

Cleft Sentences and Reconstruction in Child Language

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1. Introduction

Linguistic structures that pose potential problems for language learnability are of special interest to researchers in child language. Suppose that the meanings of certain sentences are far from transparent to language learners, based on the surface properties of these sentences. If so, then children's early assignment of these meanings could be taken as evidence in favor of an account of language acquisition according to which children do not base their linguistic hypotheses on the linguistic input they receive from parents and caretakers. The present study reports the findings of experimental studies of children's interpretation of linguistic structures that pose just this kind of puzzle for language learnability, namely cleft sentences.

Cleft sentences begin with an expletive or a demonstrative pronoun as Subject NP. This is followed by a copula, then a focused XP, and finally a relative clause completes the predicate phrase (*It is XP Rel Clause*). One of the first analyses of cleft sentences was introduced in Chomsky (1977). On this analysis, cleft sentences were analyzed in the same fashion as relative clauses, such that the focused XP functioned as the head of the relative clause (Chomsky 1977). The focus XP was base-generated and followed by a (phonetically null) operator. This operator was moved from an argument position inside the relative clause, leaving a trace behind at the extraction site inside the relative clause. The analysis is depicted in (1).

(1) It is the fox₁ *op*₁ that the farmer saw t₁.

On this analysis, the relationship between the base-generated NP, *the fox*, and the null operator is established by some extra-construal operation such as binding or predication. In sum, the null operator analysis of cleft structures is much the same as a *wh*-movement analysis of sentences with relative clauses. A more recent account by Kayne (1994), argues against base generation of the

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focused XP in a cleft structure, proposing instead that it is moved to the relevant position. Reconstruction effects exhibited in cleft constructions serve as supporting evidence for this type of analysis. Pronominal binding by quantificational expressions must be licensed by *c*-command, both in cleft sentences and the corresponding declarative sentences, with the reverse the order of the pronoun and the quantificational expression. Consider the declarative sentences in (2). The possessive pronoun *his* can be bound by the negative quantificational expression *no politician* in (2a), where the quantificational expression *c*-commands the pronoun. As the indices indicate, the pronoun *his* can also be assigned a direct reference (deictic) interpretation in (2a), so this example is ambiguous. When the same quantificational expression does not *c*-command the pronoun, however, there is no ambiguity, as in (2b). The pronoun can only be assigned direct reference (examples adapted from Sportiche 2006).

- (2) a. No politician₁ ignores his_{1/2} collaborators.
 b. His_{*1/2} collaborators ignore no politician₁.

The copy theory of movement advocated by Chomsky (1993) has been invoked to account for similar reconstruction effects in cleft sentences (Reeve 2011, 2012). The example in (3) shows that the possessive pronoun *his* can be bound by the negative quantificational expression *no politician*, despite the fact that the quantificational NP does not *c*-command the pronoun in the surface syntax. On the reconstruction theory, there are two copies of the NP *his collaborators* in the derivation; the higher copy is pronounced in the surface syntax (3a), but it is the lower copy that is interpreted at LF, as shown in (3b).

- (3) a. It is **his_{1/2} collaborators** that no politician₁ ignores ~~his_{1/2} collaborators~~.
 b. It is his_{1/2} collaborators that no politician₁ ignores **his_{1/2} collaborators**.

All three binding principles (Principles A, B, and C) apply in exactly the same way in cleft sentences, as shown in (4a). The binding principles apply to yield exactly the same range of interpretations as the corresponding declaratives (4b), despite the reversal of word order across sentence types. Given the reconstruction effects exhibited in cleft structures, we follow the copy theory of movement approach rather than the null operator analysis.

- (4) a. It is proud of **himself₁/him_{*1}/John_{*1}** that **he₁** seems to be.
 b. **He₁** seems to be proud of **himself₁/him_{*1}/John_{*1}**.

This ends our brief review of the syntax of cleft sentences, and brings us to the experimental study of reconstruction effects in child language.

2. Child Language

A number of studies have investigated whether or not children apply binding principles at levels of representation other than surface structure (see e.g., Kiguchi & Thornton 2004, Conroy & Thornton 2005, Leddon & Lidz 2006). In an earlier investigation of reconstruction in child language, Guasti & Chierchia (1999/2000) investigated children's adherence to Principle C in structures requiring reconstruction of fronted PPs containing a quantificational NP (i.e., the Italian equivalent of *In every pirate's barrel, he put a gun*). The Italian-speaking children in the Guasti & Chierchia study rejected anaphoric relations between (null) subjects and fronted quantificational NPs. This finding is important because it provides evidence that children compute Principle C at the level of Logical Form (LF). Another experimental study of reconstruction, by Kiguchi & Thornton (2015) investigated children's interpretation of specificational pseudoclefts. This study followed Heycock & Kroch (2002) in assuming that the anaphoric relations called connectivity effects that are assigned in specificational pseudoclefts like (5) are another case of reconstruction at LF.

(5) Important to **himself_i** / **John_{*i}** / **him_{*i}** is what **he_i** is.

Part of the Kiguchi & Thornton study was an independent assessment of c-command. It is well-known that disjunction phrases generate a conjunctive entailment if and only if they are in the c-command domain of downward entailing expressions, such as the negative quantifier *nobody*. Therefore, the disjunction phrase *a piece of coral or a plant* that begins the specificational pseudocleft in (6) must involve reconstruction. On the reconstruction analysis, this disjunction phrase is in the scope (i.e., c-command domain) of *nobody* at the level of Logical Form, despite the absence of c-command in the surface syntax.

(6) A piece of coral **or** a plant is what **nobody** brought back.

The prediction was that children who reconstruct the disjunction phrase at LF will license a conjunctive entailment, that is, that nobody brought back a piece of coral and nobody brought back a plant. On the other hand, if children did not reconstruct the disjunction phrase, they would be expected to interpret (6) as having 'disjunctive' truth conditions, so (6) would be true if it was either a piece of coral or a plant (or possibly both) that nobody brought back.

The pattern of responses by the child participants in the Kiguchi & Thornton study supported the experimental hypothesis. In the context corresponding to (6), three of the divers returned from their dive in the ocean with a pretty shell and a piece of trash, and two of them returned with a plant and a piece of trash. This series of events made sentence (6) true on the interpretation in which the

disjunction phrases did not undergo reconstruction (i.e., the disjunctive truth conditions), but it made the sentence false if the disjunction phrase underwent reconstruction (i.e., where disjunction licenses a conjunctive entailment). Children rejected the target sentences like (6) 96% of the time, while adults rejected them 100% of the time. The findings invites the conclusion that the child participants computed an interpretation in which the disjunction phrase was reconstructed, so as to reside in the scope of the negative quantificational expression at the level of Logical Form.

Since the obligatoriness of reconstruction is debated in the literature, Leddon & Lidz (2006) compared children's ability to compute a reconstruction analysis of *wh*-questions with moved predicate phrases, as in (7a) and *wh*-questions with moved argument phrases, as in (8a). Notice that the corresponding declarative sentences (7b) and (8b) constitute Principle C violations if the pronoun is coindexed with the fronted question phrase.

- (7) a. How proud of **Andy**₁ was **he***_{1/2}?
 b. **He***_{1/2} was very proud of **Andy**₁.
- (8) a. Which paintings of **Miss Cruella**₁ did **she***_{1/2} put up?
 b. **She***_{1/2} put up the red painting of **Miss Cruella**₁.

The results of the Leddon & Lidz study were mixed. The children rejected coreference in (7a) 75%, of the time, but rejected coreference in sentences like (8a), only 33% of the time. Adults consistently rejected Principle C violations in (7a) (over 90%), but gave fewer rejections (77%) for sentences in which the argument phrase was reconstructed (8a). For the statements, adults gave over 90% rejections of coreference for both (7b) and (8b). Children rejected coreference less often, at 72% for (7b) and 75% for the predicate case (8b) (see Figure 1, Leddon & Lidz, 2006). The adult pattern of responses was taken to indicate that reconstruction was obligatory with predicate phrases, but optional with argument phrases. Leddon & Lidz (2006) interpreted children's response pattern as evidence that children can compute reconstruction but tend to avoid reconstruction when it is optional, in sentences with argument phrases, due to parsing preferences. This concludes the literature review, and brings us to our study of children's interpretation of two cleft sentences.

3. Experiment

This experiment investigates children ability to compute reconstruction analyses of two kinds of cleft sentences. Both concern reconstruction in argument position. In one, reconstruction yields a configuration that is governed by Principle C, as illustrated by (9).

(9) It was **Spot**₁ that **he***_{1/2} brushed **Spot**₁.

In sentences like (9), the pronoun and the referring expression must be disjoint in reference, so the sentence cannot have the meaning that Spot brushed himself. Principle C is operative following reconstruction of the lower copy, at the level of Logical Form. Simple Principle C control sentences were also included in the experiment, to ensure that the child participants adhered to Principle C when the pronoun c-commands the referring expression in the surface syntax. An example of a control sentence is (10), which illustrates that coreference is not permitted between the pronoun *she* and the referring expression *Arielle*.

(10) **She***_{1/2} brushed **Arielle**₁.

A second kind of cleft sentence was used in the experiment. This kind of sentence such as (11) assessed children's use of reconstruction in assigning a bound variable interpretation to sentences with quantificational NPs.

(11) It was **her**_{1/2} **pig** that **every girl**₁ carried **her**_{1/2} **pig**.

Sentence (11) is ambiguous. The bound reading of the pronoun should be licensed by the reconstruction of the lower copy that is within the c-commanding domain of the quantificational expression. But nothing prevents a deictic reading of the pronoun in (11b). The goal of the experiment, however, was to determine whether or not children could access the bound variable interpretation of sentences like (11). To ensure that children do not access the bound variable interpretation in the absence of reconstruction, the experiment included unambiguous control sentences like (12). Because the pronoun does not c-command the quantificational expression, the bound variable interpretation is not available for (12) (at least, not for most adults). The pronoun can only have direct reference, such that it refers to some female individual who is not mentioned in the sentence.

(12) **Her***_{1/2} koala played with **every girl**₁.

The experimental hypothesis was that children would access the bound variable interpretation for the target sentences like (11) to some extent, but not for controls like (12).

3.1. Participants

Twenty children participated in the experiment. These children ranged in age from 4;0 years-old to 5;5 years-old, with a mean age of 4;9. The children were

monolingual speakers of English, and attended childcare centers on the university campus or close to campus. We also tested fifteen adult participants, who were all undergraduate native speakers of English.

3.2. Method

The child participants were tested using the Truth Value Judgment Task (TVJ Task) (Crain & Thornton 1998). In this task, the child watches stories that are acted out with toys and props by one of the experimenters. A second experimenter plays the role of a puppet who watches the stories alongside the child. At the end of the story, the puppet tries to describe what happens; this is delivery of the test sentence. The child's task is to tell the puppet whether it is right or wrong. When the child judges the puppet to be wrong, the child is asked to explain what happened, to ensure that the child participants reject the puppet's statements for the right reason.

3.3. Materials

The stories that were acted-out in front of the children conformed to the formula for the use of the TVJ Task (Crain & Thornton 1998). The stories were designed so that children could easily assent to the truth or falsity of the puppet's description of the story. To make it felicitous for children to deny the truth of the puppet's utterances, each story was designed to ensure that the proposition expressed by the test sentence was under consideration at some point in the story. This was a possible outcome. Subsequently, events conspired such that the possible outcome did not match the eventual 'actual' outcome, which made the sentence false in the context.

The stimuli were also designed to satisfy the specific felicity conditions for cleft sentences. The focused NP was contrasted with other presupposed (previously established) NPs in the context. For example, in the story designed for *It is Spot that he brushed*, *Spot* receives focus and contrasts with other characters in the workspace. The characters in this contrast set could potentially all be recipients of brushing. In the story corresponding to the bound variable cleft sentence *It was her pig that every girl carried*, there were two contrast sets, one associated with the direct reference (deictic) interpretation of the pronoun and the other with the bound variable interpretation. On the direct reference interpretation, the focused NP *her pig* belonged to a girl named Emma, and was contrasted with Emma's chicken. For the bound variable interpretation, each of the girl's pigs were contrasted with their kittens. Sample storylines follow.

Principle C Cleft Sentences: It was Spot that he brushed

Following reconstruction, children would be expected to reject the puppet's statement. Children who do not reconstruct or who lack Principle C would be expected to inform the puppet that the test sentence was true.

The story is about several friends: Spot, Buzz and Spiderman. These friends are coached by their fitness trainer, the Pink Panther. On this particular day, the friends compete in an obstacle course. By the time they have jumped over a block and wiggled through a pipe full of leaves, the friends are all dirty. They ask the Pink Panther to brush them off. The Pink Panther considers brushing each of them, including Spot. However, he decides there's only time to brush one participant, and he chooses to brush Buzz as he suffers from allergies. Spiderman decides to go dirty, but Spot, being proud of his spots, uses another cloth to get brushed off. So it is false that Pink Panther brushed Spot, but true that Spot brushed himself.

The control sentences were ordinary declarative sentences such as *She brushed Arielle*. Principle C applies in the surface syntax, making the control sentence a false description of the story.

Bound Variable Cleft Sentences: It was her pig that every girl brushed

For these cleft sentences, the bound variable interpretation was only available under reconstruction. However, these test sentences are ambiguous, so it is possible that children and adults would have a preference for assigning the direct reference (deictic) interpretation of the pronoun. This preference has been found in previous literature for other constructions. For this reason, we designed our experiment to encourage the bound variable interpretation, if this was compatible with participants' grammars. This was accomplished by appealing to the Principle of Charity, and making the test sentences true on the bound variable interpretation. That is, the sentences were true on this interpretation, but not on the direct reference interpretation, which was false.

The story for a typical bound variable cleft sentence such as *It was her pig that every girl carried* would be as follows. A girl, Emma, has a pig. The NP *her pig*, takes direct reference, and refers to Emma's pig. Emma invites every girl to get fit by carrying her pig, but her pig doesn't fit in the available basket, so they carry her chicken instead. Emma then suggests that all the girls should practice carrying their other pets. Each girl has a cat and a pig. The cats don't want to be carried, though, and decide to play instead, so the girls all decide to carry their pig. Each girl puts her pig in her basket, and they carry their pigs to the hill.

The control sentences were designed to show that the same surface ordering of pronoun and quantificational NP does not yield a bound variable interpretation in simple declarative sentences like *Her koala played with every girl*. This is because the quantificational NP does not c-command the pronoun. In response to the control sentences, therefore, we expected both children and adults to enforce disjoint reference between the pronoun and the quantificational NP. Consequently, we anticipated that participants would assign the direct reference interpretation in the control sentences, which made the test sentences false. If participants lacked knowledge that pronominal binding requires c-command, they would be expected to accept the control sentences, because they were true if the quantificational NP was taken to bind the pronoun.

3.4. Procedures

Each child was interviewed individually, over 3 sessions. There were four test sentences for each of the two types of cleft structures, and four control sentences for each, for a total of 16 trials.

The first session contained 4 Principle C target cleft sentences (e.g., *It was Spot that he brushed*) and 4 declarative control sentences that were governed by Principle C (e.g., *She brushed Arielle*). Both the test sentence and the control sentences in the first session were expected to evoke negative judgment from the participants. That is, children were expected to say ‘No’, indicating that they judged the puppet’s statement to be false. To offset the number of negative judgments in the first session, we included four ‘Yes’ fillers.

The second session tested the second kind of test cleft sentence, which permitted both a bound variable interpretation, and a direct reference interpretation of the pronoun (e.g., *It was her pig that every girl carried*). We began the second session with four additional ‘training’ trials. These trials ended with the puppet producing sentences that were felicitous in the context only if they were associated with a particular interpretation of the sentence, either a bound variable interpretation or a direct reference interpretation. There were 2 such practice trials of each type. The remainder of the session tested the bound variable cleft sentences in contexts in which both interpretations were made accessible. Filler sentences were included to elicit additional ‘Yes’ or ‘No’ responses from children, depending on how they had responded to the (ambiguous) target sentences. Because the training items lengthened the session, the four control sentences corresponding to the bound variable cleft sentences were tested in a third session (e.g., *Her koala played with every girl*). Filler items were also included in the third session in order to evoke an equal number of ‘Yes’ and ‘No’ responses from children during the session.

4. Results

We begin with the results for the Principle C cleft sentences. Children rejected both the cleft target sentences governed by Principle C under reconstruction, and the control sentences where Principle C applies in the surface syntax. Children rejected the cleft sentences 93.8% of the time, and adults rejected these sentences 100% of the time. Turning to the control sentences, children rejected these sentences 98.7% of the time, and adults rejected them 100% of the time. A Mann-Whitney test was used to compare the responses of children and adults in both the target and control conditions. There was no significant difference between children and adults on either condition. Both children and adults enforced disjoint reference between the pronoun and the referring expression, both in the test sentences and in the control sentences.

For the second type of cleft sentence, for which the bound variable interpretation of the pronoun was available only under reconstruction, the child participants accepted the cleft sentences on the bound variable interpretation 65% of the time; adults accepted them slightly less often, 50% of the time. This shows the availability of the bound variable interpretation for both children and adults, which is made possible by reconstruction. The control sentences, by contrast, did not permit a bound variable interpretation despite the same surface order of pronoun and quantificational NP. Children accepted the control sentences only 17.5% of the time while adults never accepted them. A Mann-Whitney test was used to compare the responses of children and adults. The difference between the groups was not significant for the bound variable targets but it was for the control items ($Z = -2.941$, $p < .05$).

Turning to the data for individual participants, of the 20 child participants, 3 rejected the bound variable interpretation on all 4 trials, and another child rejected this interpretation on 3 out of the 4 trials. Two of the 15 adult controls also rejected the bound variable test sentences on all 4 trials, and 3 others rejected them on 3 of the 4 trials. An analysis of the individual trials did not reveal that any particular trial(s) were responsible for the negative responses by children or by adults.

As we have seen, both children and adults sometimes preferred to opt for a deictic interpretation of the pronoun over a bound variable one for sentences like *It was her pig that every girl carried*. Some participants pointed out that it wasn't Emma's ('her') pig that every girl carried but her chicken. Interestingly, other participants justified their rejections of the fact that every girl carried Emma's pig by pointing out the girls carried their own pigs. That is, in rejecting the deictic interpretation they produced the bound variable one. Example responses from the children are given in (13).

- (13) *They carried their own pigs.*
They didn't carry Emma's pig, they carried their own.
Every girl carried their own pig.

In the next section, we consider reasons for the difficulty that both children and adults experienced in attempting to access the bound variable interpretation of cleft sentences with quantificational expressions.

5. Discussion

The present study investigated the acquisition of two kinds of cleft sentences. In one kind of cleft sentence, e.g., *It was Spot that he brushed*, one possible interpretation that might be generated cannot be. This is the coreferential interpretation, where a pronoun and a referring expression pick out the same referent. The same interpretation is prohibited in declarative sentence

when the pronoun c-commands the referring expression in the surface syntax (e.g., *She brushed Arielle*). The findings of the experiment revealed that children had an adult-like prohibition against the illicit coreferential interpretation. The interpretation was rendered illicit by one of the principles of the binding theory, Principle C. Control sentences were included in the experiment to demonstrate children's adherence to Principle C in declarative sentences (e.g., *She brushed Arielle*). The finding that children prohibited coreference in cleft sentences is important, because it is evidence that children compute the interpretation of cleft sentence at Logical Form, as expected on the reconstruction analysis.

The second kind of cleft sentence was quite different from the Principle C ones, in which one interpretation is ruled out by a linguistic constraint. In our bound variable cleft sentences (e.g., *It was her pig that every girl carried*), the adult grammar allows an 'extra' interpretation. For adults, these cleft sentences allow an interpretation that is blocked in declarative sentences that look superficially similar, namely declarative sentences that contain a pronoun which precedes a quantificational NP (e.g., *Her koala played with every girl*). In these control sentences, the quantificational NP does not c-command the pronoun. This means that the pronoun is not bound by the quantificational NP. In the cleft sentences, pronominal binding is made possible by reconstruction. Due to reconstruction, the second kind of cleft sentence has an unexpected bound variable interpretation, which is not available for declaratives, despite their surface similarity to the cleft ones.

In the experiment we conducted, a comparison of children's responses to sentences of both kinds confirmed the experimental hypothesis – that children could access the bound variable interpretation of the cleft sentences, but not in the declarative sentences. Invoking the copy theory of movement once again, we took children's acceptances of the cleft test sentences on the bound variable interpretation to be evidence that children applied reconstruction to generate this interpretation at the level of Logical Form.

The adult controls produced similar patterns of responses to both kinds of cleft sentences. In responding to the bound variable cleft sentences, a few children and adults experienced difficulty accessing the bound variable interpretation of the test sentences, and rejected them on at least 3 out of the 4 target trials. Here we consider potential explanations. Specifically, we suggest that processing factors are responsible for some participants' preference for the deictic interpretation. In these cleft sentences, the pronoun appears in the focus NP in the surface syntax, preceding the quantificational NP, although it does not c-command it. Consider the example sentence, *It was her pig that every girl carried*. Here, the NP containing the pronoun, *her pig*, precedes *every girl*. The first NP encountered by the parser contains the pronoun. It is reasonable to assume that, due to limited working memory capacity, the parser is under pressure to assign a direct referent to the pronoun. There is no evidence at this point that the bound variable interpretation is even an option, because the

quantificational expression has not been encountered. Therefore, the parser seeks to identify a direct referent for the pronoun, some salient female individual who has not yet been mentioned. Once the referent has been fixed for the pronoun, however, the parser would need to initiate several structural changes in order to formulate the bound variable interpretation. The parser would have to reanalyze both the syntactic and the semantic representations that have been formulated at this point in the sentence parse.

To conclude, the present experimental study investigated reconstruction effects in children's grammars using two types of cleft sentences that have not previously been studied. The findings are consistent with the copy theory of movement and with the critical role of c-command in formulating the interpretations of cleft sentences. C-command is used both in sentences governed by Principle C, and in sentences that permit a pronoun to be bound by a quantificational NP. Finally, the findings of the present study add to the growing body of evidence that, by age 4 or younger, children are able to reconstruct expressions from a position in the surface syntax to a different position in the semantic representation. This entails the existence of an abstract level at which reconstruction takes place and determines the relevant interpretive possibilities, viz., Logical Form.

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