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The quantificational asymmetry: A comparative look

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Abstract

The traditional account of the Delay of Principle B Effect (DPBE) predicts that all languages that show a DPBE will also reveal a Quantificational Asymmetry (QA). Children's performance on object-pronouns must therefore improve when a QP-subject replaces the NP-subject. These QA results have been obtained in English (modulo methodological differences), but none of the few Dutch studies reliably revealed this effect. We used similar materials to [Marinis and Chondrogianni \(2011\)](#) who used a test that induced both a DPBE and a QA in English; hence, we compared their results ($n = 33, 6;0-9;0$) to ours ($n = 29, 6;3-9;1$) on the same task. The comprehension experiment consists of bi-clausal sentences with Noun Phrase (NP) and Quantified Noun Phrase (QP) antecedents and object-pronouns and reflexives. Both Dutch and English children show a DPBE, i.e. they have problems with correctly interpreting object-pronouns, because they frequently accept interpretations in which the object-pronoun is co-identified with the NP-subject. However, only English children's performance reveals a QA, which the Dutch children do not show, as they perform similarly on NP and QP-subjects. Interestingly, a similar contrast is found for object-reflexives: where the English children's performance worsens when a QP-subject replaces the NP-subject, the Dutch children's scores are target-like on both subject types. These contrasts suggest that all children allow locally bound pronouns and reflexives (as suggested by [Spenader et al., 2009](#)) and that it is their quantifier reading preferences that determine how the object-pronoun or object-reflexive is understood. We hypothesize that these quantifier readings are language-specific: Dutch children prefer a distributive reading for QPs, which induces a bound pronoun interpretation; English children prefer a collective reading, which forbids a bound pronoun interpretation.

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1. Introduction

In the 1990s several studies showed that English-speaking children often incorrectly accept co-identification between object pronouns and local c-commanding referential Noun Phrase-antecedents (1). These same children correctly reject co-identification between object-pronouns and local c-commanding Quantified Noun Phrase-antecedents (2). The ameliorating effect of QP subjects is known as the Quantificational Asymmetry ([Elbourne, 2005](#)).

- (1) The boy_i scratched him_i. [incorrect acceptance]
(2) Every boy_i scratched him_i. [correct rejection]

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Explanations of the Quantificational Asymmetry predict that this phenomenon should be found in all languages in which children perform poorly on (1) (cf. Chien and Wexler, 1990). In the literature, several indications can be found that this prediction does not hold (for Russian: Avrutin and Wexler, 1992; for Dutch: Drozd and Koster, 1999), but until now a systematic comparison of the Quantificational Asymmetry in two different languages has not been made. In this paper we will do exactly that: we will present experimental evidence from Dutch children, who show a significantly different behaviour from English children tested in precisely the same way (Marinis and Chondrogianni, 2011) and we will discuss in detail the theoretical consequences of the apparent language-specific character of the Quantificational Asymmetry.

The paper is organized as follows: in Section 2, we report the main empirical findings with regard to the acquisition of reflexives and pronouns. The research questions are formulated in Section 3 and the present study is described together with its participants, method and procedures. Subsequently, in Section 4 the statistical results are presented. Then, in Section 5, we provide an account for these results by hypothesizing that children have preferred readings for universal quantifiers, with English children preferring a collective interpretation for *every* and Dutch children preferring a distributive interpretation for *elk(e)* ‘every’. These preferences explain the differences between these two learner groups. Section 6 concludes the paper and offers some suggestions on where these different preferences may come from.

2. Acquisition of the binding principles

Generally, object-reflexives show a different distribution from object-pronouns (cf. (3) and (4)) and their different behaviour is captured by the binding principles (Chomsky, 1981). Whereas Principle A states that reflexives must be bound by their local c-commanding antecedents, as in (3), Principle B states that pronominals cannot be bound by their local c-commanding antecedents, as in (4).

- (3) The hippo_i says the seahorse_j is washing himself_{i/j}
 (4) The hippo_i says that the seahorse_j is washing him_{i/*j/k}

In (3), the reflexive *himself* can only be bound by its local antecedent, *the seahorse*, but not by the subject of the matrix clause, *the hippo*. In (4), on the other hand, the pronoun *him* cannot be bound by its local antecedent, *the seahorse*, but can be co-identified with the subject in the matrix clause or with an antecedent outside of the sentence. The possible co-identification relations for *himself* and *him* are expressed by co-indexation.

In Section 2.1 we will look at the basic empirical results obtained in previous studies on the acquisition of binding. Subsequently, Section 2.2 will discuss the experiments that induced these findings.

2.1. Basic empirical findings

Language acquisition studies found two remarkable phenomena whilst investigating children’s comprehension of the binding principles: the delay of Principle B effect (DPBE) and the Quantificational Asymmetry (QA).

The term *DPBE* covers the finding that in some languages – such as English and Dutch – 4-year-olds perform well on Principle A conditions but that problems with Principle B persist until these children are 7 years old (cf. for English: Chien and Wexler, 1990; van der Lely and Stollwerck, 1997; Wexler and Chien, 1985; cf. for Dutch: Koster, 1993; Philip and Coopmans, 1996). For sentences such as (3), 4-year-olds correctly reject a non-local antecedent and correctly accept a local antecedent. For (4), children from 4 years onwards correctly accept a non-local antecedent and one occurring outside of the sentence; yet, rejecting the local antecedent for the pronoun is often problematic until they are 7. The acquisition of Principle B, in relation to Principle A, seems to be delayed by a few years, hence the coinage of the term DPBE. It refers to the errors children make on Principle B conditions, whilst at the same time performing correctly on Principle A. The standard explanation for the DPBE (cf. Chien and Wexler, 1990) is to assume that children do know Principle B but that they use semantics to override Principle B. Children, in contrast to adults, have the antecedent and pronoun accidentally refer to the same individual. This difference between Principles A and B in performance is not found for children acquiring Romance languages (cf. for French: Jakubowicz, 1989; for Spanish: Baauw, 2002), German (Ruigendijk et al., 2010), or Norwegian (Hestvik and Philip, 1999). In these languages, young children perform equally well on reflexives and pronouns, often scoring above 80% correct. This highlights the fact that the DPBE is a language-specific phenomenon that must be influenced by morpho-syntactic features of a particular language.

The QA is related to the DPBE, i.e. languages that show a DPBE are predicted to display a QA, too, see (1) and (2). The type of antecedent causes this asymmetry with respect to pronouns: whereas children incorrectly allow co-identification between the object-pronoun *him* and the NP subject, they disallow co-identification when the local subject is a QP. The QA appears in many studies on the acquisition of English (Chien and Wexler, 1990; van der Lely and Stollwerck, 1997; Marinis and Chondrogianni, 2011), so that it is a relatively robust finding for English. The QA follows from Chien and Wexler’s suggestion that children use semantics (accidental co-reference) to override Principle B. Since QPs cannot refer

to a unique referent, in contrast to object-pronouns (Baauw, 2002; Grodzinsky and Reinhart, 1993; Koster, 1993), children cannot use semantics (accidental co-reference) to override Principle B when the antecedent is a QP. If so, the quantifier conditions show more clearly than the referential conditions that children reject a local antecedent for pronouns and therefore must have knowledge of Principle B. The details of such an analysis, as well as its implications, will be discussed in Section 5.1.

This analysis predicts that the QA is part of the acquisition of any language displaying a DPBE. However, the QA is much less robustly attested in Dutch. Although Philip and Coopmans (1996) claim that they found an asymmetry, the difference was small and the percentages of correct rejection much lower than found in the studies on English (36% correct rejection for NP vs. 53% correct rejection for QP antecedents). It is questionable how representative this result is (Baauw, 2002; Elbourne, 2005; Hamann, 2011). Drozd and Koster (1999) tested 7-year-olds on a Picture Verification Task and found no asymmetry and again very poor results on the two mismatch conditions (18% correct rejection for NP antecedents vs. 21% correct rejection for QP antecedents). They concluded that the interpretation of quantifiers plays a role in QA findings; yet, their evidence could not reveal which factor in the interpretation was vital. Given these conflicting results, the status of a QA in the acquisition of Dutch is unclear. If among the DPBE-languages the QA turns out to be a language-specific phenomenon (and we will argue that it indeed is), it falsifies the standard account's prediction that a DPBE in a language automatically leads to a QA, thereby casting doubt on the correctness of this proposal.

To sum up, whilst the DPBE is considered to be a language-specific phenomenon – occurring in some languages, but not in others – the status of the QA is less clear. We therefore aim to make a more direct comparison between English and Dutch children by looking at results yielded by the same test.

2.2. Tests inducing a DPBE and QA

Test design has played a pivotal role in discussions on the acquisition of binding. There is much debate on this in the acquisition literature on binding, focusing on such factors as elicitation method, saliency of the referents and the discourse structure. All in all, each methodology has its merits and its drawbacks. In the following we discuss two contemporary methodologies before we explain our choice.

Although a number of tests have elicited the DPBE (see Elbourne, 2005; Conroy et al., 2009 for overviews and discussion), Spenader et al. (2009) show that in Dutch the DPBE disappears when the discourse is maximally transparent. They argue that ideally a pronoun refers to the active discourse topic. An example of such a discourse is given in (5) where *the crocodile* is the active discourse topic and the pronoun can therefore refer to it:

(5) This is the crocodile. The elephant is hitting him.

It is plausible, however, that the discourse set-up in (5) strongly biases co-identification with the non-local antecedent. If *him* does not refer to *the crocodile*, *the crocodile* would only be introduced but not be part of the event, which is pragmatically infelicitous. Co-identification between *the crocodile* and *him* would be a way of involving the former, so that each actor is included in the event. It might well be that this biasing discourse set-up leads children to correctly reject a mismatching sentence-picture pair but that it does not reveal children's knowledge about co-identification possibilities. Interestingly, when Spenader et al. included the introduction of *the elephant*, as in (6), they again found the classical DPBE results.

(6) This is the elephant. This is the crocodile. The elephant is hitting him.

Since both discourse set-ups in (5) and (6) are transparent, i.e. *the crocodile* is the active discourse topic when the child reaches the pronoun *him*, there should not be a difference regarding children's behaviour between (5) and (6). The fact that there is a difference seems to underpin the biasing effect of (5).

The QA in English is a disputed finding and it is elaborately discussed in Elbourne (2005), Conroy et al. (2009), and references in there. According to Conroy et al., the research methodology is flawed in many of the binding studies, because in conditions such as (1), reprised in (7), the non-local antecedent is not sufficiently salient in the context and in conditions such as (2), repeated in (8), the non-local antecedent is too salient in the story.

(7) The boy_i scratched him_i.

(8) Every boy_i scratched him_i.

This means that children incorrectly accept (7), because they cannot have *him* refer to any other character than the local subject. For (8) children interpret *him* as referring not to the local subject but to the protagonist, who is typically a highly prominent character; hence, they correctly reject (8). These critiques are mainly aimed at stories in truth value judgement

tasks, not at Picture Verification Tasks (PVT), in which children have to judge whether the picture matches the sentence, because these lack context. In fact, Elbourne points out that the absence of context in PVTs prevents the creation of a bias towards an interpretation involving the protagonist.

In their own study (Experiment 1), Conroy et al. used a truth value judgement task in which children heard stories that were simultaneously acted out by the experimenter about three dwarves and three Smurfs who, for example, had to get painted. The same story was used for the NP and QP conditions; thus, there was no difference between the contexts for (7) and (8). According to Conroy et al. their test comprised the ideal methodology, for there was no bias towards any character in their set-up. Since they found neither a DPBE nor a QA, they concluded that children essentially apply Principles A and B correctly. Yet, close scrutiny of their test materials reveals that no explicit reflexives were used in the stories, nor were there any test sentences probing the children's knowledge of reflexives. Moreover, the actions uttered in the stories were always disjoint (*I can paint you or Can you paint me?*) and expressed by the salient, disjoint pronouns: *I, me* and *you*. Together, these factors make it likely that the children in Conroy et al.'s study never fully activated reflexive actions. This may have created a significant bias against a non-reflexive interpretation of *him*, leading to apparent target-like behaviour. Since the DPBE essentially displays children's misunderstanding of pronouns as reflexives, a fair test should include both pronouns and reflexives, so that equal activation is guaranteed. Thus, we can tap into children's knowledge of pronouns and reflexives.

Overall it is unclear whether the criticisms raised against the PVT are warranted. In addition, it seems likely that the alternative tests proposed by Spender et al. and Conroy et al. contained biases themselves and that because of these biases no DPBE or QA showed up.

If our aim is to compare English and Dutch children on the DPBE and QA in a direct way, i.e. by using the same test, we need a picture-based methodology that is known to elicit these effects at least in English. One such test is the A-STOP-R test (van der Lely, 1997).¹ Using this test, Marinis and Chondrogianni (2011) recently obtained QA results with test sentences in which two plausible antecedents for the object-reflexives and object-pronouns are introduced. Conditions for NP and QP-antecedents were similar, as in (3) and (4) which are reprised in (9) and (10), so that there was no difference other than the use of the NP or QP.

- (9) The hippo_i says the seahorse_j is washing himself_{-i/j}
 (10) The hippo_i says that the seahorse_j is washing him_{i/*j/k}

Apart from the QA findings, Marinis and Chondrogianni found that children performed more poorly on mismatching sentences with QP-subjects and object-reflexives (11) than on NP-subjects and object-reflexives (9).

- (11) The hippo_i says every seahorse_j is washing himself_{-i/j}

They label this result the *inversed Quantificational Asymmetry*, because here the quantifier hinders rather than stimulates an adult-like interpretation. This finding was somewhat unexpected, as Principle A is assumed to be firmly in place in children; hence, they should show target-like behaviour on reflexives across all types of antecedents. Nevertheless, this inversed QA had been found by van der Lely and Stollwerck (1997) in an earlier study. In fact, Chien and Wexler's results show a similar pattern. Marinis and Chondrogianni, following Grimshaw and Rosen (1990), suggest that the result stems from "the complexity of constructing a distributive reading in combination with task effects". If this is the case, we expect the inversed QA to show up with Dutch children as well. As we will see, this is not borne out.

3. A replication study with Dutch-speaking children

The present study investigates the interpretation of pronouns and reflexives in object position in bi-clausal sentences in a group of Dutch monolingual children, who were age-matched to the English monolingual children from Marinis and Chondrogianni's (henceforth M&C) study. The overall question is whether the standard account, which directly links the DPBE to a QA, can be maintained. Hence, the questions addressed in this study are (i) whether on the same test the Dutch children show a similar DPBE to the English children documented in M&C, and (ii) whether the Dutch children, like the English children, show a QA on the same test. In addition, we want to know (iii) whether the Dutch children, like English children, show an inversed QA on the same task.

¹ Both Conroy et al. (2009) and Elbourne (2005) indicate that the pictures used in a PVT should not interfere with saliency, i.e. one character should not be displayed in a larger size than the other character(s) in the test materials, as was the case in Chien and Wexler's study (1990). This was a second reason for using the A-STOP-R test, as this bias is largely absent.

3.1. Participants

Twenty-nine typically developing Dutch monolingual children participated in the study and thirty-three typically developing English monolingual children participated in M&C's study. The two groups were matched as closely as possible on age. The Dutch children had a mean age of 7;0 (SD: 9 months; range: 6;3–9;1) and the English children had a mean age of 7;5 (SD: 9 months; range: 6;0–9;0).

The Dutch children attended schools in Volendam and Huizen. None of the children had any history of speech and/or language delay or impairment, and their parents were not concerned about their language development. All children understood the standard variety of Dutch that they were tested in.

All children were individually tested by two experimenters in a quiet room at school.

3.2. Material and procedures

The Dutch children were administered a Dutch translation – made by the authors – of the Advanced Syntactic Test of Pronominal Reference-Revised (A-STOP-R), the same test M&C used. The A-STOP-R is a sentence-picture verification task involving a yes/no judgement and consists of two practice and 96 test sentences.

There are two Dutch translation equivalents for the English quantifier *every*: *elk(e)* and *ieder(e)*. According to the literature, *elk(e)* and *ieder(e)* are synonymous in meaning (cf. Drozd and van Loosbroek, 2006; Philip, 2005; van der Ziel, 2008, 2011), but in production both children and adults prefer *elk(e)* to *ieder(e)* (Hendriks et al., 2012). Hence, in the A-STOP-R the English quantifier *every* was translated with the Dutch quantifier *elk(e)*.

The test sentences were bi-clausal containing a matrix clause with the verb *zeggen* 'say' and a subordinate clause with a finite action verb. Thus, there was an antecedent in the matrix clause for the pronoun to refer to; otherwise sentences would have been rejected for the wrong reasons. Two characters were introduced, one as the subject-NP of the matrix clause and one as the subject-NP of the subordinate clause. The object of the embedded clause was either a reflexive or a pronoun. Characters were only introduced in the test sentence itself and not separately beforehand.² The experimenter showed the picture first and then read out the sentence. Subsequently, the child answered *yes* or *no*, which was noted down on the score form by one of the experimenters. Occasionally, children requested a repetition of the sentence; in such a case, it was provided only once.

The test included twelve experimental and four control conditions with six sentences per condition. Four of the experimental conditions (Mismatch-Syntax) are beyond the scope of this paper. The control conditions were designed to test whether the children could determine the reference of reflexives and pronouns by matching semantic gender (mean accuracy > 84% for both groups). For half of the eight remaining experimental conditions the subject of the subordinate clause was a referential, definite NP, as in examples (12) and (14), and for the other half the subject was a QP, as in examples (13) and (15). The object-NP in the subordinate clause was either a reflexive, as in examples (12) and (13), or a pronoun, as in examples (14) and (15).

- | | | |
|------|---|---------------------------------------|
| (12) | Het paard zegt dat het konijn zichzelf krabt
'The horse says the rabbit is scratching himself'
(Reflexive Mismatch Referential NP condition) | [picture: rabbit scratching horse] |
| (13) | Het paard zegt dat elk konijn zichzelf krabt
'The horse says every rabbit is scratching himself'
(Reflexive Mismatch Quantificational NP condition) | [picture: 3 rabbits scratching horse] |
| (14) | De kangoeroe zegt dat het schaap hem krabt
'The kangaroo says the sheep is scratching him'
(Pronoun Mismatch Referential NP condition) | [picture: sheep scratching self] |
| (15) | De kangoeroe zegt dat elk schaap hem krabt
'The kangaroo says every sheep is scratching him'
(Pronoun Mismatch Quantificational NP condition) | [picture: 3 sheep scratching self] |

The picture matched the sentence (Match) in four experimental conditions, whereas in the other four conditions there was a mismatch between the picture and the sentence (Mismatch), as shown in (12)–(15). The A-STOP-R test sentences were randomized and presented in a set order.

² The animals in this test are personified (had beards, sported bows, used sponges to wash themselves); thus, the use of *him* and *himself*, rather than *it* and *itself*, is valid. Moreover, item analyses showed that there was no difference in performance between items with animal characters and reflexives or pronouns and items with human characters and reflexives or pronouns. In Dutch the pronouns *hem* 'him' and *haar* 'her' are the default forms to refer to animate referents (van Hout et al., 2011).

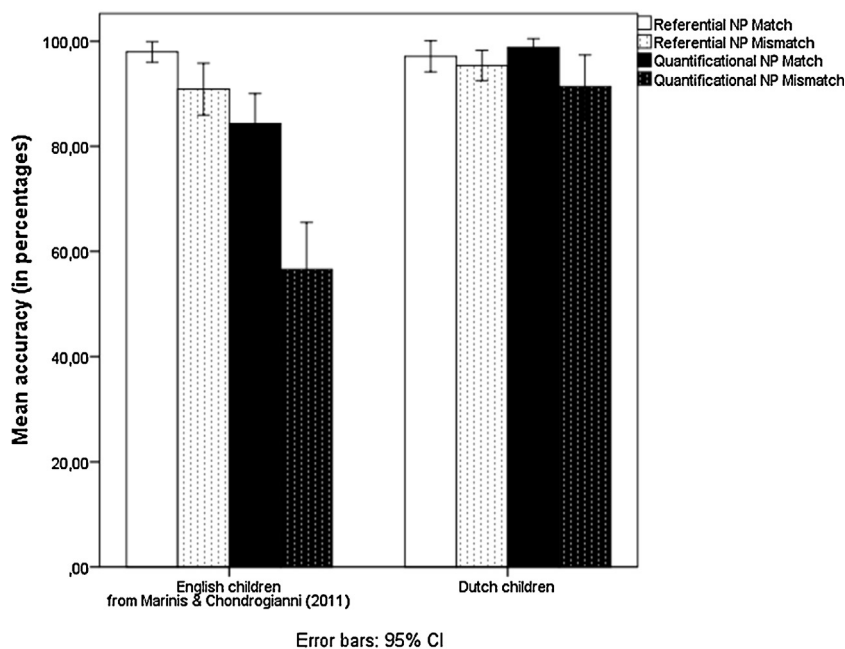


Fig. 1. Accuracy in percentages in the comprehension of reflexives. Please note that the percentages in this graph may appear higher than in the text: this is due to the co-variate Age which was included in the analyses but not in the graph.

4. Results

The children's performance on reflexives and pronouns was analyzed separately using repeated measures ANCOVAs with the between factor Language (English, Dutch), and the within factors NP type (referential, quantificational), and Matching (match, mismatch).³ Since the children's mean ages in both groups differed significantly ($F(1, 61) = 4.141$, $p = 0.046$), Age in Months was used as a covariate. It turned out that the covariate Age was significant in all analyses for all groups, meaning that the older children outperformed the younger children on all conditions in both groups. The main effects of and interactions with Age will not be further mentioned in detail. Interactions were followed up using pairwise comparisons with Bonferroni correction. One-sample t -tests were used to ascertain chance level performance.

Fig. 1 shows the Dutch and English children's performance in the interpretation of reflexives.

The ANCOVA revealed a main effect of Language ($F(1, 59) = 12.77$, $p = 0.001$, $\eta^2 = 0.18$), a main effect of NP type ($F(1, 59) = 11.81$, $p = 0.001$, $\eta^2 = 0.17$), a main effect of Matching ($F(2, 58) = 4.04$, $p = 0.023$, $\eta^2 = 0.12$), an interaction between Language and NP type ($F(1, 59) = 31.55$, $p < 0.001$, $\eta^2 = 0.35$), an interaction between Language and Matching ($F(2, 58) = 17.56$, $p < 0.001$, $\eta^2 = 0.38$), and an interaction between Language, NP type and Matching ($F(2, 58) = 16.11$, $p < 0.001$, $\eta^2 = 0.36$).

Since there was a main effect of and interactions with Language, the groups performed differently from each other in the interpretation of reflexives on all conditions. To trace the source of the interactions separate ANCOVAs were conducted for each group, again with Age in Months as a covariate. For the English children this resulted in a main effect of NP type ($F(1, 31) = 12.37$, $p = 0.001$, $\eta^2 = 0.29$). The main effect of NP type reflected better performance in sentences with NPs compared to sentences with QPs (mean accuracy: 89.1% vs. 75.6%; $p = 0.001$). Matching did not yield a main effect. One-sample t -tests showed chance performance in the quantificational NP-Mismatch condition: ($t(32) = 1.49$, $p > 0.14$).

The Dutch children showed a main effect of Matching ($F(2, 27) = 7.93$, $p = 0.001$, $\eta^2 = 0.23$). The main effect of Matching reflected better performance in the Match (mean accuracy: 98.0%) compared to the Mismatch condition (mean accuracy: 93.4%; $p = 0.031$). NP type did not yield a main effect meaning that the Dutch children did not differentiate between the NP and QP conditions. One sample t -tests showed no chance performance.

Fig. 2 shows the children's performance in the interpretation of pronouns.

³ The authors want to kindly thank Theo Marinis and Vicky Chondrogianni for sharing their English data with us.

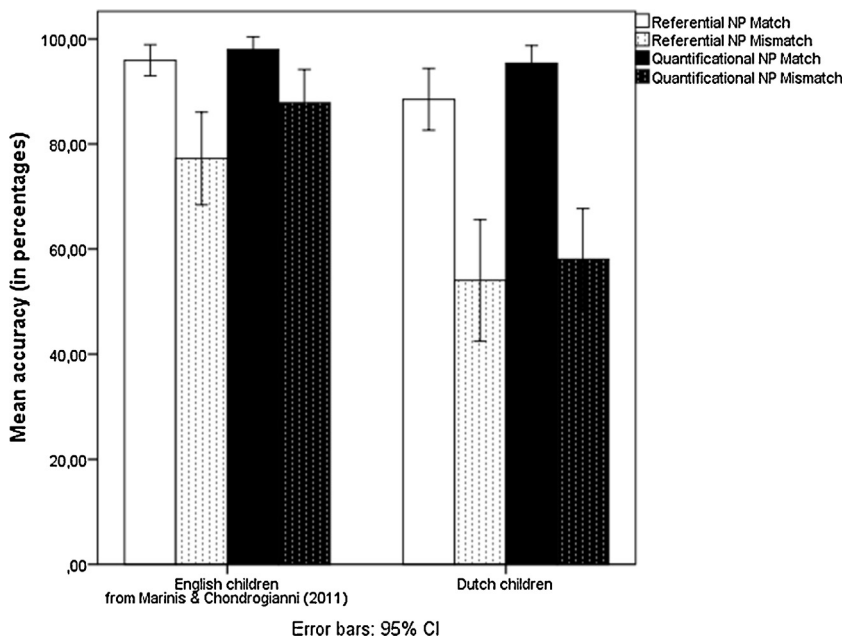


Fig. 2. Accuracy in percentages in the comprehension of pronouns. Please note that the percentages in this graph may appear higher than in the text: this is due to the co-variate Age which was included in the analyses but not in the graph.

The ANCOVAs revealed a main effect of Language ($F(1, 59) = 22.39, p < 0.001, \eta^2 = 0.28$), a main effect of Matching ($F(2, 58) = 15.43, p < 0.001, \eta^2 = 0.35$), and an interaction between Language and Matching ($F(2, 58) = 4.60, p = 0.014, \eta^2 = 0.14$). No main effects of or interactions with NP type were found.

Since the main effect of and the interaction with Language indicated that both groups performed differently on the pronouns, separate ANCOVAs were conducted for each group. In the English children this yielded a main effect of Matching ($F(2, 30) = 6.96, p = 0.003, \eta^2 = 0.32$). The main effect of Matching indicated better performance in the Match (mean accuracy: 97.0%) compared to the Mismatch condition (mean accuracy: 82.6%; $p < 0.001$). Although NP type did not generate a main effect – indicating that children scored similarly on NPs and QPs – pairwise comparisons showed a better performance in the QP condition compared to the NP condition (mean accuracy: 88.1% vs. 83.5%, $p = 0.047$).⁴ Moreover, a paired t -test comparing only the Mismatch NP-Pronouns and Mismatch QP-Pronouns showed a significant difference ($t(32) = -2.68, p = 0.006$), meaning that children understood mismatching QP-Pronouns better than mismatching NP/Pronouns (mean accuracy: 77.3% vs. 88.9%).⁵ One-sample t -tests showed no chance performance.

The separate ANCOVAs on the Dutch children revealed a main effect of Matching ($F(2, 54) = 7.95, p = 0.001, \eta^2 = 0.23$), revealing better performance in the Match (mean accuracy: 92.0%) compared to the Mismatch condition (mean accuracy: 56.0%; $p < 0.001$). The NP type condition did not yield a main effect, because the Dutch children performed similarly on sentences with NPs to those with QPs (mean accuracy: 67.8% vs. 69.7%, $p > 0.4$). Crucially, a paired t -test comparing only the Mismatch NP-Reflexives and Mismatch NP-Pronouns did not show a significant difference for the Dutch children ($t(28) = -0.89, p = 0.190$). One sample t -tests reflected chance performance in the NP-Mismatch condition ($t(28) = 0.71, p > 0.2$).⁶

5. Analysis

Looking at the mismatch conditions only to circumvent a yes-bias (McKee, 1992), our analysis and the comparison with M&C's English data leads to three generalizations that have to be accounted for: (i) both Dutch and English children show

⁴ It is unsurprising that the differences between the NP and QP conditions are so small, because English children are found to have overcome their Principle B errors by age 7 (Chien and Wexler, 1990; Verbuk and Roeper, 2010).

⁵ It is more informative to look at the Mismatch conditions, because "if people typically say yes when they do not know what to do, then we can be confident that when children do reject a meaning–utterance pair, it really is unacceptable to them." (McKee, 1992, pp. 33).

⁶ We also tested 14 adults (mean age: 39 years; range: 19–69), who hardly erred on the relevant conditions. The adults' mean accuracy on reflexives was 99.0% and on pronouns 98.8%.

a DPBE; (ii) English children scored significantly better on the QP-pronoun condition than Dutch children; and (iii) Dutch children scored significantly better on the QP-reflexive condition than the English children.⁷

In this section, we propose that the two differences between English and Dutch children, namely the ones on the QP-conditions, follow from the hypothesis that English and Dutch children have diverging preferences in their interpretation of the universal quantifiers used in the tests. Whereas English children prefer a collective reading for *every*, Dutch children prefer a distributive reading for *elk(e)* 'every'. In addition, we will show that this analysis of the QP-conditions has consequences for the analysis of the DPBE. In a nutshell, our analysis implies that an object pronoun, whether it is a reflexive or pronoun, can be interpreted as a locally bound variable. This assumption is difficult to incorporate in a binding theory that adopts Principles A and B (see Section 5.1), because the latter principle blocks such a co-identification relation. In a theory that dispenses with Principle B, such as the one proposed by [Spencer et al. \(2009\)](#), [Reuland \(2011\)](#) and [Rooryck and Vanden Wyngaerd \(2011\)](#), this assumption can be incorporated without any problem (Section 5.2). Hence, our hypothesis about distinct interpretive preferences for universal quantifiers, combined with a binding theory that disposes of Principle B, accounts for all the data.

5.1. A co-reference-based account of the QA

Chien & Wexler's account of the DPBE relies on the idea that children use a pragmatic way of establishing co-identification between the object pronoun and the local subject. The nature of this rule can be illustrated with the following context:

- (16) (You know what Mary, Sue and John have in common? Mary admires John, Sue admires *him*.) and *John* admires *him* too.
(example from [Heim \(1993, p. 216; emphasis in the original\)](#) derived from [Evans \(1980, p. 356\)](#))

In (16), there is a context in which *him* is felicitously co-identified with the local subject *John*. This shows that in principle co-reference is a rule that is part of the adult grammar but employed in very specific discourse circumstances (for details see, e.g.: [Baauw, 2002](#); [Baauw et al., 2011](#); [Grodzinsky and Reinhart, 1993](#); [Reinhart, 1986](#)). [Chien and Wexler \(1990\)](#) therefore argue that lack of pragmatic knowledge leads the children to overgeneralize the co-reference strategy, which in turn leads them to allow co-identification of an object pronoun and a local subject in general. It is perhaps more likely that the difficulty has to do with processing, because children have to compare two representations (one given by the syntax and one given by co-reference) and this creates a heavy burden on their processing capacity (cf. [Grodzinsky and Reinhart, 1993](#); [Baauw et al., 2011](#)), leading to the chance performance that has been documented ([Chien and Wexler, 1990](#); [Koster, 1993](#); [Philip and Coopmans, 1996](#); [Wexler and Chien, 1985](#)).⁸

The attractive property of this account is that it provides a handle on the QA, the fact that children seem to have more target-like interpretations when the local subject is a QP.

- (17) These are the bears_i; this is Goldilocks_j. Is every bear_i touching her_{i-j}?
([Chien and Wexler, 1990, p. 263](#))

According to Chien and Wexler the difference between a referential NP-antecedent, such as *the seahorse* in (4), and a QP-antecedent, such as *every bear* in (17), lies in the possibility of reference. An NP-antecedent refers to a fixed antecedent in the discourse. A QP, on the contrary, does not refer to a unique, fixed antecedent; hence, it cannot enter into co-reference with a pronoun. Only binding is possible if the QP is to serve as an antecedent for *her* but Principle B rules out syntactic binding of *her* by *every bear* in (17). Therefore, children correctly reject a picture in which every bear is scratching herself.

⁷ A fourth difference is that Dutch children score worse on the NP-pronoun condition than English children. This is in line with earlier findings showing that the DPBE is more prolonged in Dutch compared to English (cf. [Koster, 1993](#); [Philip and Coopmans, 1996](#)), perhaps of the three-way system that includes pronouns, SE-reflexives and SELF-reflexives. We will ignore this difference in the discussion, as the focus is on the relation between the DPBE (present in both languages) and the (inversed) QA.

⁸ Alternatively, [Rooryck and Vanden Wyngaerd \(2011\)](#) argue that the DPBE is due to morphological intransparency of the reflexive paradigm. The finding that the effect can be observed in Dutch but not in German (cf. [Ruigendijk et al., 2010, 2011](#)) can be related to the fact that the reflexive system in German is transparent (m-ich(-), d-ich(-), s-ich(-)) but not in Dutch (me(-), je(-), zich(-)). The singular reflexives in German are bimorphemic where the *m-*, *d-* and *s-* morphemes mark person and *-ich* marks singular, whilst in Dutch the *-ich* ending cannot be considered a productive pronominal morpheme. The consequence of this is that reflexives compete with pronouns at a much earlier stage in German, compared with Dutch, so that the DPBE is overcome at a much earlier stage, too. Although this is an interesting alternative to the pragmatic co-reference strategy, the proposal has little to say about the QA, nor about the acquisition differences between English and Dutch.

The problem with this analysis is that it does not account for the differences between the English and Dutch children. Firstly, it is unclear why Dutch children do not become more target-like when the local subject is a QP rather than an NP. After all, the same co-reference strategy that they employ with NP antecedents should be blocked by QP antecedents. Secondly, it remains unclear why the QP-reflexive condition causes problems for the English children: if the reflexive condition is easier than the pronoun condition, and QPs supposedly lead to more target-like behaviour, the QP-reflexive condition should be relatively simple. One could argue that an additional factor is at stake (perhaps of a methodological nature, cf. [Marinis and Chondrogianni, 2011](#)), but then the next question is why Dutch children have no problems with this condition.

5.2. An alternative analysis

Instead of focusing on the QA in English, we take as a starting point its absence in Dutch. The fact that in the QP-pronoun condition Dutch children incorrectly accept a picture in which three sheep are scratching themselves strongly suggests that they allow a bound variable interpretation of the pronoun: for each sheep it is the case that this sheep is scratching itself. This reading is only possible if we make two assumptions: (i) the QP must receive a distributive interpretation, and (ii) the child's grammar allows local binding of a pronoun. We will deal with these assumptions in turn. First, we focus on the difference between collective and distributive readings for universal quantifiers and show their relevance for the issues at hand. Then we turn to the assumption that the child's grammar allows locally bound pronouns and show how this assumption meets recent developments in binding theory. We finally show how these two ingredients derive all the data.

Universal quantifiers have two readings, a collective one and a distributive one. This difference can be clearly illustrated with the use of *all* and *each*. Example (18a) with *all* receives a collective reading, as it involves one single event in which all the individual characters participate.⁹ Note that due to the collective interpretation of the quantifier, a singular pronoun has a unique referent. Example (18b) describes a situation with a single piano:

- (18) a. All men are carrying a piano upstairs.
(example from [van der Ziel, 2011](#), p. 99)
- b. All men are carrying his piano.

Example (19a) with *each*, on the other hand, receives a distributive reading, in which there is a pairing of each individual with an event, thereby creating an unlikely situation in which there are several men who are each, on their own, carrying a piano upstairs ([van der Ziel, 2011](#)). Here, a singular pronoun can receive a distributive interpretation. Example (19b) can describe a situation with multiple pianos.

- (19) a. Each man is carrying a piano upstairs.
b. Each man is carrying his piano upstairs.

Let us now turn to the quantifiers used in the experiments (*every* for English and *elk(e)* 'every' for Dutch). These have both readings in the adult grammars, which means that they are ambiguous between a collective and distributive reading (cf. for English: [Novogrodsky et al., 2012](#); [Tunstall, 1998](#), for Dutch inter alia: [Hendriks et al., 2012](#); [Philip, 2005](#); [van der Ziel, 2011](#); [Zwart, 2011](#)). Suppose that both readings are not equally available to English and Dutch children and that, in fact, they have distinct preferences: English children prefer a collective reading, whereas Dutch children prefer a distributive one. We call this the Collective Distributive Preference Hypothesis (henceforth CDPH). We explicitly call this a preference because neither English nor Dutch children categorically reject or accept sentences in the quantifier conditions. Both groups have two representations for the quantifier but the probability that the distributive interpretation is used is higher for Dutch children, whereas the probability of using the collective interpretation is higher for English children.

The CDPH provides a handle on the differences between the two learner groups. The non-target-like behaviour of the Dutch children on the QP-pronoun condition suggests that the distributive reading is prominently available for them. The fact that, in contrast, English children more readily reject a mismatching picture in the QP-pronoun condition then follows

⁹ There are two types of collective readings. [van der Ziel \(2011\)](#) distinguishes a collective-action, which is described here, from a collective-responsibility, in which not all of the individuals in a group may necessarily have the property that the group as a whole possesses. For example, (18a) can be a description of a scene in which one of the men might be holding the door open, whilst another is shouting which way the carriers should go, and only two men are doing carrying. Only collective-action readings are concerned here and those will be referred to as collective readings for the sake of simplicity.

from the assumption that English children prefer a collective rather than a distributive reading. In that event, the object pronoun cannot be interpreted as a variable bound by the local QP. Hence, the fact that we observe a QA in English but not in Dutch is a consequence of different interpretive preferences for the universal quantifiers.

Before we expand this account, and consider each condition, we need to address the second assumption. If Dutch children allow an object pronoun to be locally bound, one might conclude that they still lack knowledge of Principle B, in contrast to English children. This, however, would amount to postulating two differences between English and Dutch children: one referring to the preferred interpretation of universal quantifiers, the other to the presence or absence of Principle B. In the NP-pronoun condition, then, co-identification between the object pronoun and the local NP would have different sources: lack of knowledge of Principle B for the Dutch children and a co-reference strategy overriding Principle B for the English children. We would like to propose a simpler analysis instead, in which the collective-distributive preference distinction is the main difference between the two learner groups and in which their grammars are similar in all relevant respects. Hence, English and Dutch children alike allow local binding of the pronoun. We do not take this to mean that both groups lack knowledge of Principle B, but rather that we need to couch our analysis in a theory that allows local binding of pronouns more generally. This squares well with recent advances in binding theory that have downplayed the overall role of Principle B in the syntax (Spencer et al., 2009; Reuland, 2011; Rooryck and Vanden Wyngaerd, 2011). In the rest of this section, we present one of these proposals (by Spencer et al., 2009), sufficient for the present purposes, and then show how the data can be made to follow from the quantifier distinction. Such an analysis makes the co-reference strategy overriding the syntax (as employed in the competing analysis, see Section 5.1) redundant.

Instead of assuming that reflexives and pronouns are handled by distinct syntactic principles, Principles A and B, it is possible to assume that reflexives and pronouns are treated the same by the syntax. If so, they can both be bound by a local antecedent. The fact that we nevertheless observe a complementary distribution between reflexives and pronouns must then be ascribed to something else. Spencer et al. argue for a pragmatic blocking principle that forbids the use of a pronoun in those contexts where a reflexive could also have been used instead. Reflexives are the dedicated elements to express reflexive relations and pronouns consequently occur elsewhere. Hence, reflexives and pronouns are treated differently by the pragmatics but not by the syntax and semantics. Therefore, nothing syntactic or semantic rules out co-identification of the subject and object referent in a sentence like *John loves him*. Such co-identification is only blocked in the pragmatics. Another consequence is that a pronoun can always function as a bound variable under the scope of a local quantifier. As such, *everybody loves him* is semantically ambiguous and can have a bound and a non-bound reading for the pronoun (cf. Heim, 2008; Heim and Kratzer, 2009). Under the first interpretation, it is indistinguishable from the interpretation of a reflexive in the same context. The pragmatic principle, however, will block the bound interpretation, as it will again favour the use of a reflexive to express a reflexive relation.

In the next section, we revisit all conditions to show how they can be derived.

5.3. Deriving the data

We have seen that Principle A together with a pragmatic blocking principle provides a correct characterization of readings that adults have for reflexives and pronouns, both in contexts with and without a quantifier. The question then is in what respect children differ from adults. Two empirical findings need to be explained: (i) both English and Dutch children show a DPBE in non-quantificational (NP-pronoun) contexts and (ii) the two learner groups behave differently in the QP-reflexive and QP-pronoun conditions. To account for (i), we adopt Spencer et al.'s (2009) proposal. To account for (ii), the interpretation of the quantifier becomes important. We discuss each in turn.

Let us start with the similarity. On the NP-pronoun condition both Dutch and English children display a DPBE. Spencer et al. (2009) note, however, that this effect only shows up in comprehension. They account for this as follows. Children have knowledge of the blocking principle and know that they should not produce a pronoun wherever a reflexive is possible; hence, in production children do not show a DPBE. In comprehension, however, children must make an additional reasoning step by realizing that the speaker uttering a pronoun does not express a reflexive relation; otherwise (s)he would have used a reflexive. This is where the problem lies. Children have to place themselves in the mind of the speaker and ascribe to the speaker the same blocking principle. Children until age 7 are not completely successful in taking the speaker's perspective into account, and this has consequences for their interpretation of (20):

(20) The kangaroo says that the sheep is scratching him.

Since the blocking principle does not filter out the reflexive interpretation in sentence comprehension, children will incorrectly accept (20) as a description of a picture in which a sheep is scratching himself.

Let us now turn to the quantifier conditions and implement the CDPH. We start with the QP-pronoun condition. Here, children have to judge whether the sentences in (21) are correct descriptions of a picture in which three sheep are scratching themselves.

- (21) a. The kangaroo says that every sheep is scratching him.
 b. De kangoeroe zegt dat elk schaap hem krabt.

The Dutch children performed as poorly on (21b) as on the NP-pronoun condition, whereas the English children scored significantly more target-like on (21a) than on the NP-pronoun condition. This means that English children more readily reject an interpretation in which each sheep scratches itself. This follows from the CDPH. If Dutch children have a preference for a distributive reading of *elk(e)* 'every', the object pronoun *hem* 'him' can be interpreted as a variable bound by the local QP. Neither the syntax nor the semantics blocks this interpretation, and the pragmatic blocking principle that would filter it out is not yet functioning properly in children's sentence comprehension. Hence, the sentence in (21b) gets a reflexive reading that matches the picture, resulting in a low rejection rate.¹⁰ English children, on the other hand, prefer a collective reading for the quantifier *every*. Although their grammar does not forbid them to interpret *him* as a locally bound variable in principle, the preference for a collective reading now does, as only a distributive interpretation allows a bound variable reading for *him*. The result is that English children will reject (21a) as a description of a picture in which the sheep are scratching themselves at a relatively high rate. The CDPH predicts that English children reject co-identification between the QP and the object pronoun, whilst Dutch children accept co-identification. This captures the finding that English children score more target-like on the QP-pronoun condition than Dutch children.¹¹

Let us now turn to the QP-reflexive condition. Here, children had to judge whether the sentences in (22) correctly described a picture in which the sheep are scratching the kangaroo.

- (22) a. The kangaroo says that every sheep is scratching himself.
 b. De kangoeroe zegt dat elk schaap zichzelf krabt.

The English children performed poorly on this condition, as in [Chien and Wexler's \(1990\)](#) study, failing to reject a non-reflexive interpretation for *himself*. The Dutch children, however, performed at ceiling and rejected a non-reflexive reading. If the Dutch children, in compliance with the CDPH, prefer a distributive reading of the quantifier *elk(e)* 'every', a bound variable interpretation is straightforward. As a result, a picture in which all sheep scratch the kangaroo is correctly rejected. English children, in contrast, prefer a collective reading, so that variable binding by the local QP is not possible. As a consequence, the local subject is not a felicitous antecedent for the reflexive. Now, in the mismatch condition three sheep are scratching the kangaroo. Since the QP subject is not a felicitous antecedent and since *himself* is a reflexive, the expectation is that English children reject the mismatching sentence–picture pair. However, this is not what they do: they accept it. This means that they must have an interpretation in which the subject of the matrix clause and *himself* are co-identified. But how is that possible? Note that *himself* is polysemous, as it can function as a reflexive but it can also be interpreted as an intensifier consisting of the pronoun *him* in combination with a focus marker *self*. When children interpret *himself* as an intensifier, they can establish co-identification with the long-distant antecedent, in this case *the kangaroo*. Since this interpretation matches the picture, English children will reject the mismatching sentence–picture pair at a relatively low rate. Note that this is contrary to what happens in the NP Mismatch condition where children correctly reject the mismatching sentence–picture pair. In this condition, local binding is straightforward and it leads to an interpretation that does not match the picture. The QP-reflexive is different, because the local antecedent is not a possible referent. Since *himself* needs to refer to something, children opt for the intensifier reading of *himself*. Thus, in both cases children are able to find a grammatical antecedent for *himself* yet leading to different judgments. Hence, children do not choose the intensifier interpretation because they want to say yes (i.e. it is not a yes-bias in that sense) but because *himself* needs a grammatical antecedent.¹²

¹⁰ An anonymous reviewer wonders if this does not predict that Dutch children should reject (21b) in the match condition, in which the picture shows one and not multiple kangaroos being scratched. The answer is *no*. If three sheep scratch one kangaroo, this can be construed as a collective scratching event but also as three scratching events on one individual. This counts as distributive (see [van der Ziel, 2011](#) for discussion). So the picture is simply ambiguous in that case. Note that the scratching example is different from the piano carrying example in (19). When three men are carrying a piano, there are no three piano-carrying events but one, which constitutes a collective event.

¹¹ An anonymous reviewer points out that there are contexts in which English children can easily have a distributive reading, such as those in (i):

- (i) Every sheep ate an apple /bit the farmer/is wearing a hat/is white.

We also believe that such contexts will activate the distributive interpretation. If so, the reviewer wonders, why does the context in (22a) not trigger a distributive reading? What makes (22a) different from (i) is that in (22a) the preferred collective reading can simply be maintained by letting *him* refer to the kangaroo, which leads to a rejection of the sentence–picture pair. This possibility of maintaining the collective reading is absent in (i).

¹² As pointed out by an anonymous reviewer, the adult grammar does not allow an intensifier interpretation of *himself* when *himself* functions as an argument, as in the test sentences. It must be the case, then, that English children at the relevant acquisition stage have not acquired this yet and allow argumental *himself* to obtain an intensifier interpretation. We know that children produce the intensifier meaning of *himself* before they use the reflexive meaning ([Gülzow, 2006](#)), which may well imply that the latter meaning is more entrenched.

Note that if English children have a preference for a collective reading for the QP, we predict that the QP cannot function as an antecedent for the reflexive in the matching sentence–picture pair either (with all the sheep scratching themselves). Although the yes-bias obviously inflates the target performance here, we nevertheless found a significant difference between the English and Dutch children on this condition (mean accuracy: 84.3% vs. 98.9%; $p < 0.001$).

To sum up, under the assumption that Principle B is not an independent principle of the syntax and pragmatics blocks the use of pronouns in contexts where a reflexive is appropriate, reflexives and pronouns can in principle be co-identified with a local subject, giving rise to a DPBE in non-quantificational conditions. The two differences between the English and Dutch children can be made to follow from a single distinction, as expressed by the CDPH.¹³ Note that we specifically call it a preference. We assume that for both child populations the universal quantifiers in principle allow both interpretations. Hence, we do not find 100% versus 0% scores but gradience.

If this analysis is on the right track, it sheds a different light on how the grammars of children and adults diverge. In Chien and Wexler's analysis, both adults and children have access to Principles A and B and therefore know that reflexives and pronouns are in complementary distribution. It is only in the NP-pronoun condition that a co-reference strategy interferes with Principle B. In the alternative analysis, children can establish a co-identification relation between a reflexive or pronoun and a local subject antecedent since the pragmatic principle responsible for the complementary distribution of reflexives and pronouns is not functioning properly in comprehension. This relation is only blocked in the QP-pronoun condition in English due to the collective preference for the quantifier. It is, therefore, the interpretation of this quantifier that leads to the apparent target behaviour of English children on this condition, and it is crucially not the knowledge that pronouns and reflexives are in complementary distribution. If this is so, the QP-pronoun condition reveals little about children's understanding of the complementary syntax of pronouns and reflexives.

6. Conclusion

Like the delay of Principle B effect, the Quantificational Asymmetry is a language-specific phenomenon. Within the group of languages displaying the DPBE, only a subset shows the QA: English does, Dutch does not. In addition, English children struggle on the QP-reflexive condition, whereas Dutch children have no problems here.

We argued that the two differences between the English and Dutch children call for a reinterpretation of the QA. The fact that QPs lead to a better performance on the interpretation of pronouns has been interpreted as showing that children have knowledge of Principle B, because it is exactly in this context that co-reference is excluded and children must rely on their syntactic knowledge. We argued that the better performance of English children on this QP-pronoun condition is a consequence of a preference for a collective interpretation of *every*. This interpretation blocks the interpretation of an object pronoun as a bound variable, which leads children to reject co-identification between the pronoun and the QP subject. The same ingredient accounts for the fact that the QP-reflexive condition is more difficult for English children than for Dutch children. If there is no preference for a collective interpretation of the universal quantifier, which we argued is the case for Dutch children with *elk(e)* 'every', the QA disappears.

The proposed analysis of course raises a question about what is behind the Collective Distributive Preference Hypothesis. Why would Dutch children have a preference for the distributive reading, and English children for a collective reading? Although a detailed answer to this is a topic for further research, there are two factors that could play a role.

Firstly, the preferential differences could already be present in the input. It is well known that Dutch is a scope-rigid language, which means that a sentence of the type *Every man owns a car* only receives the interpretation provided by the surface order: for each man it is the case that this man owns a car. The inverse scope interpretation, with the indefinite subject scoping over the quantifier, is generally unavailable in Dutch, whereas it is a possible (though disfavoured) reading in English (van der Ziel, 2011). Although this difference can be related to the strong preference in Dutch children for the distributive reading – when the quantifier appears in subject position it always scopes over the indefinite object in Dutch – it does not immediately explain the preference for the collective reading in English children.

Secondly, English has a dedicated universal quantifier for expressing a distributive reading, namely *each*, but Dutch lacks such a quantifier (both *ieder(e)* and *elk(e)* 'every' are ambiguous). Novogrodsky et al. (2012) hypothesize that English children start out with an underspecified interpretation of *each* and *every*, so that both quantifiers can receive a distributive or collective reading. As children aged 5;6–7;0 begin to grasp the distributive interpretation for *each*, their

¹³ In Drozd and van Loosbroek (2006), Dutch children performed worse on the collective context (three boys riding one elephant, two elephants – without anyone on them – next to it) than on the distributive context (four elephants, three of them each have a boy on them and one is riderless). Test sentences included *ieder(e)* ('each/every') and *alle* ('all'). Brooks and Sekerina (2006) showed in their Experiment 1 that English children performed better on collective contexts (three men washing one bear or one man washing three bears, with either two bears or two men in the background) than on distributive contexts (three men each washing a bear, with either two men or two bears in the background). Admittedly, the distributive contexts were only tested with *each* and *every*, whereas the collective contexts were tested with *all*. Still, we feel that these results are in line with the CDPH.

collective answers to *every* increases simultaneously, and they prefer to give a collective interpretation to *every* (Novogrodsky et al., 2012). Further research needs to determine whether this preference for a collective reading is maintained in tasks that do not directly compare *each* and *every*.¹⁴ Moreover, the quantifier reading preferences in general for Dutch and English adults as well as for Dutch and English children need to be further investigated.

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¹⁴ Van Koert et al. (in preparation) ran a picture selection task in which both Dutch and American-English children ($n = 150$, 5;0–9;0) had to choose between a picture containing a stereotypical distributive situation (a one-to-one pairing) and a picture showing a more collective situation (three-to-one) upon hearing a sentence such as: "All/every/each crocodile are/is tickling a dog". The results reveal that Dutch children choose the distributive picture significantly more frequently for all three quantifiers than the English children. English children show a three-way distinction in which *each* receives significantly more distributive readings than *every* and *every* receives significantly more distributive readings than *all*.

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