Arborescences
Revue d'études françaises

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Numéro 10, décembre 2020

Hommage à Yves Roberge : clitiques, éléments nuls, et autres problèmes de syntaxe et d'acquisition

URI : https://id.erudit.org/iderudit/1081893ar
DOI : https://doi.org/10.7202/1081893ar

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Éditeur(s)

Département d'études françaises, Université de Toronto

ISSN

1925-5357 (numérique)

Découvrir la revue

Citer cet article

Pérez-Leroux, A. T. (2020). Children do not ignore (null objects): Against deficit accounts of the null object stage in language acquisition. *Arborescences*, (10), 127–144. https://doi.org/10.7202/1081893ar

Résumé de l'article

Cet article se base sur les phrases négatives avec un objet nul pour montrer que les enfants anglophones monolingues de quatre à cinq ans (n=75) acceptent voire préfèrent l'interprétation anaphorique de l'objet nul (*Johnny's mom made him a sandwich, but he is not eating* Ø) mais rejettent presque catégoriquement le même sens lorsque la phrase contient un item de polarité négatif (... *but he is not eating anything*). Ces résultats écartent la question méthodologique des inférences involontaires, présentent un argument incontournable pour l'approche représentationnelle, et remettent ainsi en question l'idée que l'omission de l'objet en langage enfantin découle d'un déficit acquisitionnel lié à l'habileté langagière limitée de jeunes enfants.

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Département d'études françaises – Université de Toronto
ISSN : 1925-5357

Web arbo.erudit.org

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Children do not ignore (null objects): Against deficit accounts of the null object stage in language acquisition

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Abstract

Children across a variety of languages omit direct objects at higher rates that adults. It has been argued that these omissions arise from children's performance or pragmatic limitations. The null object approach holds that children start by allowing a broader set of mechanisms for the recoverability of null objects than those possible in the adult grammar, which becomes more restricted with experience. Comprehension data is considered key evidence for evaluating representational approaches, but the interpretation of previous comprehension results is obscured by methodological issues. This article presents new data contrasting the interpretation of various types of direct objects in negative sentences, including null objects (*Johnny is not eating*) and anaphoric and negative polarity items (*not eating it/not eating anything*). English-speaking children aged 4–5 (n = 75) participated in three separate comprehension studies contrasting the interpretation of null objects to overt objects. Children consistently accepted sentences with overt anaphoric objects and rejected sentences with negative polarity objects, and treated sentences with null objects as fully ambiguous.

1. Introduction

When young children start to combine words into utterances, roughly around the age of one-and-a-half, they do not start with long sentences. Their production capacities are so limited that language development over the next three years is well measured on the basis of mean number of words (or morphemes) that children manage to combine into an utterance (Brown 1973). For linguists of a certain persuasion, what goes missing in those early sentences is as interesting, or perhaps more, than what actually gets pronounced. In some languages, direct object omissions persist past the age of three, and this requires some explanation beyond the "kids sentences are short" story. The classic Government and Binding/Principles and Parameters model served as the foundation for the cross-linguistic study of missing arguments in child language (Hyams 1986). The contrast in how this literature handled missing objects and subjects is worth noting (Pérez-Leroux, Pirvulescu, and Roberge 2018). While early null subjects were studied primarily as a case of parameter (mis) setting and changes in grammatical

* The studies reported here were supported by a SSHRC grant (410-05-0239) to Y. Roberge. This work was presented at the Umass/Uconn colloquia in 2010, as we were moving on to other projects. Despite its relevance, the data was not published. I believe the continuing interest in this topic in the field of acquisition justifies the current inclusion. I owe a great debt of gratitude to the various members of the Object Omission Project who assisted with these studies, particularly to Anne Johnson and Tanya Battersby. I also thank two anonymous reviewers at *Arborescences* for their insightful comments. The greatest debt goes to Yves himself. Were this not meant in his honor, he would have been a co-author, and this paper would be better.

representations, early object omission was investigated as arising from potential deficits, either in production capacity (Bloom 1990; Valian 1991), or in pragmatic abilities (Schaeffer 1997).

Comprehension data has been deemed key evidence for comparing the two main lines of explanation for early direct object omissions in child language: i) deficit accounts, which hold that missing objects arise from limitations in the pragmatic or sentence-production capacities of children; and ii) representational accounts, which hold that young children have divergent representations of implicit arguments that is fine-tuned by experience, in a process that gives rise to the variety of null object types found across the languages of the world. The present article argues that representational approaches offer the best account for developmental null objects, and reports novel English data on interpretations that four and five-year-olds give to sentences such as (1)

(1) *Johnny's mom made him a sandwich, but he is not eating Ø.*

Do children think that such negative sentences mean the subject is not eating anything, or do they think that it means that he is not eating the sandwich his mother made? Negation contexts such as this allow us to differentiate between accidental inferences and truly anaphoric readings. By examining children's interpretations of various types of direct objects embedded under negation we can test the predictions of deficit and representational accounts.

This article is organized as follows. Section 2 discusses the various approaches to developmental null objects. Section 3 presents data from a truth-value judgement task comparing children's responses to null objects sentences, to sentences with overt anaphoric objects, pronouns and headless relatives, and to overt negative polarity items. This task relies on the scope of negation as a diagnostic for definite anaphoric readings vs. the expected narrow scope indefinite interpretation characteristic of implicit objects in adult English. Section 4 discusses our findings in light of unresolved issues on the status of developmental null objects.

2. Null objects in language acquisition and syntactic theory

2.1.Missing objects reflect performance deficits

Performance-based accounts of children's argument omissions have a long history in the field of acquisition. Bloom's (1990) observation that subject omission correlates inversely to the length of the verb phrase was the first empirical argument for this position. Valian (1991) also argues for the role of production limitations in the omission of direct objects. She observed that while children's object realization increases steadily over the initial stage in grammar development, children seldom produce distinctly ungrammatical omissions with strong transitive verbs. Initial lower rates of object production arise from children's use of verbs which adults treat as optionally transitive. With age and increases in utterance length, children express the objects of optionally transitive verbs more often, seeming to balance their performance limitations with sensitivity to lexical transitivity. These two studies focus on early spontaneous production, while subsequent work elicits direct objects from older children, at ages where general production limitations do not provide a coherent explanation.

Jakubowicz et al. (1998) and Schaeffer (1997) called attention to the fact that in certain clitic languages (French and Italian, respectively), direct object omission extends to later ages (3-year-olds and above) and to clearly ungrammatical uses. Some questions immediately arise: Are later missing objects the same type of phenomena as those in studies of younger children? Are these phenomena specific to

some Romance languages, or to other clitic languages in general? Does object drop in older children reflect inherent limitations or is it a case of grammatical divergence? Children might allow null objects where adults don't because they have a grammatical representation for null objects, such as that existing in topic drop or object drop languages.

Various accounts of this later stage focused on the special configurations of clitics. Jakubowicz and Nash, in work that has remained unpublished, proposed that children experience difficulties projecting 'noncanonical' or category-deficient constituents such as clitics, among other things, as arguments, because of the computational complexity of their configurations. Wexler and colleagues pursued this argument further, proposing a constraint on the number of movement computations the child is capable of executing within a given derivation: the Unique Checking Constraint (UCC) (Wexler, Gavarro, and Torrens 2004). Subsequent work attempted the integration of representations and processing. Prévost (2006) suggests that children resort to null objects when processing limitations prevent their production of the computationally more complex clitic construction. Grüter and Crago (2012: 544) make a similar point. Under this perspective, null objects are an avoidance strategy where the speaker selects one of the two other forms available in the child grammar on the basis of processing load.

Grüter (2006) offers the most explicit proposal for the deficit view of missing clitics: the Decayed Feature Hypothesis (DFH). In this model, long-distance agree relations, such as those existing between an object clitic and the related argument position, may be computed incompletely due to phi-features having decayed in the course of a derivation, and thus becoming underspecified. As in Wexler's UCC, underspecification may impact the choice of vocabulary item. In contrast to the UCC, however, the DFH effect is strictly a production process, arising from restricted working memory capacities. Grüter's analysis has two predictions. One prediction is that omission would be correlated with working memory, a fact that is upheld by various subsequent studies (Grüter and Crago 2012; Mateu 2015). This observation is important but inconclusive. Verbal working memory correlates strongly with many aspects of grammatical development (Gathercole and Baddeley 1993) and is not at all specific to clitics. The second prediction of Grüter's DFH is a comprehension/production asymmetry. As the DFH involves feature retrieval during sentence production, it predicts failures specific to clitic production along with intact comprehension. Children should omit referentially dependent objects in their expressive language, but should not assign anaphoric interpretations to missing objects. To test this hypothesis, Grüter designed a test contrasting the interpretation of an alternating (causative-inchoative) verb. In Grüter's (2006) method, children were presented sentences such as (2) in both causation scenarios (when Caillou is hiding a toy) as well as unaccusative scenarios (when Caillou hides himself).

(2) *Caillou is hiding Ø/the car/ it* (Grüter 2006)

Children did not entertain the anaphoric/pronominal interpretation of the missing object sentences, assigning them instead the unaccusative/intransitive reading. Grüter concluded that French children thus had missing pronominal objects in production but not in comprehension. One objection to this conclusion arises from a consideration of the lexical nature of the alternation: rather than failing to access the null pronominal reading in comprehension, children might simply interpret the verb as unaccusative. This interpretation is fully compatible with the stimuli in the null object condition. Costa and Lobo (2010) subsequently applied Grüter's comprehension task to Portuguese, a language that possesses both clitics and anaphoric null objects. During a preliminary phase, these authors observed that adult Portuguese speakers were only able to access the intransitive reading when the

experimenters presented the neutral objectless prompt used by Grüter (*Rui splashed_ in the water*). In Portuguese, a null subject language, it was necessary to introduce a direct appeal to the involvement of the potential direct object as part of the preamble to the stimulus "Let us see what Rui did **to the dog".** Otherwise, the test did not elicit anaphoric null object interpretations in Portuguese-speakers. With this modification, Portuguese children performed generally well with both clitics and null objects, while failing to show sensitivity to islands in their interpretation of null objects. To summarize, these two works demonstrate the usefulness of studying null objects in comprehension. However, at the same time, they establish the need for other methodologies for investigating the phenomena.

2.2. Missing objects reflect alternative representations

All of these accounts of missing objects are predicated on the premise that verbs are either intransitive (without objects, as in the unaccusative *arrive*, or the unergative *sleep*), obligatory transitive (always with a direct object, as in *devour*, and *chase*) or optional (the object can be realized or left implicit, as in *eat,* and *read*). Unexpected missing objects are treated as failures, although the violation of expectations may arise from different sources, either from lexical expectations for strong transitive verbs or from contextual factors biasing toward the presence of an object.

Idealizations about lexical transitivity are problematic in that they ignore the high degree of variation existing in spoken language, resulting in transitivity violations for all lexical classes (Cummins and Roberge 2005). Starting from the observation that lexical transitivity is not categorical, Cummins and Roberge (2005) articulated a modular account of null objects, which assumes all null objects are syntactically represented. They proposed a simple typology of null objects, starting from the definite/indefinite contrast. They argue that variation is a function of the relative contributions of verbal semantics and pragmatics. Ruda (2014) also notes that English, supposedly a non-null object language, has a range of definite null objects. She proposes that these definite null objects are nP level pronouns, a truncated, syntactically deficient structure relative to the (DP) structure of overt pronouns. She proposes that, similar to bare nouns in languages like Japanese, these pronouns are ambiguous between referential and non-referential interpretations.

Pérez-Leroux, Pirvulescu and Roberge (2008a, 2018) extended the modular account of null objects to acquisition. They argued that the complexity of microparametric variation precludes a simple parameter governing null objects. The question is, absent the possibility of a parameter setting, how can learning be accounted for in the domain of null objects. The general assumptions of their approach are as follows:

a) Language variation as to the distribution and interpretation of null objects emerges from the potential sources of recoverability of null objects, which could be syntactic (agreement controllers, dislocated sentence topics); discourse (anaphoric or deictic); lexical (as in the generic activity interpretation given to missing objects in English).
b) All children start with unrestricted null objects, in all languages, and the learning task is to refine and restrict the strategies for recoverability, which determine which interpretations are available to null objects in the target language. Just like children learning a clitic language need to learn that clitics may preclude overt pronouns (as in French) or permit doubling (as in Spanish), and can only apply to specific objects, children must learn which restrictions operate on how null objects are interpreted. Some languages exhibit animacy restrictions. In others,

such as English, recoverability is lexical, which means that the implicit object is identified by the lexical content of the verbal root (*eat* in its intransitive presentation in English means 'eat a meal/some edible stuff').

c) Learning consists of adding restrictions to an initially unrestricted representation.

The null object approach in acquisition (Pérez-Leroux, Pirvulescu, and Roberge 2008a; Castilla and Pérez-Leroux 2010) holds that missing objects arise from the integration of a universally represented implicit object argument and the various forms of recoverability. These differences are language-specific and thus must be learned from experience. At the initial stage, however, children across languages should demonstrate a stage where anaphoric null objects are part of their grammar. Given an available discourse antecedent, children should allow a null object to link to discourse, because context-based recoverability is initially an option, alongside lexical recoverability. If this approach is correct, we should find evidence for null objects in comprehension as well as in production.

To test this possibility, Pérez-Leroux, Pirvulescu and Roberge (2008b) designed a comprehension experiment to test the anaphoric interpretation of implicit objects. The premise was that negation can disambiguate whether or not children allow null objects to be discourse-linked. Negation disambiguates accidental inference anaphoric reference as in (3a), an implicature easily defeated (3b).

(3) a. *I bought a magazine and I will sit down and read… (inference=the magazine).*
b. *…but I will read something else.*
c. *I won't read.*

Under negation, this accidental reading disappears: (3c) means I won't read at all, not just the magazine. So negation can tease apart true anaphoric reading from accidental inference. An anaphoric object would take scope over the negated predicate such that a sentence of the form (4a) would be interpreted as meaning that for this already mentioned object X, Subject A is not acting on X (interpretation 4b). Under the non-referential interpretation associated with the adult grammar, the implicit object is a narrow scope existential, and the reading that obtains is one where the activity is what is being negated (4c).

(4) a. Subject A is not verbing Ø
b. x= previously mentioned, ←V (a, x) 'not verbing x' (anaphoric reading)
c. ←∃x, V (a, x) 'not verbing anything' (activity reading)

They predict that English-speaking children will undergo a stage where they are willing to treat implicit objects as ambiguous, simultaneously entertaining the anaphoric (4b) and the activity reading (4c) for constructions such as (4a). They compared negative sentences with null objects to negatives sentences with an expressed anaphoric direct object in the form of a headless relative, as in (5).

(5) *Oh look, the cat got the fish, so the mother is* *…not cooking.*
…not cooking what the boy brought.

Children correctly accepted two-thirds of the headless relatives, and incorrectly accepted null objects about the same. For adults, performance was correct 80% (correct acceptances) with the headless

relatives, and 60% correct rejection of null objects. Thus, these English-speaking children retain anaphoric objects in comprehension past the age where they may produce ungrammatical null objects.

Pérez-Leroux and colleagues conclude that English-speaking children go through a developmental stage where they allow these null objects to be anaphoric. It is important to note that adults in this study also exhibit comprehension "errors". This bears further consideration, an issue we return to in the discussion.

2.3. Missing objects reflect pragmatic deficits

The question for missing objects is not so much of whether they are possible, but where they appear. The possibility of implicit objects is in part regulated by context. Schaeffer's (1997) had early developed an alternative take on missing objects in language acquisition, where the developmental issue focused on the syntax-pragmatics interface. Schaeffer argued that certain characteristic phenomena of objects in child language (clitic omission in Romance and insensitivity to object scrambling in Dutch) could be unified by invoking difficulties with specificity marking. Specificity is grounded in the pragmatic ability to calculate shared knowledge. If children have not yet mastered this ability, syntactic marking of specificity cannot be established and therefore object movement driven by specificity will be compromised at this early stage. This would compromise performance with aspects of morphosyntax that involve specificity.

A subsequent proposal also relates functional omission or optionality to issues of the interface between syntax and pragmatics. Tedeschi (2009) aimed to answer the following question: Are clitics omitted by Italian children because clitics refer to information that is easily retrievable from the preceding discourse? Like Grüter, she argued that a comprehension approach was needed to rule out representational approaches. She independently arrived at the same approach as Pérez-Leroux et al. (2008b), which is to set the null object in the context of a negated predicate. Her study tested acceptance of (6b) as a response to (6a) in a context where the boy fished some other thing, but not the fish. If children were adult like, they should reject the null object sentence, as in (6c), but an acceptance such as (6d) indicates Tedeschi's procedure specifically asked if the puppet had paid attention to the story. The study included "irrelevant" control trials as (6e), where the sentence to evaluate is simply unrelated to the narrative.

(6) a. Question: *Cosa è successo al pesce?* 'What happened to the fish*?*'
b. Null object sentence to be judged: *Gino non ha pescato!* 'Gino hasn't fished!'
c. Target response: Reject, because the story depicts the boy as fishing something else.
d. Null object error: Accept, because the fish was not fished.
e. Irrelevant control: *Gino started running.*
f. Expected response: Reject, since it is unrelated to the story.

Her data show that not only children but occasionally also adults accept the anaphoric reading of missing objects (i.e., the fish, in this context) (46% vs. 30%). Interestingly, children (but not adults) also frequently accepted irrelevant control trials (38%). Among children who failed the irrelevant control trials, rates of null object responses were higher (58%) than in children who gave adult-like answers to the control sentences (38%). Tedeschi interprets this contrast to suggest that the source of the null object is potentially pragmatic. According to her, these null object interpretation errors arise because

the pairing is not felicitous, as the fish is not actually involved in the fishing event. She found that some children tended to accept irrelevant explanations of pictures, in general, and noted that those children had higher rates than adults of acceptance of the negative null object statement, where children who did not accept irrelevant controls had error rates in the adult range. Tedeschi concluded that non-adult-like integration of syntactic and discourse-pragmatic requirements is a source of clitic omissions in language acquisition because some children over-rely on the pragmatic principle of 'informativeness', omitting information which is easily retrievable from context.

This explanation is somehow ambivalent as to the exact role attributed to pragmatics in the null object comprehension 'error'. At the individual level, Tedeschi suggests that some children accept the negative sentence because they are less able than others to detect the relatedness of a statement to a context. At the group level, however, she attributes to children an overreliance on informativeness. This idea arises from studies of argument drop in early speech, where it has been consistently documented that children are sensitive to a range of contextual features in their patterns of argument omissions (Clancy 1997; Allen 2000; Serratrice 2005; Hughes and Allen 2013, etc.). This literature analyzes a range of contextual features, including newness/accessibility/previous mention/absence/referential contrast and joint attention, as well as grammatical features anchored in context such as person. This evidence pertains to early language use (i.e., before the second birthday), and the findings are consistent across languages: young children tend to omit arguments when the referent of the argument is maximally clear from the discourse and situational context, but refrain from omitting arguments when the referent of the argument is in doubt for any reason. In Allen's (2000) words, these results reflect "early (hyper)sensitivity to the informational structure of events, and thus to pragmatic features of discourse" (2000: 485). Tedeschi's claim—aimed to explain experimental data from preschool-aged children but potentially applicable to adults—, is that, if the context is informative enough, some speakers would ignore the grammatical requirement to make anaphoric reference overt, and recover the implicit argument directly from discourse.

The reader may note that there is a contradiction in the ongoing discussion of pragmatics and argument omissions. On the one hand, children's use of sentences with unrealized direct objects is taken to be pragmatically infelicitous. Deficits are then invoked: a potential inability to access the interface linking grammar (specificity marking) and to access to common ground of discourse (insufficient articulation between grammar and discourse, so that children do not take notice of what aspects of a sentence's form are regulated by discourse-driven interpretation). On the other, reference is made to a primacy of pragmatic recoverability over conventionalized grammatical forms (a case of pragmatics eclipsing, or outranking grammar). Obviously, both perspectives cannot be right at the same time.[1]

Some interesting observations arise from work analyzing the developmental patterns in languages where null objects are a grammatical option, and there is no grammatical violation associated with missing objects. Mykhaylyk and Sopata (2016) test children learning Polish (and Ukranian, two languages for which referential null objects are a grammatical option, but which differ as to the availability of clitics or only full pronouns. In both languages, children show preferences for null arguments use up to the age of 5, relative to target baselines, even while they show sensitivity to syntactic constraints. The authors observed no effect of animacy for the three-to -four-year-olds group. Around the age of five and six, Ukrainian and Polish children increase their use of pronouns for animate referents, focusing their reliance of null objects to animate contexts. Because clitics in Polish are not delayed relative to full

1. Tryzna (2015) makes a different case against pragmatic accounts of object omissions, based on her observation that children have generally good comprehension of clitics.

pronouns, they rule out morphosyntactic properties of clitics as a source of omission, further pointing out that animacy, although entered as a pragmatic factor in some analyses in the previous pragmatic literature, should be treated as a semantic property of referential expressions.

Sopata's (2016) study of Polish children elicited objects referring to previously established discourse referents, but controlling for the absence/presence of direct mention of the object in the prompt sentence. This would indicate whether the object is maintained or not as a secondary topic. At the earlier ages, Polish children overwhelmingly preferred the null option in both conditions, and their responses were close to the adult distribution by age six. She argues that because omissions of lexical DPs are comparable to those of clitics, neither computational problems with clitics nor Schaeffer's referentiality marking provides a sufficient explanation for the child use of null objects with perfective transitive verbs, a possibility that is blocked for adults unless the object is a familiar topic. Sopata concludes that children's use of null elements in contexts that are not allowable in Polish occurs because children "rely on a broad linguistic and perceptual context as a main domain of reference", but have initially not incorporated into their grammars the language specific restrictions on the semantic distribution of null objects.

Flores, Rinke, and Sopata (2020) formulate the problem of acquisition of null objects as one of accessibility. Following Ariel (1991) and related works, they distinguish between a universal relative accessibility of NP-types, and absolute accessibility, which refers to specific features associated with each expression. In a study of production controlling for accessibility (direct previous mention) and animacy, they found that for all three context types studied, the frequency of children's null objects decreases with development. Preschool and kindergarden-aged children have yet to master the animacy contrast inherent in adult Portuguese.

2.4. Summary

In sum, various studies find pervasive omission stages across languages, but disagree whether the omission stage requires a performance, pragmatic, or representational explanation. One thing in common between the processing deficit accounts and the pragmatic deficit accounts is that at some level, these approaches invoke a comparison between available syntactic representations, either to calculate which representation is more complex, or to compare between representations vis a vis their fit to a given discourse context. Rather than postulate deficits, our approach is to depart from the polysemy of the null form. Languages differ in the distribution of null objects according to which modes of semantic recoverability are applied. Children should be open in principle to any of the language-specific mechanisms. In joint work with Yves Roberge and others we offer a comprehensive treatment of this approach (see Pérez-Leroux, Pirvulescu and Roberge 2018, among others). The basic insight is that the domain of implicit direct objects is parameterized; not a macro parameter, but likely a micro- or even a nano-parameter, in the sense described in Biberauer (2018), and related work. Any domain of language variation requires learning, and the evidence shows that across languages, children progress from broader to narrower use of null objects.

One clear area of agreement among the works discussed above is that the viability of representational approaches depends on children showing null objects in comprehension, as well as in production. The comprehension studies reported above reached different conclusions, and leave important questions open. Work using the unaccusative/transitive alternation, such as Grüter (2006) and Mateu (2015) argued that there was no referential null object in comprehension; the Portuguese replication

of this test suggests that the method did not support a referential null object interpretation without modification. The studies by Pérez-Leroux et al. (2008b) and Tedeschi (2009) are similar in design and results but leave important questions open. The next section presents an extension of the pilot study in Pérez-Leroux et al. (2008b), which aims to fill some existing gaps.

3. Study

3.1. Questions and hypotheses

The studies in Pérez-Leroux et al. (2008b) and Tedeschi (2009) both show children accepting null object rates at one third of the responses. In each of these, a target response is to reject, so one plausible interpretation of the data is to say that null object negative sentences are difficult to reject, particularly given the availability that the corresponding positive sentence be given an anaphoric-like reading, as suggested for (3), and the possibility of a positive response bias introduced by the anaphoric trials. For the task to properly show that the anaphoric reading is available to speakers, we need to demonstrate that a) speakers are able to attend to the task, and b) that they are able to reject negative sentences. Pérez-Leroux et al. (2008b) did not exclude participants on the basis of their performance on control sentences. Tedeschi's (2009) control condition only requires they reject totally irrelevant/ unrelated affirmative questions, representing an entirely different degree of challenge. The present set of studies reanalyzes the data in Pérez-Leroux et al (2008b) and tests two new conditions, one comparing null objects in negative sentences to sentences with overt pronouns, and to negative polarity items (*anything*), which correspond to the adult interpretation of null objects under negation. If children's difficulty is purely about discourse integration, they should also avoid rejecting polarity items. If the same children simultaneously reject polarity items, but accept null objects, at least part of the time, we should conclude that indeed, null objects are ambiguous and the referential reading is licit in comprehension.

3.2. Recruitment and participants

The participants in this study were monolingual English-speakers from Toronto, 75 children and 37 adult controls. Only children who answered at least 3 out of 4 correct of a set of negative control trials (described below) were included in the study. As a consequence of this inclusion criteria, a total of 23 children (9 from the headless relative study, 6 from the pronoun study and 8 from the NPI study) were removed from further analysis. The final sample of children who passed this criterion is described in Table 1.

Table 1: Age in months and sample size for the final sample of children included in the three studies

Study	Mean age (months)	SD	Range	N
Study 1. Headless Relatives	61.3	(8.1)	41–71	17
Study 2. Pronouns	62.5	(10.8)	42–87	19
Study 3. NPIs	56.8	(7.3)	46–73	17

3.3. Methods

The truth-value judgment task was the same as employed in Pérez-Leroux et al. (2008b), extending it to test the interpretation of negative sentences with different object types. Participants were shown a set of short stories with pictures where two characters are involved in a situation described in a short narrative, followed by a negative sentences prompt, which the participants were invited to judge as correct or incorrect.

The materials include four control trials which served to evaluate the extent to which participants were willing to accept or reject negative sentences (independent of evaluating the referential status of the direct object). These trials, illustrated in (7), were accompanied by simple scenarios, and had a definite direct object These control trials were true when the pictures showed a different action performed by the subject, as in (7a), and false when they depicted the action on the VP as taking place, as in (7b).

(7) a. Oh look, Sean is not jumping off the diving board. (Correct, he is standing by the pool)
b. Oh look, the girl is not washing the dog. (False, she is actually washing the dog)

For the experimental trials, the narrative makes repeated reference to a salient and unique object x, which after first introduction is referred to as a definite NP. The storyline indicates that the salient object will be affected by a specified activity (*eating, reading, cooking, cleaning, painting*, *drawing, riding, kicking*). A first picture introduces this situation. The second picture narrates a change in the expected storyline, where something changes and the anticipated event does not happen to object X, instead the subject is portrayed as carrying out the target action on another kind of object Y, also unique, also present in the visual scene, but not mentioned in the narrative. In these contexts, the activity has happened, but has not happened to object X. Therefore, under the activity reading (NOT VERBING), the target response should be a rejection of the negative sentence (it is not true that no activity of that kind happened). Under a referential reading (NOT VERBING X), the response should be to accept the negative sentence, since the action did not happen to object X, as shown in the sample task in (8).

The experimental session was introduced as a game where a puppet named *Froggy* was trying to help the experimenter tell stories; however, Froggy was not very good at it. Children were enlisted as helpers, and they were asked to check if Froggy was saying things right or not. After participants responded, they were asked to justify their response.

(8) EATING THE SANDWICH (Pronoun)
Experimenter: This is Bobby and his mother. His mother says to him "Here, sweetie, I made you a sandwich for lunch." So, what do you think? *Is he going to eat the sandwich or not?*
Froggy, tell me what's happening in the next picture.
Frog puppet: Oh look, Bobby is not eating it.
Experimenter: Is that right?
Target: YES
Experimenter: How come?

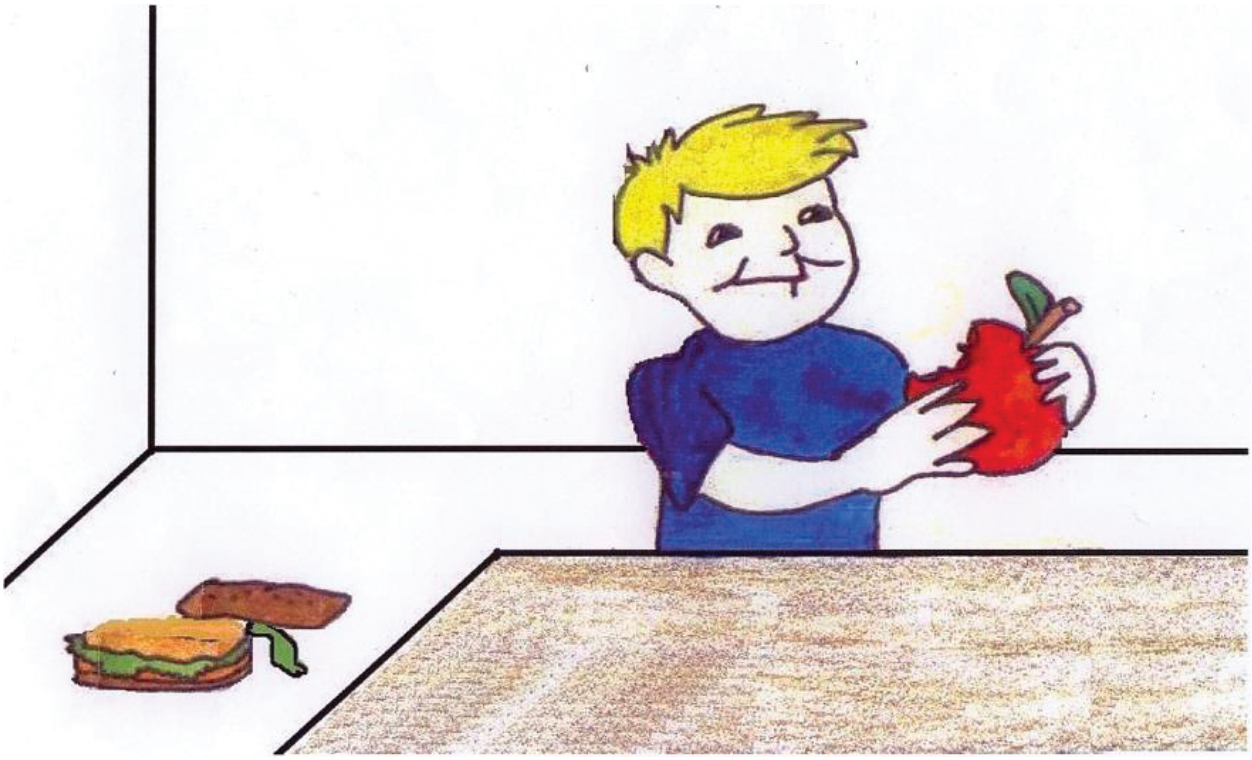

Figure 1: Sample illustration of target event

There was a total of twelve trials: four controls items and eight experimental items, equally divided between null objects and overt objects. The type of overt object differed for each study and included headless relatives, object pronouns, or negative polarity items, as shown in Table 2. Order of presentation of stimuli was semi-randomized, and condition (overt or null) was counterbalanced across participants, who were randomly assigned to one of the two versions of the test.

Table 2: Design of the three studies

Study	Conditions	Number of Trials	Target Response
1. Headless Relatives	Overt	4	Accept
	Null	4	Reject
	Control Yes	2	Accept
	Control No	2	Reject
2. Pronouns	Overt	4	Accept
	Null	4	Reject
	Control Yes	2	Accept
	Control No	2	Reject
3. NPIs	Overt	4	Reject
	Null	4	Reject
	Control Yes	2	Accept
	Control No	2	Reject

Participants were interviewed individually, and their responses were audio-recorded and transcribed, and subsequently coded as acceptances or rejections, and in a few cases, as unclear. Responses with a comment but no explicit gestural or verbal indication of acceptance/rejection were in the latter category. If a participant changed the polarity of the response during the trial, we entered the last. A common pattern was to start by saying 'yeah, right.' Speakers commonly changed this initial assent to a rejection. Justifications were checked for compatibility with the story context. No discrepancies nor specific patterns related to acceptances or rejections were detected.

3.4. Results

Adult data had fairly clear patterns of differentiation. All responses with a clear polarity stance were entered for statistical analysis. Responses which restated the situation but did not offer an explicit comment on whether Frog was right or wrong were not included. To the extent that speakers accept a sentence with a null object, they are allowing null objects to obtain reference anaphorically. Adults gave target responses near ceiling for the overt conditions (acceptances at 90% for headless relatives, 92% for pronouns, and 0%for NPIs), and very few acceptances of nulls in the NPI study (5%). Interestingly, while adults clearly contrasted between overt and null objects in the studies with overt pronouns and headless relatives, they also had a pattern of acceptance errors to null objects (30% and 48% respectively). That speakers perform differently with null objects across all three conditions suggests the possibility of a spill-over effect, because these incorrect acceptances are substantive in the conditions where nulls are balanced against anaphoric expressions, but minimal in the condition where nulls are contrasted with the negative polarity item. This is compatible with the idea that even in adults, the reference of null objects is somewhat ambiguous; if ambiguous, discourse recoverability can be primed. This performance in adults is compatible with the view that discourse control of the interpretation of null objects remains accessible in grammar. For now, our analysis concentrates exclusively on the child data.

Recall that acceptance is the expected response for the overt anaphoric conditions, and rejection is the target response for NPIs. The dialogues in (9)-(11) illustrate correct and incorrect responses:

(9) NPI Condition [target response =NO]

a. NPI (correct rejection)

Experimenter: Daniel is not painting anything. Did Froggy say it right?
[target response =NO]

Child: He is painting a wall

Experimenter: So is froggy right?

Child: No!

b. NPI (incorrect acceptance)

Experimenter: Oh look, Mary is not cleaning anything. Did Froggy say it right?
[target response =NO]

Child: Yeah she wants to clean the walls.

(10) Pronoun Condition [target response= YES]
  a. Pronoun correct acceptance
    Experimenter: Karyn is not riding it. Did Froggy say it right?
    Child: nods yes
    Experimenter: How come?
    Child: Because she's riding another horse
  b. Pronoun incorrect rejection
    Experimenter: Oh look, Bobby is not eating it. Did Froggy say it right?
    Child: No.
    Experimenter: No? How come?
    Child: Because he wants to eat a apple.

(11) Null Condition [target response= NO]
  a. Null correct rejection
    Experimenter: The big horse is asleep, so Karyn is not riding. Did Froggy say it right?
    Child: No.
    Experimenter: How come?
    Child: because she's going on a different white, a different horse.
  b. Null incorrect acceptance
    Experimenter: Did Froggy say it right?
    Child: (nods yes)
    Experimenter: How come?
    Child: Because it is.
    Experimenter: Because it is what?
    Child: Because the sandwich is on the ground.

The overall distribution of mean responses per individual children are represented in Figure 2. Children had high performance for the overt conditions (i.e., acceptances for headless relatives and pronouns, and rejections for NPIs) and had a wide range of responses for null objects, which ranged from 50–75% of acceptances in the Negative quantifier (NPI) study, and had wider ranges in the Headless Relatives and Pronoun studies, including children who consistently accepted the (false) negated sentence.

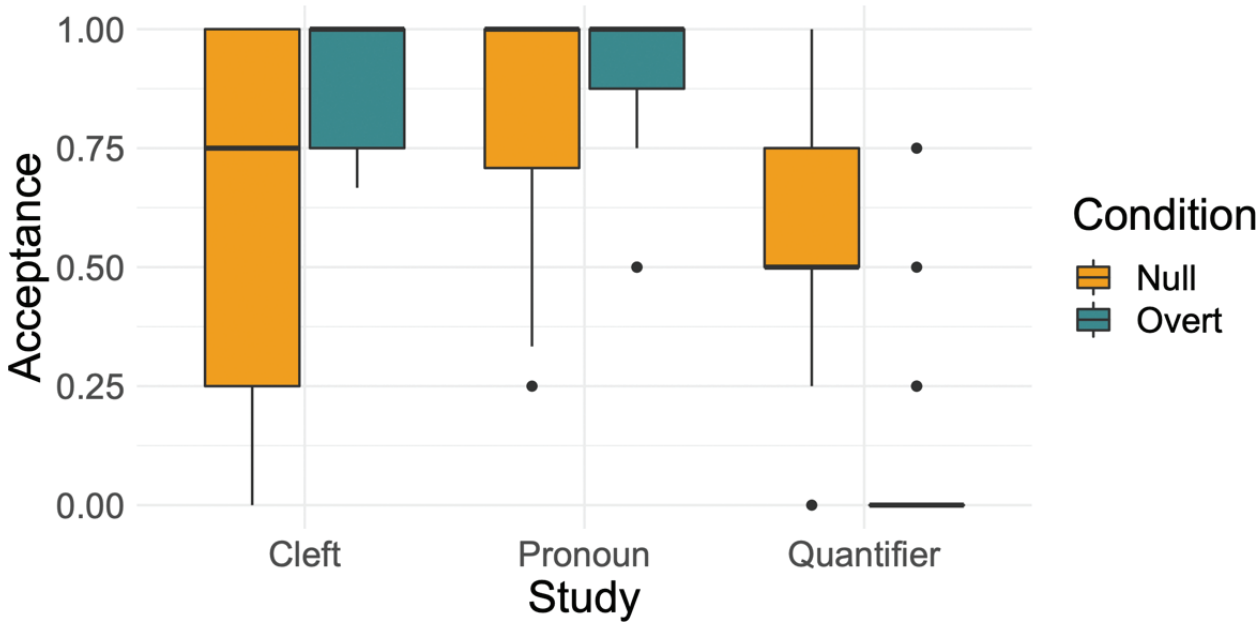

Figure 2: Mean acceptance responses to null and overt objects across studies

Children's responses were fitted into two separate generalized linear mixed-effect models (logit) using the maximum likelihood method in R (R Core Team 2019), using the Adaptive Gauss-Hermite Quadrature (nAGQ = 0), with acceptances as the binary dependent. The first model was run over the two conditions where participants were expected to accept the overt condition (headless relatives and pronouns) but reject the null object if their interpretation was restricted to the activity reading. To the extent that children are willing to interpret null objects as anaphoric, they should be willing to accept the prompts. This first model tested Study (Headless Relative/Pronoun) and Condition as fixed effects, and also included the interaction of Study by Condition. Participant and Items were entered as random effects. The results of this model show a significant effect of Condition. Thus, while null object sentences elicited substantive numbers of acceptances, these were significantly fewer than given to the anaphoric conditions, where rates of acceptances were close to ceiling.

Table 3: Generalized linear model testing the effects of group and condition in the production of target responses (Formula: Acceptances ~ Study * Condition + (1 | Participant) + (1 | Item))

Fixed effects:	**Estimate**	**Std. Error**	**z value**	**Pr(>|z|)**
(Intercept)	2.416	0.513	4.710	< 0.001***
ConditionNull	-1.589	0.506	-3.139	0.002**
StudyPronoun	-0.028	0.715	-0.039	0.969
ConditionNull:StudyPronoun	0.538	0.717	0.751	0.452
AIC	BIC	logLik	deviance	df.resid
257.5	279.5	-122.8	245.5	282

Number of obs: 288, Participants: 39; Item: 8 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Because the expected (adult-convergent) response to the NPI study is to reject both types of sentences, whether they had NPIs or null objects, the data was fitted to a separate model.

Table 4. Generalized linear model testing the effects of condition in the NPI Study (Formula: Acceptances ~ Condition + (1 | Participant))

Fixed effects:	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.285	0.483	-4.728	< 0.001***
ConditionNull	2.820	0.505	5.579	< 0.001***
AIC	BIC	logLik	deviance	df.resid
132.6	141.2	-63.3	126.6	127

Number of obs: 130, Participant, 17 Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The model showed a significant increase in the number of acceptances in the null object condition, showing rates of acceptances within the range of those offered in the pronoun and headless relative studies. In contrast, children had no ambiguity as to the interpretation of overt negative polarity objects, with all but a few outlier children giving consistent rejections to NPI sentences.

3.5. Discussion

To summarize, both statistical analyses showed that children reliably discriminate between sentence types. Children show consistently high performance for overt categories. Trials with pronouns and headless relatives are accepted at high rates. Range of individual means of (correct) acceptance is above 75% for the headless relative study, and above 90% for the Pronoun study. For the third study, the expected response was to not accept the NPI sentences, and children had no difficulty rejecting these sentences; errors with overt NPIs were extremely rare.

Null sentences, in contrast, elicit the range of responses we expect if children were treating the sentences as ambiguous. Average of individual means show a broader range of individual variability for the Cleft and Pronoun studies, with individual means clustering around 75%. In the NPI study, we observe less individual variation, and participant means occupy a narrower range, still between 50% and 75%.

The response patterns across studies summarized here suggest that evaluating negative sentences is not at all difficult for children, and that rejecting false negatives (with overt NPIs) is not harder than accepting true negatives (with overt anaphoric expressions). The overall pattern of responses indicate that the task and story materials developed for this study offer a fair chance to assess comprehension of null objects under negation. It is not the case here, as suggested by Tedeschi for her results, in which the negative activity reading (*x did not fish*) was considered to be potentially not felicitous, given a question about the potential object antecedent (*what happened to the fish*?). The materials in the present study aimed to emphasize the polarity of the proposition (*did he eat it, or not/did he eat or not*). Both interpretations were reasonable and justified (*no, he did not eat what his mother prepared for him, but yes, he did eat something*). Having established that there is no evidence that rejection responses are infelicitous or even difficult (given ceiling performance to *not V anything* sentences), the responses to null elements can be interpreted at face value. English-speaking children provide both rejections and acceptances to negative sentences with implicit objects. They do so because for them, these sentences are ambiguous between anaphoric and activity interpretations.

How do these results fit with previous studies on the comprehension of negative sentences? Research on scope interaction with negation suggests that children favor isomorphic interpretation, where they favor scope assignments that mirror linear order. Musolino, Crain, and Thornton (2000)

showed that given a sentence with negation and an object quantifier (*The smurf didn't buy every orange)*, children have difficulty with non-isomorphic interpretations. In the present set of studies, negation precedes the object so that the isomorphic interpretation corresponds to the narrow scope indefinite interpretation that I have called the activity reading. This is the target interpretation, so isomorphism predicts no errors. As mentioned by an anonymous reviewer, isomorphic biases only arise when the question under discussion is not clearly established, which is not the case of the current task. Nonetheless, the fact remains that the current data shows the opposite (i.e., non-isomorphic) pattern, which is that children freely choose a non-target with the referential object scoping over negation.

Another study on children's judgement of negative sentences suggests that children struggled with accepting true negatives; that is, where a negative statement depicts an event that did not happen, so that the negative sentence should be accepted to be true, children struggled to note it thus. Wojtecka et al. (2011) compared the interpretation of true and false sentences, without quantified or indefinite expressions (*The boy is not giving the helmet to Lise*, in a context where he actually is giving Lise the helmet), and found that children master false negatives before true negatives. In the present study, the target response (i.e., giving an activity reading to the null object sentence, given our contexts) is a false negative, whereas the non-target anaphoric reading represents a true negative sentence, and as such, should be 'harder' for the child. The results of the work by Wojtecka and colleagues would lead us to predict that the target response to null objects (reject) in the present study should be preferred by children. Instead, children overgenerate acceptance responses.

What would eliminate referential interpretations of null objects from a child's grammar? Other potential distributional cues can reinforce the association between activity readings and implicit objects, thus weakening the anaphoric reading. Nevertheless, the input is filled with ambiguous uses of null objects (Pérez-Leroux, Pirvulescu, Roberge, Tieu, and Thomas 2006), and so far, there is no concrete proposal on the table as to how this should happen. One possibility is that experience with negative sentences might play a privileged role, possibly under the kinds of constraints on strict interfaces proposed by Roeper (2018). In affirmative sentences, upward entailment operates: If Johnny ate the sandwich, Johnny ate (something). Negation blocks this upward entailment. Only negative sentences (such as used in the current study) will explicitly demonstrate to a child that Johnny could have eaten *something*, without having eaten *that sandwich*. Future work could determine if negative contexts can indeed offer particular learning pay-offs in this domain.

4. Conclusion

The simple syntactic analysis of null objects offered in Cummins and Roberge (2005) lends itself to clear acquisition predictions. Cummins and Roberge argued that the apparent diversity in the behavior of null objects across the languages of the world depends on the recoverability mechanisms available to identify the meaning of null objects. In some languages, object agreement and clitics support identification. In topic-oriented languages, recoverability is based on context. In languages like English, implicit objects are non-referential, and yield either activity readings (*eating*), or acquire special idiomatic readings (such as for *drinking)*. These mechanisms may compete, but do not cancel each other. Portuguese and Polish are clitic languages *and* null object languages. An English is a non-null object language, yet still contains a variety of null object constructions.

Precise predictions in acquisition require precise mapping of the domain of grammatical variation. The insights in the work of Cummins and Roberge opened up a new explanatory path for the

study of direct object omissions in acquisition, the idea that children have initial access to both lexical and contextual recoverability of implicit objects.[2] Time and experience would help them refine the mapping of null objects. Extended to language acquisition, the null object approach predicts a stage where children would interpret implicit direct objects as having an anaphoric interpretation. The comprehension data reported here confirms children choose (indeed, prefer) the anaphoric readings of null objects under negation. It also contributes novel data on the interpretation of negative polarity items. The same children who accept anaphoric readings of null objects are consistent in their rejections of the same meanings when the sentence contains an overt negative polarity item. This piece of evidence is crucial, as it help us discard alternative methodological explanations of children's anaphoric null objects. Taken altogether, the current results unequivocally support the null object approach to developmental omissions.

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2. Sometimes, but not as often as one would like, you come across theoretical work in generative syntax which offers clear acquisition predictions. The work of Yves Roberge and Sarah Cummins on null objects stands by its elegant logic, and the transparency of the claims within. When I first heard it presented, the predictions seemed to jump out of Yves' beautifully laid out handout. During the question period, I recall blurting "You know, you can do an experiment on that."

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