

Early development of universal quantifiers: The role of distributivity

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Function words like quantifiers (*all*, *some*), logical connectors (*or*, *and*) or negation (*not*) determine how individual words combine in interpretation. We studied how children acquire such abstract function words by examining the development of universal quantifiers in Dutch. Universal quantifiers (*all*, *every*, *each*) form a particularly interesting learning challenge: Many languages have more than one, and their meanings vary cross-linguistically.^[1] How do children acquire these meanings? Do they initially treat words like *all*, *every*, and *each* the same^[2], or do they distinguish their meanings from the outset?

Many languages distinguish between distributive and non-distributive universal quantifiers.^[3] Distributive quantifiers (like *each*, *every*) apply a predicate to individuals separately, while 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) while *each* and *every* are only compatible in (2).^[4]

- (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 lexicalised. In English, *each* has a stronger distributive force than *every*.^[5] In Dutch, this distinction is not lexicalised. Although Dutch also has two distributive quantifiers (*elk*, *ieder*), they encode the same distributivity features.^[1]

Recent work showed that English-speaking children's early understanding of *each* – but not of *every* or *all* – encodes strong distributivity from the onset of acquisition, indicating that children differentiate *each* from *every* and *all* from the start.^[6] However, because the distinction between *each* and *every* is not lexicalised across languages, it remains an open question whether this pattern generalises cross-linguistically.

We therefore investigate the acquisition of Dutch universal quantifiers, by testing whether Dutch-speaking four- and five-year-olds' interpret *alle*, *elk*, and *ieder* as encoding universal quantification and distributivity. In Experiment 1 (Figure 1), children acted out prompts like *Nu gaan alle varkens naar de wei* ("Now, all pigs go to the field"). The results showed that children interpreted *all* as a universal quantifier, but not yet *elk* or *ieder* (Figure 2). Two (non-mutually exclusive) explanations are possible: (i) Children haven't acquired *elk/ieder* yet (which occur relatively infrequent in their language input)^[1], or (ii) children have acquired a distributive meaning for *elk/ieder* and struggle with applying this distributive meaning in the non-distributive task context.

Experiment 2 (data collection nearly complete) addresses this by presenting a distributive context (Figure 3). Children distribute toy hay bales to animals one-by-one in response to prompts like *Nu krijgen alle varkens hooi* ("Now, all pigs get hay"). Preliminary results suggest that children more often interpret *elk* and *ieder* as universal quantifiers in this context. This indicates that children's early understanding of *elk/ieder*—but not *alle*—may be restricted to explicitly distributive contexts, supporting the hypothesis that quantifier-specific meanings are acquired from the outset, in line with findings for *each* in English.^[6]

Experiment 2 is the final experiment of this study and will be completed before the AMLaP2026 conference.



Figure 1. Experiment 1 setup. The farm contains six cows, pigs, and sheep. Four- and five-year-olds ($n = 77$) heard prompts like *Nu gaan {alle/elk/ieder} varken naar de wei* (“Now {all/each/every} pig goes to the field”). The task measured whether children moved all six animals of the relevant kind. Additional prompts with non-universal quantifiers (‘some’, ‘a few’, ‘a’, ‘two’) were included but not analysed.

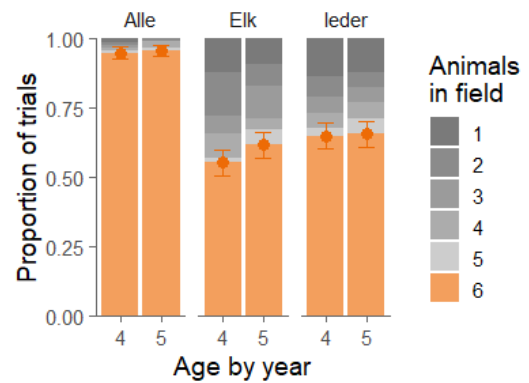


Figure 2. Experiment 1 results. Orange bars represent trials in which all six animals were moved, indicating a universal response. Logit mixed-effect models revealed that universal responses were more likely in the *all* than in the *elk* or *ieder* conditions ($\chi^2(2) = 34.30, p < 0.001$). There were no age-related effects.



Figure 3. Setup of Experiment 2: The farm features three cows, pigs, and sheep, and five hay bales. On each trial, four- and five-year-old children (currently $n = 63$ of 70, but the sample of four-year-olds is complete) are given prompts like *Nu krijgen {alle varkens / elk varken / ieder varken} hooi* (“Now, {alle/elk/ieder} pig gets hay”). A universal response – i.e., giving hay to each animal of a kind – requires giving each animal hay one-by-one.

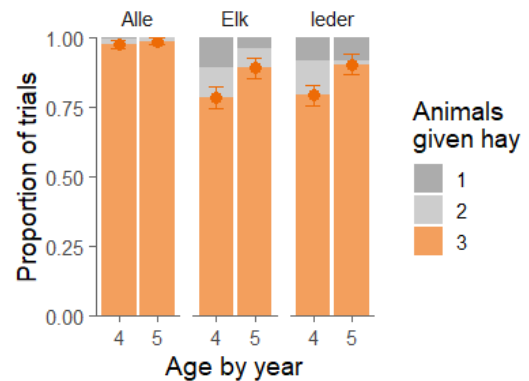


Figure 4. Preliminary Experiment 2 results. Orange bars represent trials where all three animals were fed, indicating a universal response. Descriptively, children assigned universal responses more often to *all* than to *elk* and *ieder*, but interpreted *elk* and *ieder* as universal more often than in Experiment 1, with older children doing so more frequently than younger children.

References

- [1] Slim, M. S., Tobyn, E., & Rowland, C. F. (2025). Quantifier-Specific Usage Patterns Shape Learning—A Corpus Analysis on Universal Quantifiers in English and Dutch Child-Directed Language. *First Language*. [2] Brooks, P. J., & Braine, M. D. (1996). What do children know about the universal quantifiers all and each?. *Cognition*, 60(3), 235-268. [3] Gil, D. (1995). Universal quantifiers and distributivity. In *Quantification in natural languages* (pp. 321-362). Dordrecht: Springer. [4] Dowty, D. (1987). Collective predicates, distributive predicates, and all. In *Proceedings of the 3rd ESCOL* (pp. 97-115). [5] Beghelli, F., & Stowell, T. (1997). Distributivity and negation: The syntax of each and every. In *Ways of scope taking* (pp. 71-107). [6] Anonymous (*in prep*). Learning the logic in language: acquiring the meanings of “all”, “every”, and “each”.