CHAPTER SEVENTEEN

THE COLLECTIVE-DISTRIBUTIVE READING OF *EACH* AND *EVERY* IN LANGUAGE ACQUISITION

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1. Introduction

Each and *every* are not distinguished in all languages (e.g. Hebrew). In languages that have two lexical entities for these quantifiers, such as English, their lexical and semantic properties are different in subtle ways. While *each* requires distributivity in all cases (1), *every* allows both distributive and collective readings (2) (Brooks and Braine 1996; Brooks and Sekerina 2006; Crain et al. 1996; Drozd 2001; Philip 1995; Roeper et al. 2011; Tunstall 1998). Both quantifiers require individuation. When *every* undergoes its collective accommodation, it still includes an in-principle (implicit feature) of individuation. The collective interpretation of (2b) the mom taking the dogs together, includes each of the dogs being walked, but not each action by the Mom. However for *each* the individuation meaning is required and it is not open to accommodation. The assumption is that *each* has a feature [+specific] as a lexical property which blocks a pragmatic reaction to a scenario (a picture or a story) that allows together as an explicit or implicit modifier [took every dog for a walk together]. It remains a challenge to semantics to express how this feature blocks this modifier or accommodation (see Brisson 1998 for further discussion).

(1) "The mom took each dog for a walk".

° We thank Petra Schulz and the UMass Acquisition Lab for their comments and discussion of the results.

(2) "The mom took every dog for a walk".
(2a) Distributive interpretation for *every*: one by one.
(2b) Collective interpretation for *every*: together.

How do children acquire the difference between these two quantifiers? It is shown that collective quantification (i.e.: *all, every*) comes in first in production (Philip 2011; Roeper et al. 2006). Naturalistic data from the CHILDES reported that both *each* and *every* are produced late in acquisition, but *each* is exceptionally rare in these production data (MacWhinney 2000, noted in Roeper et al. 2006). When exploring the production of *every*, it is suggested that 4 to 5-year-old children give *every* only collective and plural interpretations: "every boys and girls", "every people" (MacWhinney 2000, noted in Roeper et al. 2006). This finding suggests that children do not give *every* both collective and distributive interpretations like adults and they might start only with collective interpretation for *every*. Yet it is also evident that children get adequately large input of both *every* and *each*, (Brooks and Sekerina 2006; Philip 2011), and, of course, eventually perform as adults in comprehension.

Comprehension studies showed that children aged 4-6 performed better on *all* than on *each* (Brook and Braine 1996). The question is when children link the cognitive ability to distribute, which is shown earlier in their development (Avrutin and Thornton 1994) with the specific lexical quantifiers and when do they distinguish between *each* and *every* so that *each* distributes over both objects and actions, much like an adverb, while *every* can allow an optional collective interpretation.

The current study seeks to establish the steps on the acquisition path in the comprehension of *each* and *every* when contrastive narrative contexts for *each* as distributive versus *every* as collective are given. The study did not focus on the development of spreading which make the current task easier than similar tasks in previous studies (e.g.: Brooks and Sekerina 2006; Roeper et al. 2011). The developmental path is interesting from two points of views: understanding the development of quantifiers' comprehension in child language and understanding the semantic development of words that are contrastive in their meanings but can also share these meanings.

2. The study

Method

40 English-speaking children (3;6-7;0) were tested. Each child heard six stories as in (3) below, describing scenarios in which one character performs an action distributively (e.g.: the girl in (3)) and the other character does a similar action collectively (e.g.: the boy in (3)). The child heard the stories followed by either an *each* question (3a), or alternately an *every* question (3b), and was asked to explain his choice. Answers were coded as *distributive* (4), *collective* (5) *both distributive and collective* (6) and *other* (7). The task was a within subject design and was counterbalanced for which quantifier was used first. 30 adults participated in a paper and pencil version of the same task.

(3) "A Boy and a girl had 3 balls: a blue one, a green one, and a red one. The girl grabbed the blue ball, then the red ball, and then the green ball, to see which ball would bounce the best. The boy grabbed all the balls at once because he wanted to give them to his friend."
(3a) who grabbed each ball? Why?
(3b) who grabbed every ball? Why?

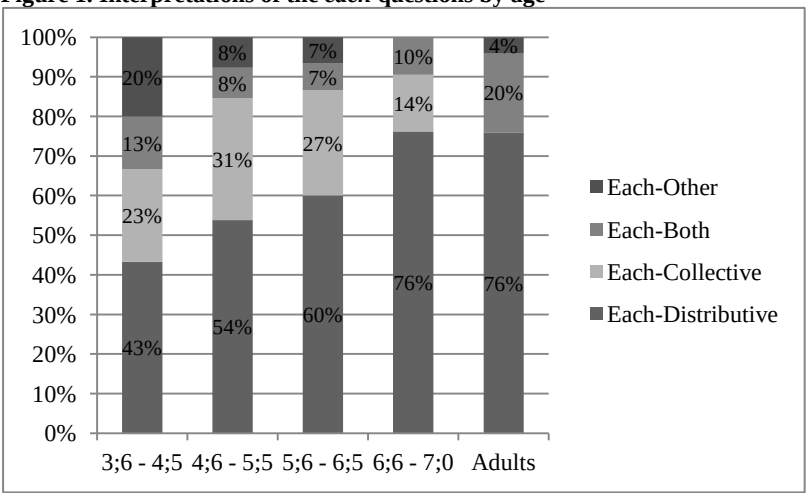
(4) Distributive interpretation: "The girl. She did not grab all of the balls at once she grabbed each one at a time" (7:0).
(5) Collective interpretation: "The boy because he wanted to give the balls to his friend" (5:0).
(6) Both distributive and collective interpretation: (an adult): "They both grabbed every ball, either one at a time or all at once"
(7) Other response: "I don't know" (6;3), "his friend" (4;8).

Results

Children showed development path towards adults' performance for both *each* and *every* (Figure 1 and 2). For each of the quantifiers we present the adults results first and then compare the children's performance. The adults gave mostly distributive interpretation (Figure 1) for *each* questions. No collective interpretation was given for the *each* questions, suggesting that the task distinguished between the meanings of the two quantifiers. 50% of the *both* interpretations were given for the first story, before the adults heard the contrast

with an *every* question[1]. These results show a strong distributive preference for *each* in adults. Children showed development in their distributive interpretations as can be seen in Figure 1. T-test showed significant difference only between the youngest age group versus the oldest age group ($t(15) = 2.51$, $p = .02$). The comparison between distributive versus collective interpretation within each age group revealed marginal difference at ages 3;6-4;5 ($t(9) = 1.77$, $p = .05$) and 4;6-5;5 ($t(12) = 1.47$, $p = .08$), and significant difference at ages 5;6-6;5 ($t(9) = 2.4$, $p = .02$) and 6;6-7 ($t(6) = 5.46$, $p < .001$). These results suggest that at the age of 5;6-6;5 children perform adults like in the comprehension of *each* questions.

Figure 1. Interpretations of the *each* questions by age



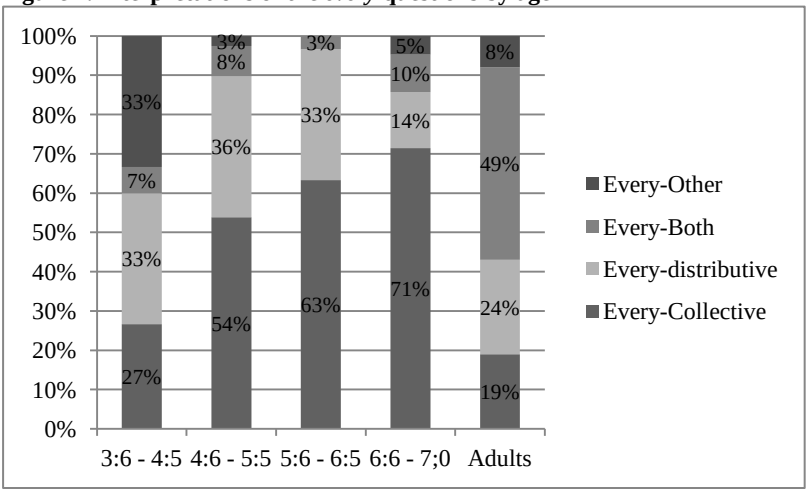
For the *every* questions adults gave mostly the *both* interpretation (Figure 2). This interpretation was given to all six stories. Children showed development in their collective interpretations as can be seen in Figure 2. T-test showed significant difference only between the youngest group versus the group from 5;6 to 6;5 ($t(18) = 2.57$, $p < .01$) and the youngest group versus the group from 6;6 to 7;0 ($t(15) = 3.26$, $p < .01$). The comparison between collective versus distributive interpretations within each age group revealed a marginal difference at ages 5;6-6;5 ($t(9) = 1.59$, $p = .07$) and significant difference at ages 6;-6-7;0

[1] A different group of 42 adults was tested with a similar version of the task with a pre-tested story presenting both *each* and every *questions*. The *both* interpretation for *each* questions in this group was only 7%.

(t(6) = 4.08, $p < .01$). Unlike the adults, the group from 6;6 to 7;0 gave *both* interpretations only for 10% of the *every* questions showing a preference for the collective interpretation over the *both* interpretation. These results suggest that children prefer the collective interpretation over the distributive interpretation for *every* at the age of 6;6-7;0, but they still don't show adult like performance, a preference for the *both* interpretation, at this age.

At the younger ages (3;6-4;5 and 4;6-5;5), when children did not interpret *each* as distributive and *every* as collective, they tended to choose the other interpretation: the collective readings for *each* and the distributive readings for *every*. Furthermore, there was no bias toward one of the interpretations in the young age.

Figure 2. Interpretations of the *every* questions by age



3. Discussion

The current results showed that at the age of 5;6-6;5, children give primarily collective interpretations for *every* and primarily distributive interpretations for *each*. Before this age they have no bias toward either collective or distributive interpretation for both quantifiers. Unlike adults, even at this age of 6;6-7;0, children were reluctant to give *both* responses.

The adult's results are in line with previous studies that argued for a distributive reading of *each* and both distributive and collective readings for *every* (Brooks and

Sekerina 2006; Crain et al. 1996; Drozd 2001; Philip 1995; Roeper et al. 2011). The results are in line with Roeper et al.'s (2011) results which allowed participants choose more than one picture per sentence. In Roeper et al. (2011), the participants indicated the two pictures of distributive and collective readings as being acceptable for the *every* sentences, and did not show a preference for one of them. In the current study, the participants preferred the *both* interpretation for *every* over the collective interpretation. We suggest that adults prefer both readings when this option is given to them as in the current task, which was not limited to a one interpretation choice.

What path do children take in the development of meanings of these two quantifiers? The current results suggest that children start at a stage where they do not distinguish between *each* and *every*. At this first stage they tend to interpret these quantifiers as distributive or collective. This stage is presented between 3;5-5;5 and it is in line with previous results of late acquisition of quantifiers' comprehension (Brooks and Braine 1996; Brooks and Sekerina 2006; Drozd 2001; Philip 1995; Roeper et al. 2011). At this initial stage the child has accommodation for both *each* and *every*, with no specificity marker for *each* (Roeper et al. 2011) which resulted with both quantifiers having similar meaning, as the results of the current study showed.

At the next stage (5;6-6;5 and 6;6-7;0), the *each* distributive interpretation is adult-like and its collective interpretation decreased (as can be seen in Figure 1). This result is in line with Brooks and Braine's results (1996) that showed 76% distributive reading for *each* at the age of 7 in a sentence picture matching task with two pictures. This result suggests that the child acquired the specificity marker for *each.* A mirror result of this development is the increasing collective interpretation for *every* (as can be seen in Figure 2 at 5;6-6;5 and 6;6-7;0). However, at the second developmental stage, the *both* collective and distributive interpretation for *every* is not acquired yet, leaving the child with a preference of the collective reading for *every*. This assumption is supported by the stable percentage of the *both* interpretation in the older ages tested in the current study. It is also supported by production data of 4 to 5 -year-old children who give *every* only collective interpretation: "every boys and girls", "every people" (MacWhinney 2000; noted in Roeper et al. 2006).

The last stage of acquisition is represented by the adults' performance: *each* has its specificity marker thus it is distinguished from *every*, and *every* has its in-principle of individuation thus it allows both distributive and collective reading. These three developmental stages need to be further explored in acquisition and they also reinforce the challenge to semantics to account for the possibility of *every* and *together*.

To conclude, in the current novel task which included two test questions that facilitate the child's capacity to seek contrasts, children could distinguish the

required distributive meaning of *each* from *every* at the age of 5;6-6;5. Isolating the strict distributive meaning for *each* is a significant challenge in the developmental path. One possibility is that the child must recognize the restrictive character of "floated" *each*, as in "the boys had one hat each" which requires that distributivity applies to both subject and object through modifying the verb adverbially, just as with the opposite form "they had one hat together". This suggests that children can use several syntactic sources to isolate the semantics of quantification. If the child is aware of "floated" *each* before they comprehend its binomial character (distributivity on both the subject and the object), then it can explain why the children do not produce *each* although they understand it in many contexts. They can be, in effect, aware that the word is incompletely acquired. This perspective may provide an important insight into how the child moves from comprehension to production.

References

Avrutin, Sergey, and Rosalind Thornton. 1994. Distributivity and binding in child grammar. *Linguistic Inquiry, 25 (1),* 165-171.

Brooks, Patricia. J. and Martin. D. S. Braine. 1996. What Do Children Know about the Universal Quantifiers all and each? *Cognition 60*, 235 – 268.

Crain, Stephen, Rosalind Thornton, Carole Boster, Laura Conway, Diane Lillo-Martin, and Elaine Woodams. 1996. Quantification Without Qualification. *Language Acquisition 5*, 83 – 153.

Drozd, Kenneth F. 1996. Quantifier Interpretation Errors as of Errors Distributvive Scope. In *Proceedings of BUCLD the 20th annual Boston University conference on language development*, eds. Andy Stringfellow, Dalia Cahana-Amitay, Elizabeth Hughes and Andrea Zukowski, 177-188. Cascadilla Press, Somerville, Massachusetts.

Drozd, Kenneth F. 2001. Children's Weak Interpretations of Universally Quantified Questions. In *Language Acquisition and Conceptual Development*, eds. Melissa Bowerman and Stephen. C. Levinson, 340-345. Cambridge University Press, Cambridge, England.

Philip, Williams. 2011. Acquiring knowledge of Universal Quatification. In *Handbook of Generative Approaches to Language Acquisition*, eds. Thomas Roeper and Jill deVilliers, 351-394. Springer.

Philip Williams. 1995. Event Quantification in the Acquisition of Universal Quantification. Doctoral Dissertation, University of Massachusetts, Amherst, GLSA Publications.

Roeper, Thomas, Uri Strauss, and Barbara Zurer Pearson. 2006. The acquisition path of the determiner quantifier *every*: Two kinds of spreading. In *Papers in*

Language Acquisition, ed. Tanja Heizmann, 97-128. University of Massachusetts Occasional Papers UMOP, 34. Amherst, MA: GLSA.

Roeper, Thomas, Barbara Zurer Pearson, and Margaret Grace. 2011. Quantifier spreading is not distributive. In *The proceedings of BUCLD the 35th annual Boston University conference on language development*, eds. Nick Danis, Kate Mesh and Hyunsuk Sung, 526-539. Somerville MA: Cascadilla.

Tunstall, Susanne Lynn. 1998. *The interpretation of quantifiers: Semantics and processing*. Doctoral dissertation, University of Massachusetts Amherst.