

# Do *elk* and *ieder* signal distributivity? Evidence from a low working memory task.

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Bachelor Project

**Abstract:** Research regarding the words *each* and *every* in English has found that the interpretations of these words differ, and that interpretation of these words between children and adults differ. Both children and adults interpret *each* as clearly distributive. However, adults interpret *every* as ambiguous, where children interpret *every* as clearly collective. This article aims to find out if such differences can be found in Dutch, a language similar to English, for the words *elk* and *ieder*. A previous version of this experiment in Dutch contained stories that were quite difficult to follow, especially for children. We wanted to lower the working memory load by improving the stories, and accompanying the stories with cartoons in hopes of finding more conclusive results. Again we found no significant difference in interpretation between *elk* and *ieder* for both children and adults. Additionally, unlike children, adults seemed to have a clear preference for the distributive interpretation for both quantifiers.

## 1 Introduction

Consider the following sentence:

- (1) Grandfather grabbed three umbrellas.

In this sentence it is absolutely clear that grandfather grabbed all three umbrellas at the same time. Figure 1 depicts this event. Because all items are used at the same time, the event is called a collective event.

An event can also be distributive, where it is distributed over time. In that case, the three items are used at different times. One can then say that all items were used within a certain time frame, even though the item were not used all at the same time. Figure 2 shows a distributive event, where grandfather is holding each umbrella at a different moment in time.

To describe an event as distributive, one can use quantifiers. Quantifiers are words like *many*, *some*, *all*, *three*, and *every*. Quantifiers indicate the amount of objects or characters involved. The English language has two quantifiers, *each* and *every*, that can signal distributivity. However, these words are not exactly the same. Consider examples (2) and (3.)

- (2) Grandfather grabbed every umbrella.
- (3) Grandfather grabbed each umbrella

The event described in example (2) can be interpreted in two ways. In one case, the situation is interpreted as the collective event from Figure 1, where grandfather grabbed all umbrellas at the same time. In the other case, the event is interpreted as the distributive event in Figure 2, where grandfather grabbed each umbrella at a different time.

The event described in example (3) has only one interpretation. It is always seen as a distributive event. The interpretation of *every* allows for both a distributive and a collective reading, where *each* is strictly a distributive marker (Turnstall,1998).



Figure 1: A collective interpretation



Figure 2: A Distributive interpretation, where the action is distributed over time

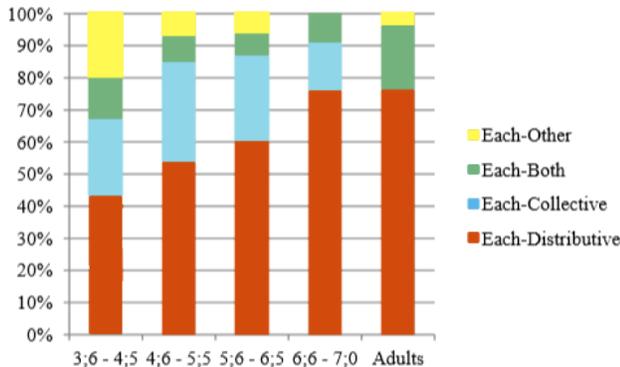


Figure 3: Results Novogrodsky et al. (2012) for Each questions

How do children acquire these interpretations? Child language is often different from adult language, since children go through different stages of interpretation. For example, Roeper et al. (2006) found that, when you do use quantifiers, English children acquire the collective quantification (*every*, *all*) before they learn distributive quantification. Syrett & Musolino (2013) did an experiment in with sentences containing *each* and *together*. They used a truth value judgement task where participants had to compare the sentence to either a collective or a distributive picture. They found that children strongly accept all combinations (*each* - collective, *each* - distributive, *together* - collective, *together* - distributive). On the other hand, adults mostly reject distributive situations for *together* and they mostly reject collective situations for *each*.

Other languages may show similar differences like those found between the English words *each* and *every*. The Dutch language is similar to English in some aspects. Interestingly, both languages have two distributive quantifiers that seem to be translation equivalents: *each-elk* and *every-ieder*. The Dutch words *elk* and *ieder* can be extended to *elke* and *iedere* depending on the word they quantify over. The results may also give us some insight as to how children develop adult-like intuitions. However, in order to establish how children get to the adult interpretations we first have to establish what the interpretations are. We know that there is a difference between the English words *each* and *every*. How are the Dutch quantifiers interpreted? And are there differences between the child and adult interpretations?

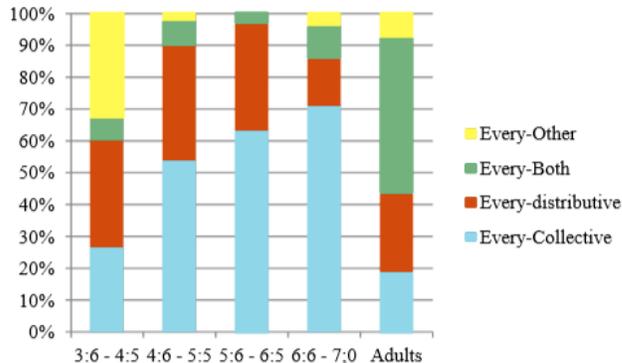


Figure 4: Results Novogrodsky et al. (2012) for Every questions

## 2 Background

### 2.1 Novogrodsky et al. (2012)

Novogrodsky et al. (2012) researched the English quantifiers *each* and *every* and found the aforementioned differences. They tested children ranging between ages 3;0 and 7;0, and adults. Participants heard six stories like the one in example (4), involving two characters, one doing an action distributively and the other doing a similar action collectively. They were then presented with one question. This question contained either the word *each* or the word *every* (examples (5) and (6)). Participants were asked to explain their answers. It was also possible to answer both. Other answers like 'I don't know' were marked as 'other'.

- (4) 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.
- (5) Who grabbed each ball? why?
- (6) Who grabbed every ball? why?

Children of ages 4;6-5;5 have no interpretation preference for either word. Children aged 6;6-7;0 treat *each* similar to adults (Each-distributive, Figure 3), giving it a clear distributive interpretation.

however, unlike adults, children aged 6;6-7;0 treat *every* as clearly collective (Every-Collective, Figure 4). They found there were three stages of acquisition:

- 1: No preference
- 2: A preference for *each* to be distributive and *every* to be collective.
- 3: A preference for *each* to be distributive where *every* is ambiguous (adult interpretation).

This shows large interpretation differences between both the quantifiers and between adult and child interpretations in English. Since the Dutch language is very similar to English, we expect to find these differences in Dutch as well.

Note also that it is possible to place the quantifiers *each* and *every* at different locations in a sentence. Although they cannot appear in any given location in a sentence, they can be found in two positions. Example (7) shows the quantifier in subject position, and example (8) shows the quantifier in object position. A distributive quantifier in subject position tells the reader about the amount of people or objects involved, where the distributive quantifier in object position is usually interpreted as distribution over time.

- (7) Every boy is holding a ball
- (8) The boy is holding every ball.

In example (7) it is not necessarily the case that each boy has his own ball. It might also be the case that multiple boys are holding on to the same ball, although this second interpretation is less straightforward.

## 2.2 Roeper et al. (2011)

Roeper et al. (2011) further shows the interpretation differences of *each* and *every* between children and adults. They compared the English words *each* and *every* in subject position with a picture preference task. They tested 38 native English children, aged 5;0 to 9;0, and 40 native English speaking adults. Each participant was presented with two sentences, first one with *every*, and then one with *each* (examples (9) and (10)). Participants could answer with none, all, or any of the options displayed on the picture. The three options shown in the picture were:

- A: collective (not distributive), not exhaustive
- B: distributive, not exhaustive.
- C: not 1-1 distributive, but it is exhaustive.

Figure 3 shows the options that go along with the sentences in examples (9) and (10).

- (9) Every flower has a vase.
- (10) Each flower has a vase.

Both distributivity and exhaustiveness were tested in this experiment. It did show that adults have clearly different preferences for *each* and *every*. Around 90% of the adults said that all pictures were good options when they were given a sentence with *every*. However, when they were given a sentence with *each*, they would say that B was the best option. Unlike adults, 40% of the children treated *each* the same as *every*. If the children did show a difference between the quantifiers, they would specifically reject B for *each*, where adults would prefer B. For *every*, children would prefer C.

It cannot be that they got these results because the children were too young to be able to distribute. Avruntin & Thornton (1994) showed that children as young as 3 and 4 have the cognitive ability to distribute. The children in this experiment were much older. The interpretation differences persist in the results for the quantifier in subject position. Both between the quantifiers and between children and adults. Adults preferred the most distributive picture for *each* as the best fit, making it clearly distributive. However, *every* is again given a more ambiguous interpretation, since adults deemed all the pictures as possible interpretations.

The differences between the *each* and *every* must be very strong, because the differences are still there when the quantifier is in subject position. This further cemented our suspicions that such differences can be found in Dutch as well.

## 2.3 Dotlačil (2010)

The difference between the Dutch *elk* and *ieder* in subject position has been researched before, albeit sometimes as a by product of another study. In an experiment by Dotlačil (2010), Dutch native adults were presented with a scenario and several sentences. Participants

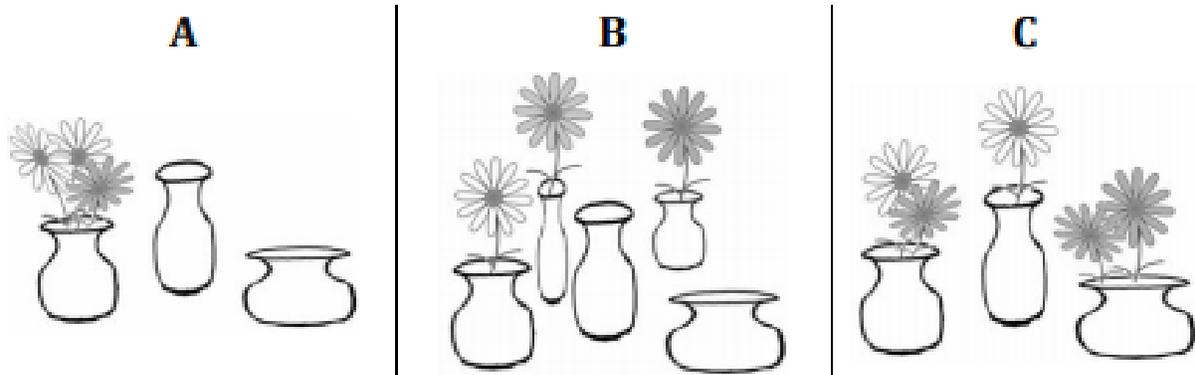


Figure 5: images from Roeper (2011)

had to indicate how acceptable the sentences were given the scenario. This was done via a six point rating system, scaling from possible to not possible. Some scenarios would force a distributive reading (example (11)). Others would force a collective reading. The scenarios and the sentences were presented in Dutch. Examples (12) and (13) give an indication of the sentences that were used.

- (11) The sailors Jip, Jaap, and Joop were stranded on an uninhabited island. After a while, they started quarreling, and went their separate ways. Jip went to live in the shipwreck, Jaap moved into a cave, and Joop found himself an abandoned hut. Each of them thought his dwelling was the worst one. Therefore they were jealous of each other.
- (12) Every (Iedere) sailor was jealous of the others.
- (13) Each (Elke) sailor was jealous of the others.

They wanted to test the interpretation of the lexical items *the others*, *each other*, *same*, and *different*, and how they were affected by different quantifiers. They also tested other quantifiers. As can be seen in the examples, the quantifiers were in subject position. For our investigation, the other quantifiers are not relevant. What is relevant for us though, is that Dotlačil (2010) found that the interpretation of

sentences with *elk* was not significantly different from the interpretation of sentences with *ieder*. Given the research regarding the English words *each* and *every* this is very unexpected.

#### 2.4 De Koster (2015)

De Koster (2015) specifically researched the interpretation preferences of the Dutch words *elk* and *ieder* among adults. In this experiment, participants were presented with sentences (example 14) and either a picture of a collective interpretation or a picture of a distributive interpretation. Participants then had to indicate if they agreed (response yes) or disagreed (response no) with the combination of the sentence and the picture. The original experiment contained only tested for *ieder*. A follow-up experiment tested for *elk* (but not for *ieder*). This second experiment used sentences as seen in example 15.

- (14) Ieder meisje bouwt een zandkasteel.  
Every girl is building a sand castle.
- (15) Elk meisje bouwt een zandkasteel.  
Each girl is building a sand castle.

The group that was given questions with *ieder* (example(15)) consisted of 40 adults (mean age 21). The second group that was given questions with the word *elk* (example (14)) consisted of 24 adults (mean age=26). There was no difference found between the quantifiers. In Dutch, there was an incredibly strong distributive preference

for both quantifiers. Over 90% of the instances where a distributive picture was shown, the participants would agree that the picture fitted with the sentence, for both quantifiers. For the cases where a collective picture was shown, in around 70% of the instances the combination was rejected. Both Dotlačil (2010) and De Koster (2015) found no differences between *elk* and *ieder* when they were in subject position. The differences that Roeper (2011) found were not found in Dutch. One would expect similar results in Dutch, yet the interpretation of the Dutch quantifiers was entirely different. If one of the two Dutch quantifiers was ambiguous, one would expect the response to be around 50%, which would indicate guessing. However, Dutch adults showed a clear preference for the distributive interpretation for both *elk* and *ieder*. This could mean that the Dutch quantifiers do not have the same properties as the English quantifiers.

## 2.5 Van Koert et al.

According to the findings from Roeper et al. (2011), the ambiguous nature of *every* seemed to persist with the quantifier in subject position, but what is the preference when participants are presented with a forced choice? Van Koert et al. (2015) compared the interpretation preferences of English children regarding the English word *every*, and Dutch children regarding the Dutch word *elk* (English: *each*). They tested 77 Dutch monolingual children and 75 American-English monolingual children. They presented Dutch children with sentences similar to example (16), and English children with sentences like example (17), along with a picture of a collective interpretation and a picture with a distributive interpretation.

(16) Elke beer kietelt een schildpad.  
Each bear is tickling a turtle.

(17) Every bear is tickling a turtle.

The children then had to indicate whether these sentences matched the collective or the distributive picture. They also tested 19 Dutch adults and 22 American-English adults. As seen in the examples (16) and (17), the quantifiers are in subject position.

For English, in around 80% of the cases the adults give the distributive response for *every*.

This is very unlike the previously discussed findings from Roeper et al. (2011) regarding *every*, where adults showed no particular preference for one interpretation. If the adults were still ambiguous in Van Koert et al. (2015), the adult response should be somewhere around 50%.

They found that the Dutch children develop adult-like intuitions at an early age. At age 5, in 65% of the cases Dutch children give the distributive response. From age 6;0 through 9;0, Dutch children give the distributive response in over 90% of the cases, just like the Dutch adults. English children show adult-like interpretations from age 7 and onwards. However, they display much more variation in their selection.

Furthermore, the distributive preference is much stronger in Dutch compared to English, for all age groups. Where the English adults give the also strong distributive response in 80% of the cases, the Dutch adults respond distributively in over 90% of the cases. The clear distributive response for the English *every* is not at all like their ambiguous response in Novogrodsky et al. (2012), where the quantifiers were in object position.

This could explain the why there was no difference between the Dutch quantifiers when they were in subject position. The quantifiers lose the ambiguous interpretation when they are in subject position. Both *each* and *every* are interpreted as distributive when participants are forced to choose. Roeper et al. (2011) showed that *each* is already preferred as distributive, since adults preferred the most distributive picture, even without a forced choice. Yet Van Koert et al. (2015) showed that *every* is also interpreted as distributive, when adults have to give a preference. In that regard the response for the Dutch words *elk* en *ieder* in the results of De Koster (2015) were similar to the results found for the English *each* and *every*. Yet the English *each* and *every* were given different interpretations when they were in object position. Therefore, we could still find the interpretation differences that Novogrodsky et al. (2015) found. Although, given how quickly the Dutch children become adult-like in the experiment by Van Koert et al. (2015), we would expect the differences for the Dutch quantifiers between children and Adults to be smaller when they are in object position.

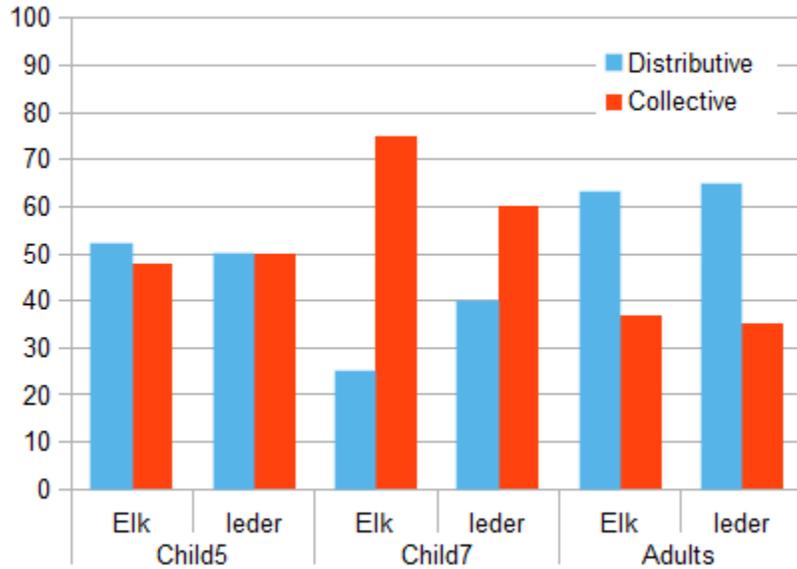


Figure 6: Results for Bouwmeester (2015)

## 2.6 Bouwmeester

In Dutch, the quantifiers *elk* and *ieder* have not been extensively compared experimentally. Earlier research focused on the quantifiers in subject position. The quantifiers in object position are relatively unexplored. Bouwmeester (2016) investigated the quantifiers in object position. She followed the design created by Novogrodsky et al. (2012) for the Dutch words *elk* and *ieder*, expecting to find results similar to the results found for the English words *each* and *every*. Participants were presented with a sound fragment, reading a story in Dutch, along the lines of the story in example (4). They then got one of the two questions as those seen in examples (18) and (19). It was a forced choice experiment. Participants had to choose between the characters.

(18) Wie pakte elke bal?  
Who grabbed each ball?

(19) Wie pakte iedere bal?  
Who grabbed every ball?

The participants consisted of 17 five-year-old children, 8 seven-year-old children, and 20 adults.

Most importantly, there was no interpretation

difference found between the quantifiers. There seemed to be three acquisition stages again:

- 1: No preference.
- 2: A collective preference for both quantifiers.
- 3: A distributive preference for both quantifiers.

Since Bouwmeester (2016) found no interpretation difference between the two quantifiers, we worried that this might be due to story length and complexity. This made it a lot more difficult to remember what the story was about, may have caused participants to prioritize remembering the story, rather than interpreting the question. Even adults sometimes had trouble remembering the entire story, and which character did what, since there was no text to help remembering the story. This might have caused participants to be confused. Maybe this is why there was no significant difference found. We wanted to expand on the research done by Bouwmeester (2016), and continue the use of the design created by Novogrodsky et al. (2012). This time, we improved the design by lowering the working memory load.

To achieve this, we added comics. We also had another look at the stories. We revised

some of the stories and we created a few new stories. We made them simpler and more like every day situations. There were two characters in each story, and they were always male and female. This made sure that there was a clear distinction between the characters. By adding the comics and making the stories more logical, we hope that participants would find it easier to follow the story. This will make the results more conclusive. This time we expect to see results more similar to what Novogrodsky et al. (2012) found for the English quantifiers.

### 3 Method

The experiment was a 2x1 design with the factor quantifier question type as the independent variable and the distributively acting or collectively acting character choice (response) as the dependent variable. We tested a group of children and a group of adults. The adult group consisted of 19 participants, recruited online (aged 19-59, mean age=27.58, 13 females). They did the experiment online in their own time. All of them signed a consent form at the beginning of the experiment. They received no reward. We tested 19 children at a Dutch primary school (aged 7-9, mean age=7.74, 8 females). The parents of these children gave passive consent. The children did the experiment supervised during school time, in a quiet office on the computer. Afterwards they were rewarded with a sticker.

Each participant heard a story that was accompanied by a comic. First the male and female characters were introduced, along with the objects. Then, one character would perform the distributive action and the other would perform the collective action. Example (20) shows the English translation of one of the stories that we used. Figure 7 shows the comic that depicts that story. The stories were recorded, so that participants did not have to read it. For this experiment we used twelve stories in total. In six stories, the distributive action would come first, and in the other six stories, the collective action would come first. The experiment took about 10 to 15 minutes to complete.

- (20) Granny and Grandpa have three umbrellas: a yellow one, a purple one, and a green one. Granny goes out with the yellow umbrella. Later that day, she takes the

purple one, and at the end of the day, she take the green umbrella with her. The next day, Grandpa takes all the umbrellas to sell them at the market.

- (21) Wie heeft elke paraplu gepakt?  
Who grabbed each umbrella?
- (22) Wie heeft iedere paraplu gepakt?  
Who grabbed every umbrella?

The materials were presented on a computer in random order and responses were stored automatically.

After a story finished, one of the two possible questions was asked. For the story in example (20), the questions would be as seen in example (21) and (22). For each item it was randomly selected whether it would ask an *elk* or an *ieder* question. It was ensured that each subject received a total of six *elk* questions and six *ieder* questions.

The participants then had to choose which one of the two characters would be the best fitting answer. This experiment was a forced choice design. They could not say both or neither. This way we can determine their interpretation preference. Whenever they chose the distributive answer, that is, they chose the character that performed the distributive action, the response would be marked as distributive, and when they gave the collective response, the answer would be marked as collective.

The participants were able to take as long as they wanted. Participants could always play the story again but they could not return to the previous question.

### 4 Results

For the analysis we used The R software to create linear models (Bates et al., 2015) to compare the results for the quantifiers (R Core Team, 2016). In Figure 8 you can see the results for the interpretation preferences for children and adults.

As can be seen in the figures, the interpretation preference between quantifiers are very similar. You can even see the error bars overlap between collective interpretations for *elk* and the distributive interpretations for *ieder*, meaning that there is probably no significant difference between the quantifiers. The children show a preference for the collective reading,

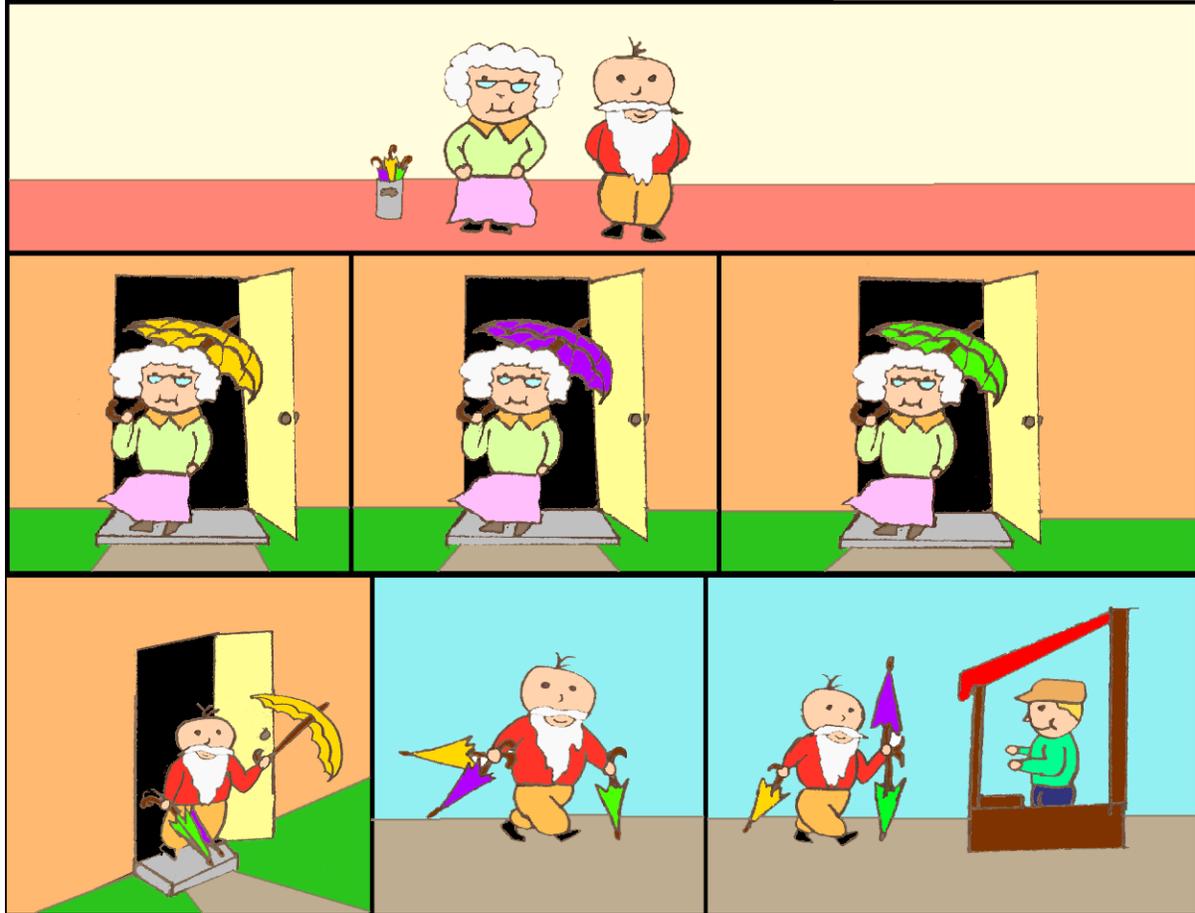


Figure 7: An example of a comic

where adults prefer a distributive interpretation.

Additional analysis in linear models also shows no significant difference. We used the response (coded as 'distributive' or 'collective') as the response variable. Age Group (child or adult) and Quantifier (*elk* or *ieder*) were used as factors. Note that all children are in one age group (child). We didn't find a significant effect for Quantifier. Table 1 shows the best fitting model and the model output.

As could be expected from graph, we did find a significant effect for Age Group. We did not find a significant interaction between Age Group and Quantifier.

In Summary, we found no significant difference between the quantifiers, but we did find a significant difference in the response between children and adults.

## 5 Discussion

Are *elk* and *ieder* the same? It seems to be the case. We hypothesized that the results would be similar to the results found by Novogrodsky et al. (2012) and Roeper et al. (2011), regarding the English words *each* and *every*. Although given how fast children acquire the adult interpretations in Van Koert et al. (2015), we thought that the differences might be smaller in Dutch. Yet we found no difference between the quantifiers, and large differences between children and adults. Dutch adults gave a very strong distributive preference. For the children, the interpretation preference seems to be collective but it is not a very strong preference. It is much closer to the 50% rate. It is unclear why the children seem to have a slight collective preference. It might be the case that for

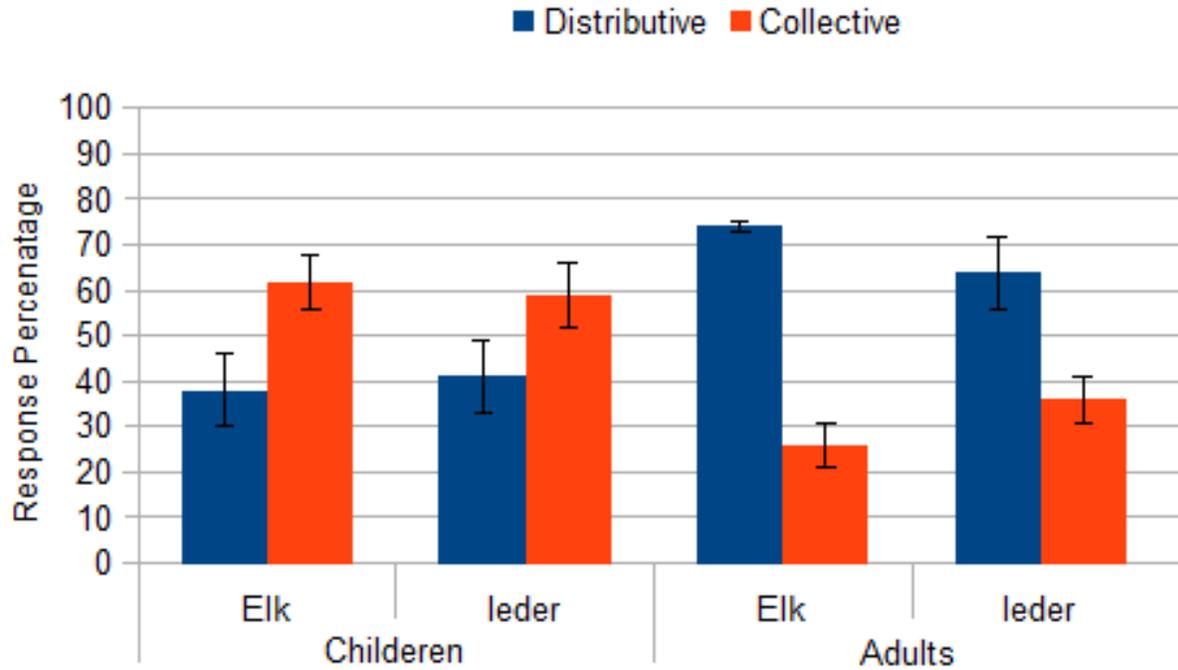


Figure 8: Results Response Percentages

Table 1: Response~Quantifier \* AgeGroup + (1+AgeGroup|ID) + (1|ID)

Predictor	SE	z-value	p-value
(Intercept)(Reference <i>Elke</i> )	0.3437	3.220	0.00128 **
Quantifier <i>Iedere</i>	0.3094	-1.552	0.12065
AgeGroup Child	0.4404	-3.906	9.4e-05 ***
Quantifier <i>Iedere</i> : AgeGroup Child	0.4320	1.568	0.11682

children the interpretation is ambiguous and that they acquire the distributive preference later, but you would have to have more participants to be sure. Bouwmeester (2016) tested 8 seven-year-olds, where we tested 19, and we got a much weaker collective preference in that age group. Therefore, the preference might be less apparent if we test more subjects.

The results for the Dutch language do show a distributive preference that is like the interpretation preference for the English word *each*. However, the difference that is seen between the English quantifiers, cannot be found in Dutch. The Dutch quantifiers *elk* and *ieder* have been researched on multiple occasions with the quantifiers in subject position and an interpretation difference was never found. Dotlačil (2010) found that there was no significant difference between the quantifiers and so did De Koster (2015). Even in this experiment, with the quantifiers in object position, adults and children treat both words the same. This is consistent with what Bouwmeester (2016) found. The adult preference is always distributive for both quantifiers. This means Dutch quantifiers *elk* and *ieder* both equally signal distributivity.

Due to the findings by Van Koert et al. (2015) we expected the children to give a distributive response, at least for *elk*, but this was not at all the case. The Children even gave a slight collective response. The only difference is that Van Koert et al. (2015) placed the quantifiers in subject position, where we put them in object position. Can we really attribute the difference found in child responses to the different position of the quantifiers? This study cannot say that.

Van Koert et al. (2015) suggested that a Dutch child can rely on syntactic cues in the input to discover that *elk* is distributive, because it can float and appear in partitive constructions. English children have to learn that *every* is distributive, even though it cannot float or appear in partitive constructions, and it can also appear in collective constructions, too. Examples (23) and (24) show how the Dutch *elk* allows partitive and floating constructions (Beghelli & Stowell, 1997; Broekhuis & den Dikken, 2012). The partitive and floating constructions are also possible with *ieder* (examples (25) and (26)). Examples (25) and (26) also show that *every* does not allow for partitive or floating constructions.

(23) Partitive construction:  
*Elk* van de meisjes aait een hond.  
Each of the girls pets a dog.

(24) Floating construction:  
De meisjes aaien *elk* een hond.  
The girls each pet a dog.

(25) Partitive construction:  
*Ieder* van de meisjes aait een hond.  
Every\* of the girls pets a dog.

(26) Floating construction:  
De meisjes aaien *ieder* een hond.  
The girls pets every\* a dog.

Partitive and floating constructions in Dutch signal clear distributivity. This can help a Dutch child learn that *elk* and *ieder* are distributive. Yet it seems that the cues disappear when the quantifiers are in object position. It is also unclear why children are unable to generalize the meaning of the quantifiers to distributive in both positions.

Another interesting thing turns up when comparing all the studies for the Dutch quantifiers is that the distributive response is much stronger whenever the quantifier is in subject position. Especially for children. Van Koert et al. (2015) showed that children as young as age 6 have a very strong distributive preference for *elk*. They already have acquired the adult interpretation. The results from De Koster (2015) and Van Koert et al. (2015) for the adults show a very strong distributive preference with the quantifier in subject position that is also there when the quantifier is in object position. However, even if this effect is still there when the quantifier is in object position, it is less apparent. The object position weakens the distributive response.

Even though it was still a long experiment for the children to sit through, they did express that they liked the cartoons a lot, so that indicates that they found it at least entertaining. Therefore distraction is less likely, since the cartoons were there to help them understand the story and stay with the task. They had something to look at as the story was told.

If the preference of the children was not based on the interpretation, due to distraction, misunderstanding of the stories, or memory limits, one would expect them to choose the distributive response. In the stories, the distributive action is salient. The largest portion of the story talks about the character that performs the distributive action, and this character is therefore expected to linger in the child’s memory, making it easier to tend towards the distributive response. Yet this did not happen.

This experiment was designed for children. Adults participated in the same experiment. To them, some stories, even though we revised them, might still seem a bit silly. Moreover, the task might be somewhat obvious to adults. This may have caused them to not take the task too seriously. However, our results are very similar to the results that Bouwmeester (2016) found. Especially given the changes that we made, it is unlikely that the adults failed to participate with a serious mindset in both experiments. It is also unlikely that adults randomly choose a response because they did not remember the story properly in our experiment, since the cartoons were there to help.

This was a forced choice experiment. If *elk* or *ieder* were ambiguous, one would expect the response for an ambiguous quantifier to be around 50% (the guess rate). This was not the case, since adults had a very clear distributive preference for both quantifiers.

Children sometimes seemed a bit scared to decide what they thought what the correct answer would be. Which would make sense if *elk* and *ieder* are the same. We would encourage children to make a decision, since there was no real correct answer anyway. Once they learned that it was fine to make a decision, children were very sure of their answers.

Then we can ask: Why does the Dutch language have both words? The Dutch Language is very similar to English. And since there are two quantifiers in Dutch that are like *each* and *every*, one would think that they are direct translations. However, it seems as though there can still be differences among words that are used for similar concepts. As the experiment shows: *elk* and *ieder* are not exact translations of the words *each* and *every*. Since the adults gave a clear distributive preference for both *elk* and *ieder*, you could say that they both translate to the English word *each*. Dutch does not seem to have a quantifier that matches the

ambiguous interpretations that adults give to the English *every*. In which case, Dutch does not seem to have a real translation for the English word *every*. Coming back to the question as to why Dutch has both words: a large database of Dutch grammar states that there is a grammatical difference. There is no official rule, but there is a tendency to use *elk* whenever you have to quantify over a non-person, and to use *ieder* whenever you have to quantify over a person (<http://ans.ruhosting.nl/e-ans//05/09/02/03/01/body.html>). This database is supported by the Radboud Universiteit and De Nederlandse Taalunie.

An interesting follow up study would be to compare Dutch and English native children as they perform actions. A possible task for them would be to pick up *each apple* or *every apple*, where Dutch children are asked to pick up *elke appel* or *iedere appel*. Experiments in English and Dutch can directly compare *each* and *every* or *elk* and *ieder* in object position versus subject position, to see if people interpret the words differently. One can also do experiments in the Frisian language, which is even more similar to the English. According to Frisian natives, Frisian has *elk* and *eltse*. Although, when translating, they say that both the Dutch *elk* and the Dutch *ieder* translate to the Frisian *elk*. It would also be very difficult to find enough participants, especially if they have to be native speakers. Further research could be looking at the non-person versus person difference, where participants (children and adults) are presented with a picture. They then have to choose between a sentence with *elk* or a sentence with *ieder* depending on what they think best fits the picture. This could be combined with collectivity and distributivity. You can also have more items per individual, since each item is much shorter than the stories used in our experiment.

## 6 Conclusion

In conclusion, we found that *elk* and *ieder* have the same quantifying properties. Adults interpret both quantifiers as distributive. Therefore, both quantifiers signal distributivity. However, these words are not exactly the same, due to the tendencies regarding persons and non-persons. This also means that *elk* and *ieder* are not direct translations of *each* and *every*. Both *elk* and *ieder* behave like the English *each*, when it comes to distributivity. Furthermore, we found

that the distributive response is weakened when the quantifier is in object position. For adults, the distributive response is much weaker when *elk* and *ieder* are in subject position. Also children unexpectedly don't show a distributive preference when the quantifier is in object position even though that preference is clearly there when the quantifier is in subject position. Finally, the improvements in the experiment ensured that all participants could understand the story and were able to concentrate on the task. This means that we can present the results with greater confidence.

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