This study examines *-clefts in four- and five-year-old English-speaking children using a truth-value judgment task. The goal was to find out whether children (i) observe principle C in clefts like *It was Spot that he brushed* and (ii) access bound-variable interpretations in clefts like *It was her pig that every girl carried*, despite the lack of c-command between relevant elements in the surface representation. Our experimental finding was that children behave like adults. This suggests that children do not rely solely on the word order of sentences encountered in their linguistic input, but use mechanisms made available by innate linguistic knowledge for interpretation.*

**Keywords:** universal grammar, *-clefts, reconstruction, acquisition of syntax, principle C, bound variables

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 sentences’ surface properties. 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 solely on the surface properties of sentences. Such evidence would, in turn, support the proposal that children are born with innate linguistic knowledge (Chomsky 1965, 1981, 1986). 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 are focus structures in English. They begin with an expletive or a demonstrative pronoun in subject position. This is followed by a copula and then a focused XP, and finally a relative clause completes the predicate phrase. The four constituents of cleft sentences are illustrated in 1.

(1) *It was the ratatouille – that the chef praised.*

pronoun – copula – focus XP – relative clause

One reason that clefts have been of interest, especially to psycholinguistics, is because they do not necessarily conform to the canonical SVO word order of English. For example, in 1, the focused XP is the object NP, so the surface order is OSV. For this reason, clefts have been used to investigate whether different populations invoke some kind of strategy to aid interpretation, or whether they do, in fact, compute the syntactic structure (Bever 1970, Grodzinsky 1990). Clefts are, moreover, extremely rare in the input, making it unlikely that experience has much of a role to play in how they are understood, at least in child grammars. According to a study of eight corpora, clefts occur ‘in less than one tenth of a percent of all sentences’, with object-gap clefts being much more infrequent than subject clefts (Roland et al. 2007:353). Our study tests children’s interpretation of two kinds of cleft structures. In both cases the focused XP is an object, so the word order is OSV, making it difficult to harness properties of the surface syntax for interpretation.

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In both of the cleft structures tested in this study, our interest is children’s interpretation of a pronominal element. In the theory of universal grammar, the potential reference of various kinds of noun phrases is constrained by universal principles. In one of the cleft structures, the pronoun is subject to a universal principle known as principle C (Chomsky 1981, 1986, 1995). In the second structure, our interest is the availability of a bound-variable interpretation of the pronoun. Given the rarity of clefts, and even more so ones containing pronouns, demonstration that children comprehend clefts in the same way that adults do would suggest that children draw on innate linguistic knowledge and not their linguistic experience in interpreting these sentences. We introduce the structures investigated in our experiment next. This will preface our discussion of the relevant linguistic theory and previous literature on principle C in child language.

Before we describe how principle C applies to this kind of OSV cleft sentence, we review its application in simple declarative sentences. Consider example 2: principle C dictates that the referring expression the princess cannot be anaphorically linked to the pronoun she, so she must refer to someone not mentioned in the sentence. In sentences with referring expressions, the anaphoric relation that is prohibited by principle C is called coreference. The acceptability of coreference in example 3 shows that the prohibition against it in 2 is not based on linear order. That is, while she precedes the referring expression the princess in both 2 and 3, coreference is prohibited in 2, but possible in 3.

(2) She cooked ratatouille when the princess was visiting.
(3) When she cooked ratatouille the princess was visiting.

Due to the application of principle C, example 2 is unambiguous. It asserts the proposition that some salient female individual, other than the princess, cooked ratatouille when the princess was visiting. This is the direct-reference (deictic) interpretation of the pronoun. Principle C prohibits coreference (backward anaphora) in sentences like 2 because the pronoun she c-commands the referring expression the princess. By contrast, the pronoun does not c-command the referring expression in example 3, because it is embedded inside a subordinate clause: when she cooked ratatouille. Both coreference and direct reference are possible in example 3, so it is ambiguous.

Now consider the cleft sentence in 4. In contrast to examples 2 and 3, the referring expression the princess precedes the pronoun she. Nevertheless, coreference between the pronoun and the referring expression is blocked, just as in example 2. So example 4 cannot be paraphrased as 4a. Instead, the meaning of 4 is a close match to that of the declarative sentence in 4b, where the pronoun c-commands the referring expression. Crucially, however, these expressions appear in the reverse order in 4, as compared to 2.

(4) It is the princess that she said cooked ratatouille.
   a. The princess said she cooked ratatouille.
   b. She said the princess cooked ratatouille.

The fact that backward anaphora is not permitted in either 2 or 4 may appear to undermine the proposal that c-command is the relevant structural property that establishes when coreference can and cannot be assigned to sentences. According to one theoretical proposal, however, principle C, which builds on c-command, is operative in cleft sentences despite appearances to the contrary. On this analysis, principle C applies at an abstract level of semantic representation, called logical form (LF). Since the representation of 4b is isomorphic to its LF, principle C is operative, as in the cleft sentence in 4. See Fiengo & May 1994 and Fox 1999, 2000 for the argument that LF is the only level where principle C
In the absence of negative evidence (e.g. corrective feedback), it is difficult to see how children could learn to prohibit coreference in ordinary declarative sentences such as 4b. The problem of learnability is even more acute in cleft sentences such as 4. There is no way to tell from the surface syntax that the pronoun, she, c-commands the referring expression, the princess, assuming this structural relationship holds at LF, and not in the surface structure that is input to the child. Even if children could somehow learn to assign hierarchical structure to ordinary declarative sentences, it is not clear how they could learn to ban coreference in cleft sentences. Thus, the acquisition of the (non)coreference facts in cleft sentences represents an instance of the poverty of the stimulus (cf. Crain 1991). If young children adhere to the constraint disallowing coreference in cleft sentences, this would provide circumstantial support for the possibility that knowledge of principle C is part of children’s biological endowment.

The second kind of cleft structure is illustrated in 5. These cleft sentences contain a quantificational expression such as every girl.

(5) It was her chihuahua that every girl played with.

There are two interpretations for 5. There is a bound-variable interpretation on which each girl plays with her own chihuahua. However, the bound-variable interpretation is available only under c-command, and in the surface configuration, the quantificational expression every girl does not c-command her chihuahua. On the analysis we adopt, the proposal is that the relevant configuration of c-command is available at LF. There is also a direct-reference interpretation of 5. On this interpretation, every girl played with the chihuahua of some other girl who is salient in the conversational context.

The interpretation of these cleft sentences can be contrasted with that of declarative sentences like 6.

(6) Her chihuahua played with every girl.

Notice that the pronoun her in 6 can only be assigned direct reference, so it cannot be anaphorically linked to the quantificational expression every girl; the sentence cannot mean every girl is such that her chihuahua played with her. Rather, her must refer to some other salient female individual. The reason why the bound-variable interpretation is not tolerated in 6 is that the pronoun is not c-commanded by the quantificational expression every girl. In the cleft sentence in 5, by contrast, both a direct-reference and a bound-variable interpretation can be assigned to the pronoun. That is, example 5 is ambiguous and can be interpreted on a par with the declarative sentence in 7.

(7) Every girl played with her chihuahua.

In both kinds of clefts that we have considered, the surface syntax is misleading in that there is no c-command relation between the relevant elements. Thus the surface syntax does not suggest the adult interpretation. If experimental evidence demonstrates that children have the adult interpretation, this would support the proposal that children use innate linguistic knowledge to guide their interpretations.

This concludes our introductory remarks. The next section discusses several theoretical analyses of cleft constructions that have been advanced in the literature, including

applies, with bleeding effects of principle C found in antecedent-contained deletion constructions. See further Kiguchi & Thornton 2004 for an experiment from first language acquisition supporting this proposal.
reconstruction. We then review the previous literature on reconstruction and on clefts in child language in §3. Sections 4 and 5 report the details of our experimental assessments of children’s interpretations of the two types of cleft sentences and our discussion of the findings, and we close with some concluding remarks (§6).

2. Analyses of clefts. In this section, we introduce three theoretical analyses of clefts that have been advanced in the literature.

2.1. The null-operator analysis. One of the first analyses of cleft sentences was introduced in Chomsky 1977. On this analysis, the focus XP is base-generated and follows the copula. Following the focus XP is a (phonetically null) operator, which was moved from an argument position inside the relative clause, leaving a trace behind at the extraction site inside the relative clause, as depicted in 8. This null-operator analysis of cleft structures is much the same as the wh-movement analysis of sentences with relative clauses (Chomsky 1977, Safir 1986, Browning 1987, 1991). On the null-operator analysis, the relationship between the base-generated focus NP, the ratatouille, and the null operator is established by an extra-construal operation such as binding or predication (see Chomsky 1986, Browning 1987, 1991, Lasnik & Stowell 1991).

(8) It is the ratatouille \( op_1 \) that the chef praised \( t_1 \).

One motivation for the null-operator analysis was the observation that cleft sentences show island effects, where movement is blocked in certain structural configurations. Examples of island effects are given in 9. The cleft sentence in 9a is well formed, whereas both 9b and 9c are unacceptable. In 9b, the null operator has been illicitly moved out of a complex NP, and in 9c, the null operator has been illicitly moved out of a wh-island following the verb wonder. The unacceptability of these sentences is taken as evidence that cleft sentences are derived by movement of a null operator.

(9) a. It is this book \( op_1 \) that I asked Bill to get his students to read \( t_1 \).
   b. *It is this book \( op_1 \) that I accepted [the argument that John should read \( t_1 \)].
   c. *It is this book \( op_1 \) that I wonder [who read \( t_1 \)]. (Chomsky 1977)

2.2. The extraposition analysis. A different approach to the analysis of clefts, initially introduced by Akmajian (1970), can be termed the extraposition approach. The extraposition approach identifies cleft sentences as a species of specificational sentences and attempts to derive them from specificational copular sentences. Specificational copular sentences are ones such as The culprit was Jennifer, in which the NP in postcopula position is considered to be in focus and more referential than the NP in subject position (cf. Heycock 2013).

One representative analysis of this type of approach is Percus 1997. Specifically, Percus (1997) proposes that the cleft pronoun and the cleft clause originally form a definite DP, which is generated in the subject position, as in 10b. The relative clause then undergoes extraposition and is adjoined to IP, as shown in 10c. Finally, the [DP [0]] is spelled out as it to obtain the surface representation (in 10d). The derivation is depicted in 11. As a result of this process, the NP that was in postcopula position in the original specificational sentence becomes the focused NP in the cleft.

(10) a. It is John that he saw.
   b. [IP [DP the 0 [CP \( OP_2 \) that he saw \( t_2 \)]1 [VP \( t_1 \) is John]]]
   c. [[IP [DP the 0 \( t_3 \) 1 [VP \( t_1 \) is John]] [CP \( OP_2 \) that he saw \( t_2 \)]3]
   d. [[IP [DP It 1 [VP \( t_1 \) is John]] [CP \( OP_2 \) that he saw \( t_2 \)]3]
   (spell-out: [DP the 0 \( t_3 \) ⇒ It)
The virtue of this line of analysis is that clefts can be shown to have certain properties observed in specificational sentences. Especially noteworthy is that binding relations conform to so-called pseudocleft connectivity; although there is no c-command between the relevant elements in these sentences, interpretations that are normally available only under c-command are available. The parallel in connectivity effects in clefts, pseudoclefts, and specificational copular sentences is shown in 12 and 13 for principle C and bound variables, respectively, the topic of our investigation.

(12) Principle C
   a. *It is proud of John₁ that he₁ seems to be. (Reeve 2012)
   b. *What he₁ is is angry with John₁. (pseudocleft)
   c. *One thing that he₁ isn’t is angry with John₁. (specificational copular sentence) (den Dikken et al. 2000)

(13) Bound-variable reading of a pronoun
   a. It was his₁ mother that every boy₁ saw.
   b. What every boy₁ saw was his₁ mother. (pseudocleft)
   c. The one that every boy₁ saw was his₁ mother. (specificational copular sentence) (Percus 1997)

Even acknowledging this line of argumentation, reconstruction would be required in order to achieve a structure that gives rise to the correct interpretation (we discuss reconstruction in detail in the next section). For example, the extraposed CP in 10d has to be reconstructed back inside the DP, as in the configuration in 10b, where pseudocleft connectivity is invoked. While there have been a number of proposals for how to relate these nominals in terms of c-command, the way that pseudocleft connectivity should be analyzed from a binding-theoretic point of view is still a matter of debate. In sum, if Percus’s (1997) line of analysis is adopted, how the relevant nominals in our cleft sentences should be treated with respect to binding is not straightforward. This could undermine our chief assumption that the binding relations observed in our cleft sentences are connected via c-command at LF. However, the disadvantage of the extraposition approach is that there are cases where the binding relations observed in clefts and pseudocleft connectivity diverge (Reeve 2011, 2012, 2013).

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2 See den Dikken et al. 2000 and Schlenker 2003 for the ellipsis approach, and Heycock & Kroch 1996, Bošković 1997, and Boeckx 2007 for a movement analysis. See also Sharvit 1999 for a purely semantic approach abandoning the role of c-command in binding theory, which has been criticized by den Dikken and colleagues (2000), Heycock and Kroch (2002), and Schlenker (2003), among others.
If clefts and pseudoclefts are derived from the same source, the quantifiers in 14a,b and 15a,b should permit the same scope relations, and 14c and 15c should show the same accessibility to an idiomatic reading. In addition, as den Dikken (2006) points out, the range of focused XPs is different in clefts and pseudoclefts. For example, den Dikken observes that whereas a small clause can be focused in pseudoclefts, as shown in 16b, it cannot be focused in clefts, illustrated in 16c.

(16) a. We need Jerry drunk.
   b. What we need is Jerry drunk.
   c. *It is Jerry drunk that we need.

Empirical support for movement leaving behind copies has been found and extensively discussed in current theoretical literature (see Nunes 1995, 1999, 2004, Bošković 2010). Another problem for the extraposition approach, pointed out by Hartmann and Veenstra (2013), is that a specificational sentence cannot have a PP in its postcopular position, but clefts permit this and reconstruction effects occur, as in (iii).

(i) It was to John that I spoke.
(ii) *The one that/who I spoke was to John.
(iii) *It was to John, that he spoke.

2.3. THE RECONSTRUCTION ANALYSIS. Reconstruction is the mechanism whereby a dislocated element is interpreted as if it is in the position in which it was located prior to movement. Reconstruction effects have long been observed and discussed in the literature (Chomsky 1977, Lebeaux 1984, 2009, Barss 1986, among others). Current syntactic analyses of reconstruction appeal to the COPY THEORY OF MOVEMENT. Chomsky (1993) proposes that movement leaves a copy of the moved element and that reconstruction is executed through these copies in the phrase marker. This is illustrated in 17. In 17a, we can see that the wh-phrase, whose examination of Mary, has been moved in the surface syntax, and the lower copy (shown in strikethrough font) is not pronounced. The lower copy is reconstructed at LF, however, and principle C is invoked because the pronoun now c-commands the referring NP, Mary. Thus, 17b asks whose examination of Mary some female salient in the context feared. It cannot be asking whose examination of herself Mary feared.

(17) a. Whose examination of Mary did she fear whose examination of Mary?
   b. Whose examination of Mary did she fear whose examination of Mary?
& Nunes 2007, among others). There is also evidence from child language that suggests that movement leaves copies. In an experiment eliciting long-distance questions from three- to five-year-old children, Thornton (1990) found that some children produced long-distance wh-questions with overt wh-copies, such as 18. Presumably, these children have not yet worked out that copies are generally not pronounced.

(18) a. Who do you think who is in the box?
   b. What do you think what Cookie Monster eats?

Given that movement should leave copies, let us return to example 17, repeated in 19a. This example does not permit the interpretation on which Mary and the pronoun she corefer. Now compare two potential representations for 17a, shown in 19b and 19c. In 19b, the lower copy is available at LF, and principle C applies. By contrast, if the element that the movement leaves behind is interpreted as its trace at LF, the pronoun c-commands the trace of the entire moved NP, as shown in 19c. And since it is a part of the moved NP, Mary cannot be bound by the pronoun. Therefore, this LF representation incorrectly anticipates coreference between the pronoun and the referring expression to be possible. These facts are evidence in favor of the copy theory of movement.

(19) a. *Whose examination of Mary did she fear?
   b. Whose examination of Mary did she fear whose examination of Mary?
   c. [Whose examination of Mary] did she fear t?

Based on the argument above, we regard reconstruction as involving the copy theory of movement and interpretation of the lower copy at LF.

An account by Kayne (1994), following Schachter (1973), proposes that the focused NP in a cleft structure and the head noun in a relative clause are not base-generated, as in the null-operator analysis, but moved to the relevant position. Reconstruction effects similar to those seen in 19 have been observed for cleft sentences (Halvorsen 1978, Reeve 2011, 2012, 2013). All three of the binding principles (principles A, B, and C) apply in exactly the same way in cleft sentences, as shown in 20a. The binding principles apply to yield exactly the same range of interpretations as the corresponding declarative sentences (20b), despite the reversal of word order.

(20) a. It is proud of himself/him/John that he seems to be.
   b. He seems to be proud of himself/him/John.

Example 21 shows that a pronoun is assigned the same range of interpretations in both cleft sentences with quantificational expressions and in the corresponding declarative sentences. Again, the same interpretive pattern is exhibited, despite the reversal in word order. It is important to note in this regard that the bound-variable reading is not accessible when the possessive pronoun precedes the quantificational expression in declarative sentences like 21c, so the pronoun his refers to some salient male individual in the conversational context, presumably a teacher. A comparison of 21a and 21c shows that linear order cannot explain the availability of pronominal binding in cleft sentences. Some type of reconstruction is needed to establish c-command between the quantificational expression and the pronoun.

(21) a. It is his final exam that no student enjoys taking.
   b. No student enjoys taking his final exam.
   c. His final exam was difficult for every student.

Finally, the examples in 22a and 22b show that an indefinite NP in the focus position of cleft sentences yields the same scope ambiguity that obtains when the indefinite NP appears within the surface scope of the universal quantifier in the corresponding declarative sentence (Reeve 2011, 2012). Again, the scope ambiguity does not arise when an
indefinite NP merely precedes the universal quantifier, as in 22c, where the indefinite NP is base-generated in the higher clause (Williams 1986). A comparison of 22a and 21c shows that it is not linear order but reconstruction that is responsible for the availability of scope ambiguity in cleft sentences.4

(22) a. It was a bone that every dog ate. (every > a, a > every)
   b. Every dog ate a bone. (every > a, a > every)
   c. Someone thinks that every dog ate a bone. (*every > some, some > every)

To sum up, we conclude that in clefts, the binding relation between the element in the focused XP and the one inside the relative clause should be related via reconstruction of the focused XP, which originates inside the relative clause. The current analysis has several empirical advantages over the alternatives that we have reviewed. As discussed above, the extraposition analysis cannot explain a variety of differences in grammaticality between clefts and specificational sentences or pseudoclefts. Importantly, the null-operator analysis does not predict reconstruction effects observed in cleft sentences, especially where the bound element is confined within the whole focused XP. Recall that the null operator is related to the whole focused XP, as indicated in 23, not just the name. On this account, how the nominal inside the focused XP can be bound by the pronoun he even if it undergoes reconstruction into the relative clause is not explained.

(23) a. It is [proud of himself, him$_1$/John$_1$,]$_2$ op$_2$ that he$_1$ seems to be. 
   b. It is [proud of himself, him$_1$/John$_1$,]$_2$ op$_2$ that he$_1$ seems to be op$_2$.

For these reasons, we adopt the analysis that the binding relations observed in clefts are tied to the copy theory of movement and subsequent reconstruction.

This ends our brief review of the syntax of cleft sentences and brings us to the experimental study of child language. The aim of the study was to see whether young English-speaking children interpret cleft sentences in the same way as adults, despite the misleading data in the linguistic input.

3. Child language. A number of studies have investigated whether children apply binding principles when the relevant elements are not in a c-command relation in the surface syntax (see e.g. Kiguchi & Thornton 2002a,b, 2004, Conroy et al. 2009). Early studies of children’s acquisition of structures involving reconstruction of an NP or a PP found that children had some difficulty in comprehending the test sentences. For example, a study by Hsu and colleagues (1989) included sentences like 24, where the fronted PP could be reconstructed at LF and, therefore, would be governed by principle C. At LF, the pronoun he would c-command the PP under the zebra’s tail, which has the referring expression the zebra as a constituent. Children whose grammars contained principle C were expected to assign disjoint reference to sentences like 24. However, the Hsu et al. study found that children as old as seven years allowed coreference between the pronoun and the referential NP the zebra in sentences like 24.

(24) Under the zebra’s tail, he found a glass of water.

There are at least three possible reasons for children’s acceptance of coreference in sentences like 24. The first possibility, suggested by a referee, is that for children, the fronted PP is base-generated as a topic. If so, the fact that children permit coreference is expected as there would be no reconstruction of the PP. Another possibility is that the research methodology that was used in these studies imposed nonlinguistic computa-

4 This comparison also excludes the possibility that the scope ambiguity in 22a is due to quantifier raising of the universal quantifier, maintaining that the range of quantifier raising is shown to be clause-bound (Lasnik & Saito 1992).
tional demands on children that exceeded their limited processing capacities (see also Lust et al. 1980, Taylor-Browne 1983, Ingram & Shaw 1988). The study by Hsu and colleagues used an act-out task. This task requires children to hold the test sentences in memory, while they construct a (mental) plan for executing the actions that correspond to the meaning of the sentence. This two-step process could have exceeded children’s computational capacities, resulting in their overacceptance of the test sentences. There is also a third possibility for children’s reported linguistic behavior. In a more recent paper, Reinhart (2011) argues that children’s assignment of coreference in sentences like 24 does not violate principle C, but rather violates a pragmatic rule, called rule I. This pragmatic principle is claimed not to be operative in children’s grammars until they are six or seven years old. In sentences subject to principle C, if the pronoun precedes the referring expression, Reinhart argues that there is some kind of directionality effect in place that disables the pragmatic rule. However, in 24, the pragmatic rule is not disabled because the name precedes the pronoun. Since children are hypothesized not to have the computational capacity to use rule I at this age, in any kind of judgment task, they guess. Thus Reinhart (2011) would predict children to permit coreference in structures with a fronted PP some proportion of the time.

An experimental study by Guasti and Chierchia (1999/2000) also investigated children’s adherence to principle C in structures with fronted PPs. In order to sidestep any issues with rule I, the fronted PPs contained quantificational NPs. With quantificational NPs, coreference is not a consideration, and therefore children’s knowledge of rule I does not play a role in interpreting their linguistic behavior. Guasti and Chierchia’s experiment used the truth-value judgment task (Crain & Thornton 1998), so it avoided the methodological problems that may have potentially been an issue with earlier studies of reconstruction using the act-out task. Guasti and Chierchia tested eighteen four- to five-year-old Italian-speaking children on sentences such as 25a, and either 25b or 25c. The example in 25a was the critical target sentence and does not permit the preposed quantifier to bind the subject pronoun of the main clause. The examples in 25b,c were ambiguous. They both allow the quantifier each child to bind the null subject in the while-clause, and a direct-reference reading of the pronoun is additionally permitted.

(25) a. Nel barile di ciascun pirata con cura ha messo una pistola.  
in.the barrel of each pirate with care (he.)put a toy.gun  
b. Le scimmie hanno nascosto il tesoro di ciascun bambino, mentre  
the monkeys have hidden the treasure of each child while  
(dormiva.  
(he.)was.sleeping  
c. Il tesoro di ciascun bambino, le scimmie lo hanno nascosto, mentre  
the treasure of each child the monkeys it have hidden while  
(dormiva.  
(he.)was.sleeping

The finding was that children rejected anaphoric relations between (null) subjects and quantificational NPs inside fronted PPs as much as 90% of the time. For the controls like 25b and 25c, collapsing across both structures, children allowed the quantifier to bind the pronoun 86% of the time, and they allowed the direct-reference reading 89% of the time. The results from the Guasti and Chierchia (1999/2000) study are important because they provide evidence that children reconstruct the fronted PP back into its base position and compute principle C at the level of LF.

Another experimental study of reconstruction, Kiguchi & Thornton 2016, investigated children’s interpretation of specificational pseudoclefts. This study followed
Heycock and Kroch (2002) in assuming that the anaphoric relations assigned in specificational pseudoclefts like 26 are another case of reconstruction at LF.

(26) Important to himself, John, himself is what he is.

An independent assessment of c-command was part of the Kiguchi & Thornton 2016 study. 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, including the negative quantifier nobody. The example in 27 generates a conjunctive entailment, because English speakers interpret this sentence to mean that nobody brought back a piece of coral and nobody brought back a plant. It follows that the disjunction phrase a piece of coral or a plant must reconstruct so that it is in the scope (i.e. the c-command domain) of nobody at the level of LF, despite the absence of c-command in the surface syntax.5

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

The prediction was that children who reconstruct the disjunction phrase at LF would license a conjunctive entailment for 27. Children would interpret the sentence to mean that nobody brought back a piece of coral and nobody brought back a plant. But if children did not reconstruct the disjunction phrase, they would be expected to interpret 27 to have a meaning with ‘disjunctive’ truth conditions, so 27 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 2016 study supported the experimental hypothesis. In the context corresponding to 26, three of the divers returned from their dive in the ocean with a pretty piece of coral and a piece of trash, and two of them returned with a plant and a piece of trash. This series of events made sentence 27 true on the interpretation in which the disjunction phrases do not undergo reconstruction (i.e. the disjunctive truth conditions), but it made the sentence false if the disjunction phrase undergoes reconstruction (i.e. where disjunction licenses a conjunctive entailment). Children rejected target sentences like 27 96% of the time, while adults rejected them 100% of the time. The findings invite 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 LF.

Theoretical research on reconstruction has focused much attention on the wh-move ment of NPs known as picture-NPs. An example is the NP which paintings of Miss Cruella in 29a. Leddon and Lidz (2006) compared children’s ability to compute a reconstruction analysis of wh-questions with moved predicate phrases, as in 28a, and wh-questions with moved argument phrases, as in 29a, on the grounds that the obligatoriness of reconstruction is debated in the literature. Notice that the corresponding declarative sentences 28b and 29b constitute principle C violations if the pronoun is coindexed with the fronted question phrase.

(28) a. How proud of Andy was he?
   b. cf. He was very proud of Andy.

(29) a. Which paintings of Miss Cruella did she put up?
   b. cf. She put up the red painting of Miss Cruella.

5 Kiguchi & Thornton 2016 also investigates children’s interpretation of type A pseudoclefts with un inverted word order in which the what-clause comes first. These are not claimed to be subject to reconstruction, but are analyzed as self-answering questions and given an ellipsis analysis; they are thus not discussed in this article.
The results of the Leddon and Lidz (2006) study were mixed. The children rejected the coreference interpretation between the pronoun and the referential expression (Andy) in predicate phrases, as in 28a, 75% of the time, but they rejected coreference in sentences with moved argument phrases, as in 29a, only 33% of the time. A control group of adults consistently rejected (97%) principle C violations in questions in which the predicate phrase would be reconstructed (e.g. 28a), but they produced fewer rejections (77%) in response to the sentences in which the argument phrase would be reconstructed (e.g. 29a). This pattern of responses by adults was taken to indicate that reconstruction is obligatory with predicate phrases, but optional with argument phrases. Leddon and Lidz (2006) interpreted the children’s pattern of responses as evidence that children can compute reconstruction but, unlike adults, tend to avoid reconstruction when it is optional, that is, in sentences with argument phrases, due to parsing preferences. The proposal that argument phrases reconstruct optionally is not well supported in the theoretical literature, however. It has been proposed for principle A, but not for principle C. This weakens their experimental findings considerably and leaves open the possibility that there were methodological issues with the experiment. In the next section, we review the literature on children’s performance with cleft structures.

3.1. CLEFTS IN CHILD LANGUAGE. In the 1970s, developmental linguists questioned whether children compute adult-like structures, or whether they put in place strategies to interpret sentences. Bever (1970) proposed that when confronted with unusual or atypical sentences, children would assign an agent role to the first NP in a sentence and treat the second NP as an object—that is, they would favor a linear strategy with Noun_{agent} Verb Noun (NVN) word order. This strategy predicted reversal of semantic roles in passives and also in clefts in which the object NP is the focused XP. A slightly different prediction was made by Lempert and Kinsbourne (1978), who proposed that children have an ‘agent-action’ strategy, in which the noun immediately preceding the verb is assigned as agent. This would mean that clefts with an object gap (NN_{agent}V) would be correctly interpreted, but passives would not. In a later study, Lempert and Kinsbourne (1980) sought to find out if children differ in the strategy they impose to aid interpretation. They concluded that younger children tend to choose a strategy and use it consistently, while older children may use a variety of approaches. In their experiments, children were given a collection of toys and asked to act out a sentence (e.g. It’s the truck that the wagon bumps), but without any appropriate supporting discourse. This lack of supporting discourse may have contributed to about 30% errors in children younger than five years. These early studies found object clefts more difficult than subject gaps, a finding highlighted in a study by Dick and colleagues (2004). This study was an on-line reaction-time study with older children, aged five to seventeen years, as well as clinical populations. Although the methodology differed, it also tested clefts in the null context and, like previous studies, found that children performed poorly on object clefts. In hindsight, the main reason that children did not perform well in these early experiments was likely because the experiments were conducted in infelicitous circum-

6 Sportiche (2006) observes that the anaphor in (i) is licensed by the matrix subject. If reconstruction were obligatory for principle A, the sentence would be deviant because the anaphor reconstructed into the postverbal position in the embedded clause would not be locally bound.

(i) They wonder which pictures of each other I preferred. (Sportiche 2006)

This is not applicable to principle C. If argument phrases reconstructed optionally in the case of principle C, the bleeding effects of principle C should be observed, contrary to fact.
stances. In more recent studies, such as Aravind et al. 2017 and our own experiment introduced in §4, cleft sentences are introduced with supporting discourse.

As Aravind, Hackl, and Wexler (2017) point out, clefts are focus structures. The XP following the cleft pronoun (i.e. *It is XP*) bears the main focus of the sentence. Second, as they also note, clefts have an existence presupposition. That is, ‘clefts “presuppose” the existence of some member of a relevant set which satisfies the cleft clause predicate’ (Reeve 2012:118). For example, it is only felicitous to have children act out *It’s the truck that the wagon bumps* if the fact that there is something that the wagon bumps into has already been introduced in the preceding discourse. A further property of clefts is that the content of the relative clause has already been established in the discourse. Given that felicitous use of a cleft requires these three properties to be satisfied, it is not surprising that children had difficulty when asked to act out or interpret clefts in situations with null context.

In a reaction-time study with four- to seven-year-old children, Aravind and colleagues (2017) satisfy these three properties of clefts. In this task, the child saw two pictures, one after the other, and a cartoon character made some statements about the actions taking place. On a typical trial testing a subject cleft, for example, the first picture shows something chasing a cat, but the something is obscured by a big black square. The cartoon character says, ‘Look! Something is chasing the cat, I wonder what it is!’ In the second picture, the black square is removed, and a dog is revealed. Now the cartoon character says, ‘It’s a dog that is chasing the cat’. The child’s task was to say whether the cartoon character had said something right or wrong. With the felicity conditions satisfied by the accompanying discourse, Aravind and colleagues report higher accuracy rates than previous studies. For subject clefts, children were 84% accurate, and for object clefts, they were 83% accurate.

### Motivation for the Present Study

Our study also investigates object clefts, but ones in which children must reconstruct the object NP at LF if the sentence is to be interpreted as constrained by binding principles, in particular, principle C. Although the application of principle C under reconstruction has been investigated by Guasti and Chierchia (1999/2000), our study uses a different structure. Their study investigated structures in which a quantificational NP was part of the reconstructed PP, whereas our study investigates reconstruction of a name in cleft structures in which coreference is the relevant notion. By using clefts, we sidestep any possibility that children may base-generate the PP (cf. 24). In addition, we investigate the availability of a bound-variable interpretation of a pronoun under reconstruction, which has not previously been investigated.

In the next section we turn to our experiment investigating cleft structures. Our own study used the dynamic version of the truth-value judgment task. This task is always conducted with appropriate contextual support for a structure and accompanied by a lead-in statement that makes the use of the target structure felicitous.

### Experiment

Our review of analyses of clefts concluded that the reconstruction analysis was the most elegant and explanatory, so we simply assume this analysis in the discussion of our experiment. The experiment we report investigates two kinds of object clefts. One type is governed by principle C, as illustrated by the typical test sentence in 30.

1. **It was Spot that he brushed.**
2. **It was Spot, that he brushed Spot.**

In sentences such as this, the pronoun and the referring expression must be disjoint in reference, so 30 cannot have the meaning that Spot brushed himself. As indicated in
30b, principle C applies at the level of LF.\(^7\) If children were to determine coreference based on the surface syntax of these cleft sentences, then principle C would not be operative, because the pronoun does not c-command the referring expression in the surface syntax. Therefore, these cleft sentences assess children’s knowledge that the referring expression is reconstructed at the level of LF, where principle C is also operative. Simple principle C control sentences such as 31 were also included in the experiment, to ensure that the child participants adhered to principle C when there is c-command between the pronoun and the referring expression in the surface syntax. In the control sentence, coreference is not permitted between the pronoun she and the referring expression Arielle; the sentence cannot mean that Arielle brushed herself (cf. 31b). The pronoun can only have direct reference.

(31) a. She brushed Arielle.
    b. \(\text{She}^{1/2}\) brushed \(\text{Arielle}_1\).

The experiment also tested a second kind of object-cleft sentence. This kind of sentence assessed children’s use of reconstruction in assigning a bound-variable interpretation to sentences with quantificational NPs. One of the test sentences is 32.

(32) a. It was her pig that every girl carried.
    b. It was \(\text{her}^{1/2}\) pig that \(\text{every girl}_1\) carried \(\text{her}^{1/2}\) pig.
Sentence 32a is ambiguous. As indicated in 32b, nothing prevents a deictic reading of the pronoun. There is also a bound-variable interpretation of her. The bound-variable reading of the pronoun is licensed by reconstruction of the lower copy that is within the c-commanding domain of the quantificational expression. On this interpretation, each of the girls carried her own pig. If children base their interpretation on the surface syntax, a bound-variable interpretation would not be expected. Unless the NP her pig has undergone reconstruction, the only available interpretation is one in which the pronoun has direct reference, so the sentence could only mean that every girl carried a pig that belongs to some salient female individual who is not mentioned in the sentence. As controls, the experiment included unambiguous sentences like this. Because the pronoun does not c-command the quantificational expression, the bound-variable interpretation is not possible in sentences like 33 (at least, not for most adults). This is the configuration of pronoun and quantifier that is known as ‘weak crossover’. The pronoun can only have direct reference, such that it refers to some female individual who is not mentioned in the sentence. It cannot mean that every girl is such that her koala played with her.

(33) \(\text{Her}^{1/2}\) koala played with \(\text{every girl}_1\).

The experimental hypothesis was that children would access the bound-variable interpretation for the ambiguous target sentences like 32 at least to some extent, whereas they would not access this interpretation for control sentences like 33.

4.1. Participants. Twenty children participated in the experiment, ranging in age from 4;0 to 5;5, with a mean age of 4;9 (years;months). The children were monolingual speakers of English and attended childcare centers either on the university campus or

\(^7\) Shoichi Takahashi (p.c.) points out that principle C effects are hard to explain using an analysis that employs movement of a null operator. The reason is that a null operator is analyzed as a lambda expression, \(\lambda x P(x)\), at LF, so 30 would be represented along the lines of (i).

(i) \(\text{It was Spot}_1 \lambda x [\text{that he}_1 \text{brushed } x]\).

It is unclear why principle C rules out coindexation between the variable and the pronoun in (i). In this regard, it is worth noting that Aoun and Li (2003) propose an analysis on which null operators are available only for structures involving anti-reconstruction, such as restrictive relative clauses (but cf. Reeve 2013 for an extension of the Aoun and Li analysis to cleft constructions).
close to the university. An additional seven children were excluded from the study, either because they did not participate in all of the test sessions (one child), failed to respond correctly to the practice items in the first session (five children), or because more than a month elapsed between test sessions (one child). We also tested fifteen adult participants, all of whom were undergraduate students and native speakers of English.

4.2. Method. Children were tested using the dynamic version of the truth-value judgment 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 that watches the stories alongside the child. At the end of each story, the puppet says what it thinks happened in the story, using one of the test sentences or one of the control sentences. Although the puppet’s descriptions are sometimes accurate, the child is informed that the puppet does not always pay close attention to the story and sometimes makes statements that are not accurate descriptions of the story events. The child’s task is to tell the puppet when it is right and when it is wrong. To make the experiment more enjoyable for children, a reward system is implemented. If the puppet’s description is deemed by the child to be correct, the child is instructed to reward the puppet by feeding it one of its favorite foods. If the puppet is judged to be wrong, the child still gives a reward, but with a less-favored food item. Whenever the child judges the puppet to be wrong, the child is asked: ‘What really happened in the story?’ This feature of the experimental design is implemented to ensure that the child participants reject the puppet’s statement for the right reason.

4.3. Materials. The stories that were acted out in front of the children conformed to the recipe spelled out in Crain & Thornton 1998 for the use of the truth-value judgment task. Stories were designed so that children could easily assent to the truth of the puppet’s description of the story or could easily deny it. In particular, to make it felicitous for children to reject 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—that is, it was a possible outcome. Subsequently, events conspired such that the possible outcome did not match the actual outcome. The actual outcome made the sentence false in the context. To illustrate this point, consider the principle C cleft It was Spot that he brushed. At some point in the story, it is possible that ‘he’ will brush Spot. In the end, however, he makes the decision to brush Buzz, and so the actual outcome makes the test sentence false.

The stimuli were also designed to satisfy the specific felicity conditions for the use of cleft sentences (cf. Aravind et al. 2017). As noted earlier, in English, clefts are structures in which the moved XP is identified as the focus at the level of semantic interpretation (Rochemont 1986, Œ. Kiss 1998, Reeve 2012, among others). In our experiment, in order to be felicitously interpreted as the focus, the NP in focus position was contrasted with other relevant NPs from a presupposed (previously established) set of alternatives. For example, in It is Spot that he brushed, there is a contrast set of characters other than Spot who potentially could have been brushed, but Spot is identified in the sentence. This satisfies the exhaustivity property of clefts (e.g. Percus 1997, Œ. Kiss 1998, among others). In addition, the stories satisfied the existence presupposition. The storyline established that the trainer (he) brushed someone, and the set of alternatives to the focused NP expressed the possible set of characters who could be brushed.

8 The Aravind et al. 2017 experiment did not take into account the exhaustivity property of clefts.
In the story corresponding to the bound-variable interpretation of *It was her pig that every girl carried*, there were two contrast sets. One was associated with the bound-variable interpretation, and the other was associated with the direct-reference (deictic) interpretation of the pronoun. On the bound-variable interpretation, each girl’s pig was contrasted with her kitten, and on the direct-reference interpretation, the NP *her pig* belonged to the girl named Emma and was contrasted with Emma’s chicken. Having two contrast sets made the stories quite complex, but in our view, these sets were necessary in order to meet the contextual requirements for cleft sentences. In lieu of a more detailed description of the stories, we illustrate each of the types of cleft target sentences by providing a sample story.

**Example story for the principle C cleft sentences.** The following is a story that illustrates the trials testing cleft sentences that would be governed by principle C if the NP in focus has undergone reconstruction. Following reconstruction, children would be expected to reject the puppet’s statement. A child who does not reconstruct the focus NP or lacks principle C would, by contrast, be expected to inform the puppet that its statement about the story was correct.

The story is associated with the cleft sentence *It was Spot that he brushed*. The story was about several friends: Spot, Buzz, and Spiderman. These friends were being coached by their fitness trainer, the Pink Panther. On this particular day, the friends are competing 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 and covered in leaves. They ask the Pink Panther to brush them off before they continue training. The Pink Panther considers brushing each of them, including Spot. At that point in the story, one possible outcome is that he, the Pink Panther, will brush Spot, so it could turn out to be true that *It was Spot that he brushed*. The story proceeds as follows (and see Figures 1–3 below).

(34) Spider Man: ‘It was very dirty inside. The leaves will get stuck in my webs and I won’t be able to use them. Pink Panther, can you brush the dirt off me now?’

Spot: ‘Me too, I am all dirty. You can’t see my spots and I am very proud of my spots.’

Buzz: ‘I have bad allergies, and I will start sneezing real bad if I don’t get brushed off.’

Pink Panther: ‘I can help make you clean with this cloth, but if I brush you all, we’ll never finish the obstacle course and cross the finish line. Buzz, I think your reason is the best so I will brush you, but Spiderman and Spot—I can’t brush you. But here is an extra cloth for you to use.’

Spider Man: ‘If you won’t brush me then I will just stay dirty.’

Spot: ‘I want to show my spots, so I will brush off all the dirt with the cloth.’

The puppet continues with the lead-in and target sentence.

(35) Puppet: ‘Cool story! In that story, the Pink Panther was the coach and there was Spider Man, Buzz, and Spot. I know one thing that happened in the story. *It was Spot that he brushed.*’

The control sentences were ordinary declarative sentences such as *She brushed Arielle*. In these sentences, the referring expression (e.g. *Arielle*) does not undergo reconstruction. Principle C straightforwardly applies, making the control sentence a false description of the story.

In our second type of cleft sentence, the bound-variable interpretation was available only under reconstruction. These test sentences are ambiguous, however, so we con-
fronted the possibility that children and adults would have a preference for assigning the direct-reference (deictic) interpretation of the pronoun. This preference has been found in the previous literature for other kinds of constructions (e.g. Grimshaw & Rosen 1990). Even if children assigned the pronoun direct reference on the vast majority of the trials, this would not warrant the conclusion that the bound-variable interpretation was not generated by their grammars. We therefore designed the experiment to encourage the bound-variable interpretation of the test sentences if this was compatible with the participants’ grammars. We did this by making the test sentences true on the bound-variable interpretation. That is, the test sentences were accurate descriptions of the story on this interpretation. This maneuver follows the principle of charity (e.g. Davidson 1984). According to this principle, as listeners, we interpret a speaker’s statements as being true whenever we can. Therefore, the principle of charity should encourage participants to override their preference for the direct-reference interpretation of the pronoun, since this made the test sentences false, and it should encourage partic-
ipants to access an interpretation of the test sentences that made them true, namely the bound-variable interpretation.

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, because the quantificational NP does not c-command the pronoun. In response to the control sentences, we therefore expected both children and adults to enforce disjoint reference between the pronoun and the quantificational NP. Consequently, we anticipated that participants would manifest a strong tendency to assign the direct-reference interpretation of the control sentences, which made the test sentences false. If participants lacked knowledge that pronominal binding required c-command, they would be expected to accept the control sentences because these sentences were true if the quantificational NP was taken to bind the pronoun.

Example story for the bound-variable cleft sentences. Children who reconstruct so that the DP her pig is copied back into its base position in sentences like It was her pig that every girl carried should allow a bound-variable interpretation of the sentence, since in this configuration there is a c-command relation between every girl and her pig. On this interpretation, every girl carries her own pig, which does, in fact, occur, so the sentence is true in the story context. However, since the sentence is ambiguous, there is an alternative interpretation available that does not depend on reconstruction. The DP containing the pronoun, her pig, takes direct reference and refers to some female’s pig. In the story illustrated below, this is Emma’s pig. It is false that every girl in the story carries Emma’s pig; they carry her chicken instead. In the interests of space, the sample story shows all four girls making the same comment, but in acting out the story, each girl speaks, saying something similar (and see Figures 4–8).

(36) Emma: ‘We need to stay fit and healthy. So let’s carry my pig in this basket to make our muscles nice and strong. Oh no, my pig is too big for the basket. Let’s carry my chicken then. Okay, everyone have a turn, you all need to practice carrying my chicken in the basket to make your muscles big and strong too.’

Girl 1,2,3,4: ‘Wow, this is fun. She likes it when we carry her.’ <Each girl makes similar comment.>

Emma: ‘Okay, thanks for carrying my chicken; you should all go home and carry your pets in those baskets. I’ll stay here with my pig and my chicken.’

Girl 1: ‘C’mon cats and pigs, jump in the baskets. We will carry you to the hill to play.’

Cat 1,2,3,4: ‘Oh no, we don’t want to be carried to the hill. We want to stay here and play with our toys.’ <Each cat makes similar comment.>

Girl 1,2,3,4: ‘That’s okay, cats; you stay here. You pigs are slow walkers. So jump in our baskets and we’ll carry you to the hill so we can all run up and roll down the big hill.’ <Pigs get carried in baskets.>

The puppet continues with the lead-in and target sentence.

(37) Puppet: ‘I liked that story. In that story, there was Emma and her friends. And I know one thing that happened, it was her pig that every girl carried.’

In addition to the target clefts and their control items, we also included filler items to balance out acceptances and rejections in the sessions. These were simple sentences such as Goofy ate bananas or Only duck drank a cold fruit juice. Although the sentences were simple, the stories were still designed to conform to the requirements of the truth-value judgment task.
4.4. Procedures. Each child was interviewed individually, over three sessions. There were four test sentences for each of the cleft structures, and four control sentences for each, for a total of sixteen trials.
The first session began with a short ‘training’ session that was designed to familiarize the child participant with the task. This training session consisted of two practice stories; one was true and one was false. Once it was clear that the child understood the task, the first session was conducted. This session contained four principle C target cleft sentences (e.g. *It was Spot that he brushed*) and four control sentences corresponding to the bound-variable cleft sentences (e.g. *Her koala played with every girl*). Both the test sentences and the control sentences in the first session were expected to evoke a 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’ filler sentences. These were simple sentences and the children made no errors.

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 koala that every girl played with*). Pilot studies indicated that some children find the direct-reference interpretation of the pronoun to be more accessible than the bound-variable interpretation. Therefore, 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 two such practice trials in which only the direct-reference interpretation was available, and two in which only the bound-variable interpretation was available. The remainder of the session tested the bound-variable cleft sentences in contexts in which both interpretations were made accessible. Two filler sentences were included to elicit additional ‘Yes’ or ‘No’ responses from the children, depending on how they had responded to the (ambiguous) target sentences. Again, these were simple sentences and the children made no errors. Because the training items lengthened the session, the four declarative control sentences testing principle C (e.g. *She brushed Arielle*) were tested in a third session. Two filler items were also included in the third session. These could be adjusted to elicit ‘Yes’ or ‘No’ responses, depending on the child’s previous answers; these were all answered correctly.

5. Results. We report the experimental findings one sentence type at a time, beginning with the cleft sentences that are putatively governed by principle C at the level of LF.

The main finding was that children were like adults in rejecting both the cleft target sentences governed by principle C under reconstruction, and the simple control sentences where principle C applies without reconstruction. The results are shown in Figure 9, where it can be seen that 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, in both the test sentences and the control sentences. Children’s justifications for rejecting the target sentences revealed that they had computed the reconstruction analysis of the cleft sentences. Here is a sample of children’s reasons for rejecting the puppet’s statement for the test sentence *It was Spot that he brushed*.

(38) a. ‘Because he just gave him an extra one [cloth].’
b. ‘The Pink Panther brushed the bee [i.e. Buzz].’
c. ‘Cause, there’s one reason why the Pink Panther brushed him, cause he had allergies.’
d. ‘He brushed Buzz.’
e. ‘Because Spot brushed himself.’
f. ‘It was the bee that he brushed.’

For the second type of cleft sentence, in which the bound-variable interpretation of the pronoun was available only under reconstruction, the pattern of responses was exactly as predicted by the experimental hypothesis. The results are shown in Figure 10. The child participants accepted the cleft sentences on the bound-variable interpretation 65% of the time. Adults accepted them slightly less often, on 50% of the trials.

This shows the availability of the bound-variable interpretation for both children and adults. The control sentences, by contrast, did not permit a bound-variable interpreta-
tion at all, 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 ($Z = -2.941, p < 0.05$).

Turning to the data for individual participants, of the twenty children, three rejected the bound-variable interpretation of the cleft sentences on all four trials, and another child rejected this interpretation on three of the four trials. Two of the fifteen adult controls also rejected the bound-variable test sentences on all four trials, and three others rejected them on three of the four trials. An analysis of the individual trials did not reveal that any particular trial(s) was responsible for the negative responses by children or by adults.

As we have seen, both some children and some adults sometimes preferred to opt for a deictic interpretation of the pronoun over a bound-variable interpretation for test 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 interpretation. Some examples from the children are given in 39.

(39) a. ‘They carried their own pigs.’
    b. ‘They didn’t carry Emma’s pig, they carried their own.’
    c. ‘Every girl carried their own pig.’

In the next section, we interpret our experimental findings and consider why some children and adults have a preference for the direct-reference interpretation of cleft sentences such as *It was her pig that every girl carried*.

6. DISCUSSION. The present study investigated the acquisition of two kinds of cleft sentences. The study was motivated by the observation that the semantic interpretation of sentences of both kinds could not be derived transparently based on the surface syntax. In one kind of cleft sentence—for example, *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, that is, the meaning that Spot brushed himself. The same coreference interpretation is prohibited in a declarative sentence when the order of the pronoun and NP differs (e.g. *She brushed Arielle*). Notice that an ‘agent’-first analysis of cleft sentences, as proposed by Bever (1970), for example, would be unlikely to capture the experimental findings. If the first NP is taken as the agent, then in *It was Spot that he brushed*, presumably Spot is the agent of brushing, possibly himself, so it is likely that children would give many acceptances of these sentences, rather than the high rate of rejections that we found.

If this analysis is on the right track, then the finding that children know that the coref erential interpretation is not applicable to cleft sentences would make an important contribution to theories of child language. The finding that children prohibit coreference would support a theory such as the theory of universal grammar on which children are endowed with innate grammatical knowledge that enables them to compute abstract structural relations (e.g. Chomsky 1981, 1986, 1995). Recent linguistic theory has proposed that cleft sentences are formed by a process of reconstruction, where an NP in one structural position in the surface syntax is interpreted in a different position at the level of semantic interpretation. The present study adopted an account of reconstruction based on the copy theory of movement (cf. Chomsky 1993, Kayne 1994, and Fox 1999, 2000, among others).
Our experimental investigation revealed that children had an adult-like prohibition against the illicit coreferential interpretation in sentences like *It was Spot that he brushed*. 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 sentences at LF, as expected on the reconstruction analysis we adopted. This finding requires an account of language development according to which children use abstract structural principles. This kind of an account of development can be contrasted with one that supposes that children only have access to surface representations of the primary linguistic data, as in usage-based accounts of language acquisition.

The second kind of cleft sentence was quite different from the first. In this kind (e.g. *It was her pig that every girl carried*), an extra interpretation is made available by the adult grammar. More specifically, these cleft sentences allow an interpretation that is blocked in declarative sentences that look superficially similar, namely declarative sentences that contain a pronoun preceding a quantificational NP. Recall here that the quantificational NP does not c-command the pronoun (e.g. *Her koala played with every girl*). In such declarative sentences, the pronoun cannot be bound by the quantificational NP. In cleft sentences, by contrast, pronominal binding is made possible by reconstruction. Due to reconstruction, the second kind of cleft sentence thus has an unexpected bound-variable interpretation that is not available for declarative sentences, despite their surface similarity.

The experiment we conducted was designed to see if children could access the bound-variable interpretation of the second kind of cleft sentence, in addition to a direct-reference (deictic) interpretation of the pronoun. Because the target cleft sentences are ambiguous, it was essential to take certain experimental maneuvers to make the bound-variable interpretation accessible to children. One feature of the experiment attempted to elevate children’s preference for the bound-variable interpretation by making the sentence true on this interpretation, and false on the direct-reference interpretation of the pronoun. We also presented control sentences to children that look superficially similar to the cleft sentences under investigation, but where the bound-variable interpretation was not available for adult English speakers (e.g. *Her koala played with every girl*). It should be noted here, however, that there was a significant difference between adult and child participants on the weak-crossover controls, with children accepting these 17% of the time. We interpret these as performance errors, due to the complexity of the stories. For example, for the story *Her koala played with every girl*, it had to be false that a salient female’s koala, the queen’s koala in this case, played with every girl, but it also had to be true that every girl’s own koala played with her (i.e. each girl). Given this complexity, it does not seem unreasonable that children rejected the weak-crossover controls at a rate of 83%. In sum, 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 the declarative sentences. 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 three of the four target trials. Here we consider potential explanations for these responses. One possibility is that both children and adults experience in-
tervention effects (Friedmann et al. 2009). Several studies have shown that when an NP moves from object position in the sentence over an NP with overlapping features or the same features, children experience difficulties in comprehension. On this proposal, adults too may experience difficulty if the target and intervening NP have identical features (Friedmann et al. 2009, Adani et al. 2010, Hamann & Tuller 2015). Potentially, then, children have difficulty accessing the bound-variable interpretation of the cleft sentence because reconstruction of the focus NP requires computation of a derivation in which there is an intervening quantificational NP. However, on Friedmann and colleagues’ (2009) proposal, adults should only have difficulty if the intervener is identical in features. There are two reasons for questioning the intervention explanation in the present case. One is that only some children had difficulty accessing the bound-variable interpretation, which is not necessarily expected if intervention is a grammatical phenomenon. Any grammatical phenomenon would be expected to impinge on all children’s grammars in the same way. Second, adults behaved in the same way as children, which is also not anticipated on the intervention proposal, as has been noted. On the intervention proposal, children have a particularly strong version of relativized minimality, which is relaxed in the adult grammar. Instead, we suggest that processing factors are responsible for certain children’s and adults’ difficulty in accessing the bound-variable interpretation.

In the bound-variable cleft sentences, the pronoun appears in the focus NP in the surface syntax. Therefore, the pronoun precedes the quantificational NP, although it does not c-command it. Consider the example sentence It is her pig that every girl carried. Here, the NP that contains the pronoun, her pig, precedes the quantificational NP 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 immediately 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 will seek to identify a direct referent for the pronoun, which is some salient female individual who has not yet been mentioned in the sentence. Once the referent has been fixed, 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.

It is worth noting that such an extensive reanalysis was not required in earlier studies, where children have been found to allow a backward-anaphora interpretation of certain sentences, but to reject this analysis of others. One such study, by Crain and McKee (1985), found that children rejected backward anaphora for sentences like He was in the barn when the fox stole the chickens, and the same children readily accepted it in sentences like When he was in the barn, the fox stole the chickens. Notice, however, that only a direct-reference interpretation was formulated in sentences of either kind. In these studies, children who assigned an incorrect referent to the pronoun (as it turned out) would only have been required to change from one referent to another; children were not required to restructure the sentence in order to compute an entirely different kind of semantic interpretation. From this perspective, it may seem remarkable that children or adults accessed the bound-variable interpretation at all in the present study. In order to assign this interpretation, the parser needed to backtrack and reanalyze the structural representation, changing from a parse on which the pronoun assigns direct reference to one that takes the pronoun to be bound by a quantificational NP. The parsing pressure to immediately assign a referent to the pronoun proved to be the correct
one in analyzing the control sentences. As one would expect, therefore, children and adults who did not access the bound-variable interpretation of the cleft test sentences produced correct rejections of this interpretation of the control sentences.

One might have expected children to have more difficulty than adults do in computing a reanalysis during on-line sentence processing. If so, they should have found it more difficult than adults to access the bound-variable interpretation. However, the justifications produced by both children and adults for rejecting the test sentences suggested that both the direct-reference and the bound-variable interpretation were sometimes computed. That is, some participants rejected the test sentences but justified their rejections by pointing out that the sentence could be assigned a bound-variable interpretation, which, as a matter of fact, made the sentences true (see 37).

It is also worth pointing out finally that, in producing their justifications, some participants used a plural form of the pronoun (i.e. *their*) as the bound variable, not the singular forms *his* or *her* that appeared in the test cleft sentences produced by the puppet. Children’s use of plural pronouns as a bound-variable pronoun has been reported previously in elicited-production investigations of questions such as *Who said he has a hat?* (Thornton 1990). If the puppet had used plural pronouns, or if the experimenter had used them in narrating the stories, this would presumably have boosted the availability of the bound-variable interpretation for these participants. However, implementing this change would have considerably increased the complexity of the stories.

7. **Conclusion.** The present experimental study investigated reconstruction effects in children’s grammars using two types of cleft sentences that have not been examined in previous studies of child language. The findings are consistent with the critical role of c-command in formulating the interpretations of cleft sentences. C-command is critical 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 four or younger, children are able to properly interpret expressions in a position that is different from the surface syntax position. This entails the existence of the abstract level at which reconstruction takes place and determines the relevant interpretive possibilities, viz., LF.

**Appendix**

**Principle C Target Cleft Sentences**

1. It was Spot that he brushed.
2. It was King Kong that he dried.
3. It was Tiger that he painted.
4. It was Rubber Ducky that he covered.

**Principle C Controls**

1. She brushed Arielle.
2. He dried Oscar the Grouch.
3. He painted the rhino.
4. He covered croc.

**Bound-Variable Cleft Sentences**

1. It was her pig that every girl carried.
2. It was his dog that every boy played with.
3. It was his spaceship that every astronaut drove.
4. It was his book that every penguin rescued.

**Bound-Variable Controls (Weak-Crossover Sentences)**

1. Her koala played with every girl.
2. His monkey drove every boy.
3. Her mum carried every baby.
4. His dino rescued every boy.
REFERENCES

ADANI, FLAVIA; HEATHER K. J. VAN DER LEly; MATTEO FORGIARINI; and MARIA TERESA GUASTI. 2010. Grammatical feature dissimilarities make relative clauses easier: A comprehension study with Italian children. Lingua 120.2148–66. DOI: 10.1016/j.lingua.2010.03.018.


CONROY, ANASTASIA; ERI TAKAHASHI; JEFFREY LIDZ; and COLIN PHILLIPS. 2009. Equal treatment for all antecedents: How children succeed with principle B. Linguistic Inquiry 45.495–76. DOI: 10.1162/ling.2009.40.3.446.


DE DikkEn, MarCeL; ANDRÉ MEnUNGER; and CHRIS WILDER. 2000. Pseudoclefts and elipsis. Studia Linguistica 54.41–89. DOI: 10.1111/1467-9582.00050.


REEVE, MATTHEW. 2013. The cleft pronoun and cleft clause in English. In Hartmann & Veenstra, 165–86.


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