Connecting the Exhaustivity of Clefts and the Homogeneity of Plural Definite Descriptions in Acquisition

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1. Introduction

Cleft sentences like (1) are typically interpreted exhaustively:

(1) It’s the truck that is blue. \(\Rightarrow\) Nothing else is blue.

Various views exist on the kind of meaning that the exhaustivity component of clefts corresponds to, and therefore on the status that clefts have when exhaustivity is violated. In particular, two semantic theories have recently been spelled out in some detail. According to Velleman et al. (2012), (1) carries the presupposition that it’s not the case that both the truck and something else are blue, and asserts that the truck is, in fact, blue. When exhaustivity fails, the cleft therefore incurs a presupposition failure. The presupposition is, in particular, taken to be akin to that of “only”.

Alternatively, Büring & Krž (2013) and Krž (2016) have argued that exhaustivity in clefts should be unified with the phenomenon of homogeneity, which can be observed in plural definite descriptions: both (2a) and (2b) are neither true nor false when the set of trucks is not homogeneous with respect to blueness, i.e. when some are blue and some are not (see, among others, Löbner 2000 and Krž 2015).

(2) a. The trucks are blue.
   b. The trucks aren’t blue.

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According to this latter proposal, non-exhaustive clefts are semantically undefined in the same way, because cleft sentences have an underlying semantics involving a number-neutral plural definite description, e.g., *the blue thing(s)*.

The present paper adds an acquisition perspective by comparing the acquisition of clefts to that of the two constructions that theories have posited are analogous: exhaustive sentences with “only” on the one hand, and plural definite descriptions on the other hand. If children acquire the meaning of clefts and “only” in tandem, this would provide evidence for Velleman et al.'s theory. The homogeneity-based theory, on the other hand, makes a strong prediction that exhaustivity in clefts should not be acquired before the homogeneity of plural definite descriptions.

Our study was conducted in French using *c’est*-clefts such as (3).

(3) C’est le camion qui est bleu.
   ‘It’s the truck that is blue’

It should be noted that the theories we mention were developed with a view to English *it*-clefts. It has been argued that French clefts differ from English and German clefts in the nature and strength of exhaustivity (Destruel 2013), though whether this is because they have a different meaning entirely or just because they also have additional, other readings, is currently unclear. To the extent, however, that French clefts have at least one reading like that of English and German clefts, theoretical conclusions can still be drawn from the observed data.

2. Background

A sentence with “only” carries the presupposition that the sentence without “only” is true, and asserts that no stronger alternative is true:

(4) Only John came.
   a. PRESUPPOSES: John came.
   b. ASSERTS: It’s not the case that John and Mary came, that John and Bill came, etc.

Velleman et al. (2012) argue that the meaning of a cleft is the same, but with assertion and presupposition reversed:

(5) It was John that came.
   a. PRESUPPOSES: It’s not the case that John and Mary came, that John and Bill came, etc.
   b. ASSERTS: John came.

Essentially, “only” asserts exhaustivity and clefts presuppose it. We therefore might expect children to have similar problems with both. If they have trouble
computing exhaustivity, then they should presumably accept both constructions at a heightened rate when exhaustivity is violated. If they have problems dealing with the presupposition, then they should accept only-sentences when the predicate is true of no individual, and they should also accept non-exhaustive clefts.

The definite description theory of clefts (Büring & Križ 2013; Križ 2016) takes a very different approach. According to this view, cleft sentences are underlyingly identity statements with definite descriptions, except that they are number neutral:

(6) a. It was John that came.
    b. The person(s) who came is/are John.

Sentences with plural definite descriptions are known for the phenomenon of homogeneity, which manifests in the following way: both (7a) and its negation (7b) are neither true nor false when only a proper part of the trucks are blue.

(7) a. The trucks are blue.
    b. The trucks aren’t blue.

Analogously, the cleft in (6) (and its negation) is neither true nor false when John is a proper part of the people who came. An exhaustivity violation with a cleft is therefore, ipso facto, a homogeneity violation. This makes a clear developmental prediction that homogeneity in definite descriptions should be acquired at least as early as exhaustivity in clefts.

Existing acquisition studies of children’s interpretations of plural definite descriptions have yielded somewhat conflicting data; some report that preschoolers interpret plural definite descriptions maximally (Munn et al. 2006), while others report that preschoolers allow non-adult-like non-maximal interpretations of plural definite descriptions (Karmiloff-Smith 1979; Caponigro et al. 2012). More recent work reveals sensitivity to homogeneity violations developing between 4–5 years of age (Tieu et al. 2015, 2017). On the homogeneity account of clefts, we therefore do not expect to see exhaustive interpretations prior to this age range.

Aside from these two semantic theories of clefts, the literature also offers the proposal that exhaustivity is nothing more than a special case of quantity implicature and therefore pragmatic in nature (Horn 1981, 2014; Geurts 2010). That is, upon hearing the cleft in (8), the hearer reasons that if other people had also come, the speaker would have said so, and so nobody else came.

(8) It was John that came. \(\leadsto\) Nobody else came.

This is analogous to the case of standard scalar implicatures like (9), where the hearer reasons that if Mary had eaten all of the cookies, the speaker would have said so, and so Mary didn’t eat all of the cookies.
(9) Mary ate some of the cookies. $\Rightarrow$ Mary didn’t eat all of the cookies.

The cleft implicature, however, is special in that it is more robust (less easily cancellable), and, unlike standard implicatures like (9), does not require access to lexical alternatives (Geurts 2010; van Tiel & Schaeken In press).

Much early developmental work on scalar implicatures demonstrated that children computed fewer implicatures than adults (see among many others, Noveck 2001; Chierchia et al. 2001; Gualmini et al. 2001; Papafragou & Musolino 2003). On the basis of this literature, one might expect children to fail to access exhaustive interpretations of clefts, just as they often fail to compute scalar implicatures. However, more recent developmental work on implicatures has revealed the role that alternatives play in children’s abilities with implicature. Computing the implicature in (9), for instance, requires lexical replacement of “some” with the stronger alternative “all”, and negating the resulting stronger alternative sentence (“Mary ate all of the cookies”). Recent studies have shown that when lexical replacement of alternatives is not required, children’s performance on implicature significantly improves (for relevant discussion, see Barner et al. 2011; Singh et al. 2016; Tieu et al. 2016; Skordos & Papafragou 2016). If the exhaustivity of clefts is an implicature that does not require access to lexical alternatives, one might similarly expect kindergarteners to interpret clefts exhaustively.

Existing child data on clefts suggest that exhaustive interpretations of clefts gradually emerge around 4–5 years of age. Heizmann (2007, 2012) presented English- and German-speaking 3, 4-, 5-, and 6-year-old children with videos depicting, for example, Cookie Monster throwing away his ball and hat, but not his book. A puppet would then utter a description like (10), and children had to judge whether the puppet was right or wrong.

(10) It was the ball that Cookie Monster threw away.

Heizmann found that both the English- and German-speaking children started out interpreting clefts non-exhaustively, i.e. accepting the puppet’s non-exhaustive cleft descriptions. Heizmann also observed differences across the two groups, concluding that the German-speaking children had acquired the exhaustivity requirement of clefts by 6 years of age, while the English-speaking children of the same age, though better than the younger children, still had not fully acquired exhaustivity.

The results of Heizmann’s English experiment raise a puzzle on one version of the implicature account of clefts. It is puzzling that 6-year-olds still have not mastered the exhaustivity of clefts, if indeed clefts involve an implicature that requires no recourse to lexical alternatives (Geurts 2010). The implicature account would need to explain why children fail to compute exhaustive interpretations of clefts, in an age range where they have been shown to compute implicatures (and other exhaustive meanings) that do not require lexical replacement (Barner et al. 2011; Singh et al. 2016; Tieu et al. 2016, In press).
The goal of Heizmann’s study was to investigate the acquisition of exhaustivity in clefts, quantifiers, and questions. While relevant, the results do not have a strong bearing on the semantic theories of clefts we have discussed, since the experiments lacked the relevant comparisons with “only” and definite descriptions. While Heizmann’s results show children judging clefts non-exhaustively at an age where we might expect them to have already mastered homogeneity (Tieu et al. 2015, 2017), the difference is not very large and, more importantly, there is a question of whether even children who have acquired homogeneity would consistently reject undefined sentences.1

In the study to be presented, we attempted the direct comparisons relevant to the existing semantic theories of clefts.

3. Experiment
3.1. Participants

Sixteen French-speaking preschoolers (“Petite Section”) (3;04–4;02, M=3;08) and 20 French-speaking kindergarteners (“Grande Section”) (5;04–6;04, M=6;00) participated in the experiment. The children were recruited and tested in local schools in Paris. We also tested 22 adult native speaker controls, who were recruited through the French crowdsourcing platform Foule Factory. The adult participants were paid €2 for their participation.

3.2. Procedure

We used a Truth Value Judgment Task (Crain & Thornton 1998, 2000) to test participants’ comprehension of sentences involving clefts, positive and negative plural definite descriptions, and “only”. Participants were presented with a series of pictures of clipart images, each containing three familiar objects. A puppet appeared in pre-recorded videoclips throughout the presentation, creating the ruse that she was participating live via webcam. On each trial, the puppet was asked to describe the objects in the picture, and participants had to decide whether she was right or wrong. Children indicated their responses by placing small cutouts of happy and sad faces accordingly, in a box (Figure 1). Adults completed a web-based version of the task. They saw the same pictures and videos, and responded by clicking on the appropriate ‘yes’ and ‘no’ buttons. Each participant saw two training items (a clear ‘yes’ target and a clear ‘no’ target), followed by a total of 32 test trials presented in one of four pre-randomized orders.

1It is known that even adults do not do so under all conditions, cf. Schwarz (2013) and Križ & Chemla (2015).
3.3. Materials

Each picture contained three familiar objects; sometimes there were three different objects; sometimes the three objects were the same but differed only in color. This allowed us to create the relevant target types.

On the non-exhaustive cleft targets, participants saw three different objects, two of which were of the same color. For example, participants saw the picture in Figure 2; the experimenter asked the question in (11a), and the puppet replied with the description in (11b).

Figure 2: Example of a non-exhaustive cleft target image (the balloon and heart are both red, while the truck is blue). This image accompanied the question-answer pair in (11).

(11) a. Qu’est-ce qui est rouge dans cette image?  
   ‘What is red in this picture?’

b. C’est le ballon qui est rouge.  
   ‘It’s the balloon that is red.’

A participant who interpreted the cleft exhaustively was expected to reject the description. Participants received four non-exhaustive cleft targets.

On the non-homogeneous plural definite description targets, participants saw three of the same object, two of which were of the same color. For example,
participants saw the picture in Figure 3; the experimenter asked the question in (12a), and the puppet replied with the description in (12b).

Figure 3: Example of a non-homogeneous plural definite description target image (the first two balloons are red, while the third balloon is blue). This image accompanied the question-answer pair in (12).

(12)  

a. Tu peux nous dire quelque chose sur les ballons?  
   ‘Can you tell us something about the balloons?’

b. Les ballons sont rouges.  
   ‘The balloons are red.’

A participant who interpreted the plural definite description homogeneously was expected to reject the description. Participants received four non-homogeneous (positive) plural definite description targets.

On the presupposition failure *il n’y a que* ‘only’ targets, participants saw images of the same type as for the non-exhaustive cleft targets, containing three objects, two of which were of the same color. For example, participants would see a picture like Figure 2; the experimenter would ask the question in (13a), and the puppet would reply with the description in (13b).²

(13)  

a. Qu’est-ce qui est rouge dans cette image?  
   ‘What is red in this picture?’

b. Il n’y a que le ballon qui est rouge.  
   ‘Only the balloon is red.’³

A participant who was sensitive to the presupposition of the *il n’y a que* ‘only’ construction was expected to reject the description. Participants received four presupposition failure targets.

Since the cleft and ‘only’ trials were quite similar, we presented them in blocks; half of the participants saw the cleft block first, followed by the ‘only’ block, while the other half saw the reverse.

²The colors, objects, and combinations of colored objects were varied across all the trials, to keep the visual display interesting for children.
³A more literal translation may be along the lines of: ‘There isn’t but the balloon that is red.’
In addition to the critical cleft, definite description, and presupposition failure targets, we also included a variety of controls. Participants received four negative plural definite description controls, which involved the same kind of pictures as the critical positive plural definite description targets; these controls were meant to rule out a strategy whereby children might restrict the domain of quantification to just the objects that were of the color mentioned by the puppet. Participants also saw two trials in which a *il n’y a que* ‘only’ sentence was presented in a non-exhaustive context (e.g., the balloon was *not* the only thing that was red).

Finally, participants saw 14 unambiguous control trials involving positive and negative plural definite descriptions, clefts, and “only”, where the sentence was either clearly true or clearly false; half were clear ‘yes’ targets and half were clear ‘no’ targets. These were meant to ensure that participants were paying attention to the task, and could give appropriate ‘yes’ and ‘no’ responses.

A summary of the various types of targets and controls is provided in Tables 1 and 2.

<table>
<thead>
<tr>
<th>Trial type</th>
<th>Sentence</th>
<th>Example picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-exhaustive cleft target (x4)</td>
<td><em>C’est le ballon qui est rouge</em> ‘It’s the balloon that’s red’</td>
<td><img src="red-red-blue" alt="Image" /></td>
</tr>
<tr>
<td>Non-homogeneous plural definite description target (x4)</td>
<td><em>Les ballons sont rouges</em> ‘The balloons are red’</td>
<td><img src="red-red-blue" alt="Image" /></td>
</tr>
<tr>
<td>Non-homogeneous negative plural definite description control (x4)</td>
<td><em>Les ballons ne sont pas rouges</em> ‘The balloons are not red’</td>
<td><img src="red-red-blue" alt="Image" /></td>
</tr>
<tr>
<td><em>il n’y a que</em> ‘only’ presupposition failure target (x4)</td>
<td><em>Il n’y a que le ballon qui est rouge</em> ‘Only the balloon is red’</td>
<td><img src="blue-blue-yellow" alt="Image" /></td>
</tr>
<tr>
<td><em>il n’y a que</em> ‘only’ non-exhaustive control (x2)</td>
<td><em>Il n’y a que le ballon qui est rouge</em> ‘Only the balloon is red’</td>
<td><img src="red-red-blue" alt="Image" /></td>
</tr>
</tbody>
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Table 1: Summary of non-exhaustive, non-homogeneous, and presupposition failure trial types.
Adults’ performance on control trials was entirely target-like; children’s performance was target-like with the exception of two trial types, where they differed from adults. First, children unexpectedly rejected the negative plural definite description true controls (see Table 2); closer examination revealed that the children did not like these descriptions because they mentioned a color that was not pictured. While literally true, these negative descriptions are somewhat pragmatically odd, so we decided to exclude these trials. Second, children accepted the

<table>
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<th>Condition</th>
<th>Target</th>
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<tr>
<td>Positive plural definite description</td>
<td>True (x2)</td>
<td><em>Les tasses sont roses</em> ‘The cups are pink’</td>
<td><img src="pink-pink-pink" alt="Picture" /></td>
</tr>
<tr>
<td></td>
<td>False (x2)</td>
<td><em>Les bols sont roses</em> ‘The bowls are pink’</td>
<td><img src="blue-blue-blue" alt="Picture" /></td>
</tr>
<tr>
<td>Negative plural definite description</td>
<td>True (x2)</td>
<td><em>Les balles ne sont pas rouges</em> ‘The balls are not red’</td>
<td><img src="blue-blue-blue" alt="Picture" /></td>
</tr>
<tr>
<td></td>
<td>False (x2)</td>
<td><em>Les bottes ne sont pas rouges</em> ‘The boots are not red’</td>
<td><img src="red-red-red" alt="Picture" /></td>
</tr>
<tr>
<td>Cleft</td>
<td>True (x2)</td>
<td><em>C’est la tasse qui est rose</em> ‘It’s the cup that is pink’</td>
<td><img src="pink-blue-blue" alt="Picture" /></td>
</tr>
<tr>
<td></td>
<td>False (x2)</td>
<td><em>C’est le bol qui est rose</em> ‘It’s the bowl that is pink’</td>
<td><img src="blue-blue-pink" alt="Picture" /></td>
</tr>
<tr>
<td><em>il n’y a que</em> ‘only’</td>
<td>True (x2)</td>
<td><em>Il n’y a que la tasse qui est rose</em> ‘Only the cup is pink’</td>
<td><img src="pink-blue-blue" alt="Picture" /></td>
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Table 2: Summary of unambiguous ‘yes’/‘no’ controls.

### 3.4. Results

Adults’ performance on control trials was entirely target-like; children’s performance was target-like with the exception of two trial types, where they differed from adults. First, children unexpectedly rejected the negative plural definite description true controls (see Table 2); closer examination revealed that the children did not like these descriptions because they mentioned a color that was not pictured. While literally true, these negative descriptions are somewhat pragmatically odd, so we decided to exclude these trials. Second, children accepted the
non-exhaustive *il n’y a que* ‘only’ controls more than adults did; this is somewhat surprising if *il n’y a que* is indeed a direct counterpart of English ‘only’, as Barner et al. (2011) have shown that children are quite adept at computing exhaustive meanings for overt ‘only’ when the alternatives are context-dependent, as they were in the present case. However, it’s quite possible that the *il n’y a que* construction is not a perfect test of overt exhaustification.

We had initially designed our exclusion criterion to be based on the unambiguous ‘yes’/‘no’ controls in Table 2; however, given children’s reasonable justifications for rejecting the true negative homogeneity controls, we decided to exclude these two trials, leaving a total of 12 unambiguous ‘yes’/‘no’ control trials. Participants had to correctly answer at least 9/12 of these trials to be included in the analysis. All participants passed and were included. All groups scored above 84% accuracy on the exclusion controls. The results from the exclusion controls are presented in Figure 4.

![Figure 4: Percentage of yes-responses to unambiguous ‘yes’/‘no’ exclusion controls. Target truth values are indicated in parentheses, i.e. (T)rue, (F)alse.](image)

Results from the three target conditions are presented in Figure 5. We first tried to fit a 3x3 logistic regression model on responses to all three conditions, but this model failed to converge. Given that all three groups were generally quite consistent in their rejection of the *il n’y a que* ‘only’ targets, and that both groups of children clearly distinguished this condition from the clefts and the definite descriptions, we decided to focus our attention on the comparison between the clefts and definite descriptions. We fitted a mixed-effect logistic regression model on the responses to the cleft and homogeneity targets, and compared models with and without Age Group (Adults vs. Younger Children vs. Older Children), Target Type (Cleft vs. Plural definite description), and their interaction as fixed effects. The model comparisons revealed significant main effects of Age Group ($\chi^2(2) = 38.3, p < .001$) and Target Type ($\chi^2(1) = 21.1, p < .001$), and a significant interaction between Age Group and Target Type ($\chi^2(2) = 22.3, p < .001$).
Follow-up comparisons revealed an effect of Target Type for adults and for the older children, but no effect of Target Type for the younger children. Children appear to start out with non-exhaustive interpretations of clefts and non-homogeneous interpretations of plural definite descriptions. Homogeneity appears to develop earlier, as evidenced by the effect of Target Type in the older children; exhaustive meanings of clefts appear to emerge later.

Examples of the younger children’s justifications for accepting the targets also provide support for non-exhaustive (14) and non-maximal (15) interpretations.

(14) Justifications for accepting non-exhaustive cleft targets:
   a. PUPPET: C’est le coeur qui est rouge. ‘It’s the heart that is red.’
      CHILD: (Oui) et les chaussures. ‘(Yes) and the shoes.’ (3;10,23)
   b. PUPPET: C’est la voiture qui est bleue. ‘It’s the car that is blue.’
      CHILD: (Oui) et la balle. ‘(Yes) and the ball.’ (3;10,23)

(15) Justifications for accepting non-homogeneous positive definite description targets:
   a. PUPPET: Les ballons sont rouges. ‘The balloons are red.’
      CHILD: (Oui) rouges et bleus. ‘(Yes) red and blue.’ (3;10,23)
   b. PUPPET: Les boîtes sont vertes. ‘The boxes are green.’
      CHILD: (Oui) et celle-là elle est orange, Rafie. ‘(Yes) and that one is orange, Rafie.’ (3;04,11)

Note that acceptance of the homogeneity targets cannot be explained by non-adult-like domain restriction to the subset of objects that satisfied the predicate. Children who accepted the positive homogeneity targets (e.g., ‘The trucks are blue’) because they restricted the domain to the blue trucks should analogously have accepted the negative homogeneity controls (e.g., ‘The trucks aren’t blue’) by restricting to the non-blue trucks, contrary to fact.
4. Conclusions

We presented French-speaking preschoolers and kindergarteners with non-exhaustive cleft sentences, non-homogeneous plural definite descriptions, and sentences with *il n’y a que* ‘only’ that were either false or presupposition failures. We found that children started out interpreting clefts non-exhaustively and plural definite descriptions existentially. Data from the older group of children also revealed that a homogeneous understanding of definite descriptions emerges earlier than an exhaustive interpretation of clefts. The French-speaking children in our study were found to interpret clefts non-exhaustively at an age when English- and German-speaking children in previous studies are reported to have at least partly acquired exhaustivity (Heizmann 2012). Furthermore, even our French-speaking adults were relatively more tolerant of non-exhaustive clefts than of homogeneity-violating sentences with definite descriptions.

This order of acquisition is in principle compatible with the homogeneity-based theory of exhaustivity in clefts, though that theory is called into question by the high rate of acceptance of non-exhaustive clefts in all groups, including adults. Our findings are consistent with a picture where, for example, French clefts have a second, non-exhaustive reading on top of one that is equivalent to English-style exhaustive clefts. It may therefore be desirable to complete the cross-linguistic picture by conducting a parallel study using similar materials and contrasts, but translated into English.

With respect to the ‘only’ sentences, we found that children displayed mastery of their meaning very early on. This would be very unexpected if the semantics of clefts were related to that of “only” in the way suggested by Velleman et al. (2012).

Our experiment did not include a direct comparison with scalar implicatures, but replicates and even strengthens Heizmann’s (2012) finding that children still judge clefts non-exhaustively at an age where they are able to compute exhaustivity in other cases, especially when no lexical/scalar alternatives are involved (e.g., exhaustive meanings associated with English “only”, free choice inferences, conjunctive inferences of disjunction, cf. Barner et al. 2011; Tieu et al. 2016; Singh et al. 2016; Tieu et al. In press).

Thus, while our data are not entirely explained by any theory of exhaustivity in clefts, it is fair to say that they are most readily compatible with the homogeneity-based theory. Given the potential peculiarity of French clefts, at least as compared to English and German, similar comparative data for these other languages would be desirable.

References


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