production and his nonadult assignment of transitive readings to sentences lacking an overt object.

A possible alternative interpretation is that children have a null referential object grammar coupled with a very strong preference for the intransitive interpretation. However, Grüter (2006) and Grüter & Crago (2012) obtained a similar pattern of results for their "superfluous condition," despite using a truth value judgment task. That is, children would not always reject an intransitive interpretation given a sentence containing a clitic, i.e., they also seemed to ignore the clitic. Moreover, this type of account would still not explain the rest of our findings, i.e., the correspondence between nonword repetition span and production and comprehension of clitic constructions, the increased use of full DPs in the initial stages, the perfect performance (6/6) in the full DP transitive conditions of the comprehension task, or the differences found in the paired clitic conditions of the comprehension task.

On the other hand, we found that children's overall performance in the clitic conditions (2. simple present preverbal clitic, 4. present continuous preverbal clitic, 5. present continuous postverbal clitic, and 6. present continuous postverbal clitic with no AdvP/PP) was noticeably low. Group performance for the two younger groups was at chance level: 2-year-olds correctly matched the clitic sentences to the transitive scenes only 56% of the time, 3-year-olds did so 60% of the time. An individual subject analysis confirmed that the average score of the child groups did not result from half of the children performing below chance and half performing at ceiling. Rather, individual average correct scores for the clitic conditions formed a continuum that ranged from 33% to 100%.

This pattern of results cannot be easily interpreted by accounts that posit a representational deficit in the child's grammar (Castilla & Pérez-Leroux 2010; Müller, Crysmann & Kaiser 1996; Pérez-Leroux, Castilla & Brunner 2012). These views propose that the observed inconsistent use of clitics results from the child having an alternative nonadult means of encoding a referential object, i.e., null. Therefore, they do not predict that clitic constructions should cause any difficulties in comprehension.

Children's difficulties interpreting clitics would also seem to be problematic for Grüter & Crago's (2012) TAG account, which is delimited to predicting processing difficulties with object clitic omission in production, but not comprehension. However, these results could in fact be explained under Jakubowicz's (2005, 2011) Computational Complexity Hypothesis, which predicts long distances between dependencies to cause difficulties in comprehension when working memory capacity is taxed. As in our production study, the results obtained from this second study point toward a processing explanation. The regression analysis showed that nonword repetition span has a significant predictive value in children's ability to correctly interpret object clitic constructions. A number of perceptual and processing studies have related phonological encoding to sentence processing. In a study investigating subject drop, Read and Schreiber (1982) trained English-speaking 7-year-olds to repeat only the subject of each sentence they were given.[18] Surprisingly, even though more than half of the children were able to correctly repeat five-word subjects, they were unable to correctly identify and repeat one-word subjects when these were pronominal (correct mean rate = 8%). The authors concluded that perceptual and

[18]This was done by playing the game *Walrus and Alligator*. Walrus would say a sentence in English, and Alligator would repeat a "special part of that sentence." After several trials, the child would take the place of Alligator.

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semantic salience plays a determinant role in language processing and language comprehension, particularly in children.

In another study, Huang et al. (2013) used an act-out task to investigate passives in 5-year old Mandarin-speaking children. Passives in Mandarin may have the order OSV when the direct object is followed by the syntactic marker BEI. As it is expected, children showed a strong agent-first interpretation bias, assigning an agent theta-role to the first NP. However, when the first NP was a pronoun, instead of an expressed NP (e.g., 'the seal'), children did significantly better, suggesting that they were less likely to prematurely assign the NP1 to the agent role when they could not immediately identify the referent.

Adult processing studies (Bornkessel et al. 2004; Francis, Clark & Humphreys 2003; Butterworth, Shallice & Watson 1990; MacDonald & Christiansen 2002) have also suggested that phonological encoding plays a determinant role in interpreting sentences such as garden-path constructions, given their assumption that these involve a reanalysis process that requires sentences to be stored and rehearsed in the phonological short-term memory.

In line with these studies, our results suggest that children with poor phonological short-term memory may be at a disadvantage when interpreting clitic constructions. Independently from short-term memory, if children have difficulties identifying (and not merely perceiving) pronominal elements, sentences containing a clitic and a verb that allows a transitive-intransitive reading may be ambiguous to them. Those who are able to effectively hold the entire test sentence in memory will be able to rehearse it and search for a disambiguating element, i.e., the object clitic. Those who cannot will exhibit poorer performance in the clitic conditions. Notably, this difficulty will be even more accentuated in situations that require concurrent cognitive processes, as in Study 2, which required mapping auditory signals to a visual stimulus and pointing to the correct image (see Naigles 2002; Stager & Werker 1997; Sundara, Demuth & Kuhl 2011).

Given these assumptions, other factors, such as sentence complexity or clitic position, will affect children's ability to correctly interpret the clitic construction. Comparative analyses of the results obtained in the four clitic conditions reveal that this is indeed the case, providing additional evidence in favor of processing accounts, such as Jakubowicz's (2011) Computational Complexity Hypothesis; and posing more problems for theories that rely solely on grammatical or pragmatic deficiencies. With respect to sentence complexity, 2- and 3-year-olds were significantly more likely to correctly assign a transitive reading when the sentence contained a simple verbal form (i.e., simple present) than when the verb was periphrastic (i.e., present continuous). This result would also be predicted under Jakubowicz's account, which predicts distance between dependencies to be affected by limited working memory capacity. This may not come as a surprise, considering that several studies investigating language processing have found a strong preference in both children and adults for shorter over longer dependencies (McDaniel, McKee & Garrett 2010; Viggiocco, Butterworth & Garrett 1996; Vigliocco & Nicol 1998; Wagers & Phillips 2013).

In a second comparative analysis we observed that sentences containing a postverbal clitic followed by an additional constituent (i.e., an AdvP/PP) received fewer correct responses than those where the postverbal clitic was in final position. This result is also predicted if we assume that the longer the sentence, the more elements must be computed, increasing the possibility of failure (Bloom 1990).

Additionally, results from perception studies on typically developing children as well as children with SLI have shown that edges of sentences are more salient and are routinely remembered

more often than elements in medial positions (Deese & Kaufman 1957; Leonard, Miller & Owen 2000; Norbury, Bishop & Briscoe 2001; Song, Sundara & Demuth 2009; Sundara, Demuth & Kuhl 2011). Although none of these studies has been able to determine whether this is due to immaturity of the sensory systems or to verbal working memory limitations, both would be considered to be purely performance-related limitations.

Finally, Jakubowicz & Nash (2001) and Prévost (2006) suggested that clitics that appear postverbally should be easier to interpret than those preceding the verb, given that full DP objects also have a postverbal position. This prediction, however, was not borne out in our study. In fact, two of the three child groups performed significantly better in the preverbal clitic condition than in the postverbal clitic. In terms of overall frequency, preverbal clitics are more common than postverbal clitics in Spanish adult speech. According to Torres Cacoullos & Schwenter (2009), the use of preverbal clitics in oral speech is 72%, as opposed to 28% of the cases where the clitic follows the verb.

Another factor that could account for children's better performance with preverbal clitics is that cross-linguistically preverbal clitics are phonologically less integrated to their base than postverbal clitics (Peperkamp 1997). In other words, the phonological boundaries following preverbal clitics tend to be stronger than those preceding the postverbal clitic. Peperkamp (1997) attributes this effect to processing issues that predict word beginnings to be more prominent than word ends, both in word production and in word recognition (Cutler, Hawkins & Gilligan 1985; Hawkins & Cutler 1988).

In sum, children's nearly perfect performance in the intransitive conditions strongly suggests that they do not allow referential null objects at any stage of development, contrary to the predictions of most representational accounts. At the same time, results from a regression analysis together with children's distinct performance in the different clitic conditions suggests that comprehension of clitic constructions, like clitic production, may indeed be related to working memory limitations.

5. CONCLUSION

In this article, we presented the results of two studies aimed at investigating the production and comprehension of object clitics in Spanish-acquiring children aged between 2 and 4. Predictions were based on two different classes of explanations: representational accounts and processing accounts.

The first study investigated the incidence of clitic omission in Spanish, a language for which the research literature had offered conflicting data. Results showed that object clitic omission occurs at nonnegligible rates in 2- and 3-year-olds acquiring Spanish, a nonagreeing participle language. Wexler, Gavarró & Torrens's (2004) UCC account of clitic omission was thus disconfirmed. Additionally, we assessed the relationship between rate of clitic omission and a selection of linguistic and nonlinguistic factors: age, verbal working memory (nonword repetition score), and four other measures of grammatical development (NU-TU, MLTU, SUB-I, and NDW). Nonword repetition span proved to be the only significant predictor for the elicitation results, strongly suggesting that verbal working memory limitations have an effect on the inconsistent use of object clitics.

The second study was designed to investigate whether Spanish-speaking children would accept referential null objects on a receptive task, an issue that had not been previously investigated in

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this language. Several new findings emerged from our sentence-picture matching task. First and foremost, all children consistently chose the intransitive scenes when they were presented with potential null object structures, namely intransitive sentences containing a verb that allows a transitive-intransitive alternation (e.g., *volar* 'to fly'/'to fly something'). Crucially, this pattern of results was found regardless of the individual rates of clitic omission in the elicitation task. This could be interpreted as counterevidence to proposals that attribute clitic omission to a null object representation. Further analysis revealed that in fact children have trouble interpreting object clitic constructions, and that this difficulty is directly associated with low scores in the nonword repetition task. These results suggest that clitic comprehension in children may require more reliance on verbal working memory than previously assumed.

A comparative analysis of children's performance in the four different clitic conditions provided further evidence favoring processing accounts. Generally, children's performance was significantly better when the verbal structure was simple as opposed to periphrastic; when the sentence contained fewer constituents, allowing the clitic to be in final position, which is a prominent place in sentence processing; and when the clitic was located preverbally as opposed to postverbally, a more frequent and perceptually more salient position.

The results of these two studies do not provide irrefutable evidence against representational accounts. However, they strongly suggest that children's difficulty with clitic constructions, both in production and comprehension, is directly affected by their limited processing and working memory capacity and is not representational. We may thus conclude that the linguistic principles that operate in Spanish-speaking children may be adultlike from the beginning, but the way these principles are deployed cannot initially be the same because the specific mechanisms for integrating linguistic forms require more refined and developed mechanisms of memory and language processing. To what extent these two aspects interact to generate the performance profile observed in children remains for future processing research to explore.

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APPENDIX A. ELICITATION STIMULI

Training Items

		Order		
Questions	*Expected responses*	*A*	*B*	*C*
El día está muy soleado y el niño quiere mirar hacia afuera. ¿Qué hace el niño con la ventana? 'The day is sunny and the boy wants to look outside. What does the boy do to the window?'	*La abre* 'He opens it'	1	1	1
¡Mira! Esta mamá tiene un bebé. ¿Qué le hace la mamá al bebé? 'Look! This mom has a baby. What does the mom do to the baby?'	*Lo acarrea* 'She holds him'	2	2	2
Los perros estaban muy sucios. ¿Qué le hacen los niños a los perros? 'The dogs were very dirty. What do the boys do to the dogs?'	*Los bañan* 'They wash them'	3	3	3

Test Items

		Order		
Questions	*Expected responses*	*A*	*B*	*C*
La niña y la mamá iban a salir de paseo. La niña se bañó y la mamá ayudó a que se arreglara. ¿Qué le hace la mamá a la niña? 'The girl and the mom were going out. The girl took a shower, and the mom helped to get her ready to go. What does the mom do to the girl?'	*La peina* 'She combs her'	1	2	5
Hoy es el cumpleaños de esta niña. Su mamá le hizo una rica torta y le puso una vela. ¿Qué le está haciendo la niña a la vela? 'Today is this girl's birthday. Her mom made her a yummy cake and put a candle on it. What is the girl doing to the candle?'	*La sopla* 'She blows it out'	2	6	2
La abuelita le regaló un libro muy lindo al niño. ¿Qué hace el niño con el libro? 'The grandmother gave a nice book to the boy. What does the boy do with the book?'	*Lo lee* 'He reads it'	3	1	7

(*Continued*)

(Continued)

Questions	*Expected responses*	*Order*		
		A	*B*	*C*
Hoy este niño recibió un regalo de parte de su papá. ¿Qué le hace el niño al regalo? 'Today this boy got a gift from his dad. What does the boy do to the gift?'	*Lo abre* 'He opens it'	4	4	1
Esta niña tiene unas ranas. La niña va a salir al patio y quiere llevarse las ranas en la caja. ¿Qué le hace la niña a las ranas? 'This girl has frogs. The girl is going to the backyard and wants to take the frogs with her. What does the girl do with the frogs?'	*Las mete en la caja* 'She puts them in the box'	5	8	8
¿Qué hace la mamá a las flores? 'What does this mom do to the flowers?'	*Las corta* 'She cuts them'	6	3	6
La familia terminó de comer y la mamá recogió los platos. ¿Qué le hace la mamá a los platos? 'The family finished dinner and the mom picked up the plates. What does the mom do to the plates?'	*Los lava* 'She washes them'	7	7	3
La mamá quiere mucho a sus bebés y piensa que son muy lindos. ¿Qué le hace la mama a los bebés? 'The mom loves her babies a lot, and she thinks they are very cute. What does the mom do to the babies?'	*Los mira* 'She looks at them'	8	5	4

APPENDIX B. STORY RETELLING TASK STIMULI

Page	*T-units*
1	Había una vez un niño que tenía tres mascotas: el perro, la tortuga y la rana saltarina. Los cuatro pasaban mucho tiempo juntos y se divertían. Una noche el niño se preparaba para salir a comer con su familia. Las mascotas estaban muy tristes porque el niño no las podía llevar con él.
2	Cuando el niño se estaba despidiendo del perro y la tortuga, la rana saltarina dio un brinco y se escondió en la chaqueta.
3	El niño se fue sin darse cuenta que la rana estaba en su bolsillo.
4–5	La familia llegó a un restaurante muy bonito y elegante donde todas las personas estaban vestidas para la ocasión.
6–7	Mientras el mesero les preguntaba qué querían comer, la rana decidió dar un paseo. Miró a su alrededor y dio un gran brinco.

(*Continued*)

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(Continued)

Page	*T-units*
8–9	La rana cayó dentro del saxofón.
	Todos se preguntaban porqué el saxofón sonaba tan feo.
	"No sé, pero voy a revisarlo," dijo el músico.
10–11	En ese momento *¡sas!* la rana le cayó justo en la cara.
	El músico sorprendido y asustado se fue para atrás
	y cayó dentro del tambor
	y lo rompió.
12–13	Los músicos quedaron confundidos sin saber qué pasó.
	Sólo vieron algo verde que volaba.
	La rana saltarina aprovechó la confusión
	y dio un gran salto cayendo en un plato de ensalada.
14–15	Resulta que la ensalada donde estaba la ranita iba para una señora muy elegante.
	Cuando empezó a comer *¡sas!* Se encontró a la ranita.
16–17	"¡auxilio auxilio hay una rana en mi plato!"
	Y la rana brincó de nuevo para escaparse cayendo en una copa de un señor gordo y de bigote.
18–19	Al tomar el agua el señor, la rana saltó de la copa
	y *mua* besó al señor en la nariz.
20–21	"Con que aquí estás rana," dijo el mesero.
	"Todo este desorden es por tu culpa."
22–23	La agarró de las patas para sacarla del restaurante.
	"no puede ser,
	es mi rana,
	¿qué hace aquí?," dijo el niño.
24–25	"Señor, señor, no se la lleve por favor,
	es mi amiga la rana," dijo el niño.
	La familia lo miraba muy confundidos y enojados.
	"En este restaurante no nos gusta tener ranas.
	¡Llévensela inmediatamente!," dijo el mesero muy enfadado.
26–27	Al regresar a casa todos estaban enojados porque la rana dañó la noche.
	La ranita se sintió muy mal al darse cuenta que los había molestado con su travesura.
28–29	"tú y tu dichosa rana,
	llévatela ahora mismo para tu cuarto!," dijo el papá.
	El perro y la tortuga no entendían qué pasaba.
30	Cuando llegaron al cuarto recordaron todas la travesuras de la rana: el saxofón, el tambor, la ensalada, la copa y el beso.
	Todo había sido muy chistoso.
	El niño y la rana se rieron sin parar.
	Y colorín colorado este cuanto se ha acabado.

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APPENDIX C. SENTENCE-PICTURE MATCHING TASK STIMULI

Volar 'to fly'/'to make something fly'

Prompt	*Trial*	*Condition*	*Order*		
			A	*B*	*C*
¡Mira! Aquí está Diego patinando y el papalote sigue en el suelo. ¿Y ahora? 'Look! Here's Diego skating and the kite is still on the floor. And now?'	*¡Diego vuela muy alto!* 'Diego flies very high!'	Simp. Pres. Intrans.	15	16	7
¡Mira! Aquí está Carla sentada en un banco y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Carla sitting on a bench and the kite is still there. And now?'	*¡Carla está volando muy alto!* 'Carla is flying very high!'	Pres. Cont. Intrans.	5	11	5
¡Mira! Aquí está Pablo comiendo y hay un papalote en el suelo. ¿Y ahora? 'Look! Here's Pablo eating and there's a kite on the floor. And now?'	*¡Pablo lo vuela muy alto!* 'Pablo flies it very high!'	Simp. Pres. Preverbal	2	1	2
¡Mira! Aquí está Diego jugando y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Diego playing and the kite is still there. And now?'	*¡Diego lo está volando muy alto!* 'Diego is flying it very high!'	Pres. Cont. Preverbal	20	19	18
¡Mira! Aquí está Carla leyendo y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Carla reading and the kite is still there. And now?'	*¡Carla está volándolo muy alto!* 'Carla is flying it very high!'	Pres. Cont. Postverbal	18	6	15
¡Mira! Aquí está Pablo paseando y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Pablo having a walk and the kite is still there. And now?'	*¡Pablo está volándolo!* 'Pablo is flying it!'	Pres. Cont. Postverbal No AdvP/PP	11	18	20
¡Mira! Aquí está Pablo tomando un helado y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Pablo having an ice cream and the kite is still there. And now?'	*¡Pablo vuela el papalote muy alto!* 'Diego flies the kite very high!'	CONTROL Simp. Pres. Full DP	8	9	10
¡Mira! Aquí está Diego tomando fotos y el papalote sigue ahí. ¿Y ahora? 'Look! Here's Diego taking pictures, and the kite is still there. And now?'	*¡Diego está volando el papalote muy alto!* 'Diego is flying the kite very high!'	CONTROL Pres. Cont. Full DP	22	24	22

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Correr 'to run'/'to make someone/something run away'

Prompt	*Trial*	*Condition*	*Order*		
			A	*B*	*C*
¡Mira! Aquí está Carla tomando un batido y el perrito está con ella. ¿Y ahora? 'Look! Here's Carla having a milkshake and the doggy is with her. And now?'	*¡Carla corre de su casa!* 'Carla runs away from her house!'	Simp. Pres. Intrans.	21	21	21
¡Mira! Aquí está Diego leyendo y su perrito está con él. ¿Y ahora? 'Look! Here's Diego reading and his doggy is with him. And now?'	*¡Diego está corriendo de su casa!* 'Diego is running away from his house!'	Pres. Cont. Intrans.	10	10	9
¡Mira! Aquí está Pablo patinando y el perrito está con él. ¿Y ahora? 'Look! Here's Pablo skating and the doggy is still there. And now?'	*¡Pablo lo corre de su casa!* 'Pablo is kicking him out of his house!'	Simp. Pres. Preverbal	6	4	4
¡Mira! Aquí está Pablo descansando y el perrito está con él. ¿Y ahora? 'Look! Here's Pablo resting and the doggy is with him. And now?'	*¡Pablo lo está corriendo de su casa!* 'Pablo is kicking him out of his house!'	Pres. Cont. Preverbal	23	23	23
¡Mira! Aquí está Diego sentado en el porche junto a su perrito. ¿Y ahora? 'Look! Here's Diego sitting in the porch by his doggy. And now?'	*¡Diego está corriéndolo de su casa!* 'Diego is kicking him out of his house!'	Pres. Cont. Postverbal	3	3	1
¡Mira! Aquí está Carla jugando y el perrito está con ella. ¿Y ahora? 'Look! Here's Carla playing and the doggy is with her. And now?'	*¡Carla está corriéndolo!* 'Carla is kicking him out!'	Pres. Cont. Postverbal No AdvP/PP	14	13	12
¡Mira! Aquí está Diego cantando y su perrito está con él. ¿Y ahora? 'Look! Here's Diego singing and his doggy is with him. And now?'	*¡Diego corre al perrito de su casa!* 'Diego kicks the doggy out of his house!'	CONTROL Simp. Pres. Full DP	17	7	14
¡Mira! Aquí está Carla comiendo y el perrito está con ella. ¿Y ahora? 'Look! Here's Carla eating and the doggy is with her. And now?'	*¡Carla está corriendo al perrito de su casa!* 'Carla is kicking the doggy out of her house!'	CONTROL Pres. Cont. Full DP	12	15	17

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Dormir ('to sleep'/'to make someone fall asleep')

Prompt	*Trial*	*Condition*	*Order*		
			A	*B*	*C*
¡Mira! Aquí está Pablo cantando y el bebé sigue ahí. ¿Y ahora? 'Look! Here's Pablo singing and the baby is still there. And now?'	*¡Pablo duerme en la cama!* 'Pablo sleeps in the bed!'	Simp. Pres. Intrans.	13	14	13
¡Mira! Aquí está Diego leyendo y el bebé sigue ahí. ¿Y ahora? 'Look! Here's Diego reading and the baby is still there. And now?'	*¡Diego está durmiendo en su cama!* 'Diego is sleeping in his bed!'	Pres. Cont. Intrans.	24	22	24
¡Mira! Aquí está Carla oliendo unas flores y su hermanito bebé está con ella. ¿Y ahora? 'Look! Here's Carla smelling some flowers and her baby brother is with her. And now?'	*¡Carla lo duerme en la cama!* 'Carla puts him to sleep in the bed!'	Simp. Pres. Pre-verbal	1	2	3
¡Mira! Aquí está Pablo jugando y el bebé sigue ahí. ¿Y ahora? 'Look! Here's Pablo playing and the baby is still there. And now?'	*¡Pablo lo está durmiendo en la cama!* 'Pablo is putting him to sleep in the bed!'	Pres. Cont. Preverbal	4	12	6
¡Mira! Aquí está Carla tocando la flauta y su hermanito bebé sigue ahí. ¿Y ahora? 'Look! Here's Carla playing the recorder and her baby brother is still there. And now?'	*¡Carla está durmiéndolo en la cama!* 'Carla is sleeping in the bed!'	Pres. Cont. Postverbal	9	8	8
¡Mira! Aquí está Diego comiendo un helado y el bebé sigue ahí. ¿Y ahora? 'Look! Here's Diego having an ice cream and the baby is still there. And now?'	*¡Diego está durmiéndolo!* 'Diego is putting him to sleep!'	Pres. Cont. Post-verbal No AdvP/PP	7	5	11
¡Aquí está Carla comiendo una manzana y el bebé sigue con ella. ¿Y ahora? 'Look! Here's Carla eating an apple and the baby is still there. And now?'	*¡Carla duerme al bebé en la cama!* 'Carla puts the baby to sleep in the bed!'	CONTROL Simp. Pres. Full DP	16	17	19
¡Mira! Aquí está Pablo tomando un batido y el perrito sigue ahí. ¿Y ahora? 'Look! Here's Pablo having a milkshake and the baby is still there. And now?'	*¡Pablo está durmiendo al bebé en la cama!* 'Pablo is putting the baby to sleep in the bed!'	CONTROL Pres. Cont. Full DP	19	20	16

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