

## Early interpretations of universal quantifiers in Dutch: The role of distributivity

Function words like quantifiers (*all, some*), logical connectors (*or, and*) or negation (*not*) are essential for semantic processing, as they express how individual word meanings combine in sentence interpretation. We studied how children acquire such function words by examining the development of universal quantifiers in Dutch. Universal quantifiers (*all, every, each*) form a particularly interesting learning challenge because many languages have more than one universal quantifier, and their meanings are not the same across languages<sup>[1]</sup>. How do children acquire the abstract meanings specific to each universal quantifier, and how is this acquisition shaped by language-specific properties?

Many languages have distributive and non-distributive universal quantifiers.<sup>[2]</sup> Distributive quantifiers (like *each, every*) apply a predicate to all individuals separately. Non-distributive quantifiers (like *all*) also allow a collective application of the predicate to a set as a whole. Therefore, *all* is compatible in both (1) and (2) and *each* and *every* only in (2).<sup>[3]</sup>

(1) {All the children / \*Each child / \*Every child} completed the assignment together.

(2) {All the children / Each child / Every child} completed their own assignment.

Languages differ in how distributivity is encoded. In English, there is a further distinction between *each* and *every*, with *each* having a stronger distributive force.<sup>[4]</sup> In Dutch, this *each/every* distinction is not lexicalised. Although Dutch also has two distributive quantifiers (*elk, ieder*), these two distributive quantifiers seem synonymous and have the same inherent distributivity<sup>[1]</sup>.

Our recent work showed that English-speaking children's early understanding of *each* – but not of *every* and *all* – already captures distributivity.<sup>[5]</sup> Thus children acquire quantifier-specific meanings from the start of development. The present study tests whether Dutch-learning children show a similar pattern despite the different lexicalisation of distributivity.

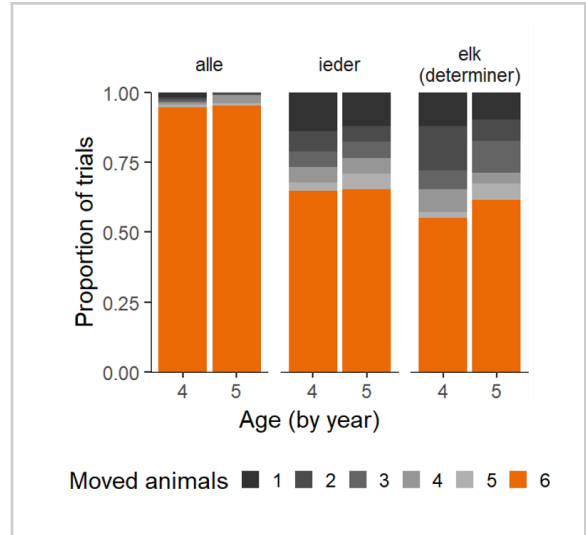
We tested whether children understand that *alle, elk, and ieder* express universal quantification in two experiments. In Experiment 1 (Figure 1), children acted out prompts like *Nu gaan alle varkens naar de wei* (“Now, all pigs go to the field”). Children showed good understanding of *all*, but not of *elk* or *ieder* (Figure 2). Two explanations are possible: (i) Children haven't acquired *elk/ieder* yet (which are infrequent words)<sup>[1]</sup>, or (ii) children may have acquired a distributive meaning for *elk/ieder* and struggle with applying this distributive meaning in the non-distributive task context.

Experiment 2 (ongoing), therefore, presents a distributive context (Figure 3). Now, children distribute plastic hay bales to individual animals in response to prompts like *Nu krijgen alle varkens hooi* (“Now, all pigs get hay”). If children have acquired distributive meanings for *elk/ieder*, their understanding of these words should improve in Experiment 2. Such a finding (i.e., children's early understanding of *elk/ieder* but not of *alle* is limited to distributive contexts) would indicate that children acquire quantifier-specific meanings from the outset.

Altogether, our experiments demonstrate whether Dutch-speaking children, like English learners, acquire quantifier-specific meanings from the start of learning, and how language-specific semantic distinctions shape the acquisition of universal quantification. Data from Experiment 2 will be analysed by the time of the conference.



**Figure 1.** Experiment setup of Experiment 1: The farm features six cows, six pigs, and six sheep. On each trial, four- and five-year-old children ( $n = 77$ ) responds to prompts like *Nu {gaan alle varkens / gaat elk varken / gaat ieder varken} naar de wei* (“Now, {alle/elk/ieder} pig goes to the field”). The dependent variable in this experiment is whether the child gave a *universal response*, that is whether they moved all six animals of the relevant kind into the field.



**Figure 2.** Results of Experiment 1. Orange bars denote the proportion of trials in which the children moved all six animals, demonstrating a universal response. Logit mixed-effect models revealed that children were significantly more likely to give a universal response in the *all* condition than in the *elk* or *ieder* conditions ( $\chi^2(2) = 34.30, p < 0.001$ ). The analyses showed no effects of age. The experiment also included prompts with *sommige* (‘some’), *een paar* (‘a few’), *een* (‘a’) and *two* (‘twee’). These conditions were included to add variation to the task, but were not included in the statistical analysis.



**Figure 3.** Experiment setup of Experiment 2: The farm features three cows, three pigs, and three sheep and five hay bales. On each trial, four- and five-year-old children (*currently*  $n = 45$ ; *aimed*  $n = 70$ ) responds to prompts like *Nu {krijgen alle varkens / krijgt elk varken / krijgt ieder varken} hooi* (“Now, {alle/elk/ieder} pig gets hay”). Note that a universal response – i.e., giving hay to each animal of a kind – requires distributing over each animal separately.

## References

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