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Four- to five-year-olds' use of word order and prosody in focus marking in Dutch

Abstract: This study investigated Dutch-speaking four- to five-year-olds' use of word order and prosody in distinguishing focus types (broad focus, narrow focus, and contrastive narrow focus) via an interactive answer-reconstruction game. We have found an overall preference for the unmarked word order SVO and no evidence for the use of OVS to distinguish focus types. But the children used pitch and duration in the subject-nouns to distinguish focus types in SVO sentences. These findings show that Dutch-speaking four- to five-year-olds differ from their German- and Finnish-speaking peers, who show evidence of varying choice of word order to mark specific focus types, and use prosody to distinguish focus types in subject and object nouns in both SVO and OVS sentences. These comparisons suggest that typological differences in the relative importance between word order and prosody can lead to differences in children's use of word order and prosody in unmarked and marked word orders. A more equal role of word order and prosody in the ambient language can stimulate more extensive use of prosody in the marked word order, whereas a more limited role of word order can restrict the use of prosody in the unmarked word order.

Keywords: information structure; Dutch-speaking children; word order; prosody; focus.

1 Introduction

The linguistic realisation of focus in Dutch-speaking children has received substantial attention in recent years. Focus is an information structural category that signals the presence of alternatives in the discourse context and typically contains new information to the receiver (Lambrecht 1994; Vallduví and Engdahl 1996). Existing work is primarily concerned with children's use of phonological and phonetic means in realising narrow focus (i.e. focus on a single content word of a syntactic phrase) in different sentence-positions in SVO sentences, compared to non-focus (e.g. Chen 2009, Chen 2010, Chen 2011a, Chen 2011b; Romøren and Chen 2014). Phonological means are defined as coarse-grained prosodic changes, including accent placement - accenting or not accenting a word, and choice of accent type, e.g., accenting a word with a falling pitch accent or a high-level pitch accent. Phonological means are crucial to the distinction between narrow focus and post-focus, i.e. non-focal constituents following the focal constituent. Phonetic means are defined as fine-grained prosodic changes within a phonological category, also known as phonetic implementation of a phonological category, e.g. changes in pitch span (i.e. the difference between the highest and lowest pitch) of a pitch accent. They are crucial to the distinction between narrow focus and pre-focus, i.e. non-focal constituents preceding the focal constituent. It has been found that Dutch-speaking children become largely adult-like in the use of phonological means to distinguish narrow focus from non-focus by the age of seven or eight but still develop their use of phonetic means at this age. For example, Chen (2009) showed that although both children and adults accent the subject nouns with a falling accent regardless of focus conditions, adults realise the falling accent with a larger pitch span and longer duration in narrow focus than in pre-focus and children only use pitch span in an adult-like way at seven or eight, but not duration.

However, narrow focus is only one type of focus. The focus constituent can also be a complete syntactic constituent (e.g. a phrase, a clause, a sentence) as in (1). This type of focus is known as broad focus (Ladd

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1980). Focus can also contain contrastive information, e.g. a correction or an alternative to what has been introduced previously. It can be either "broad" or "narrow" in terms of the size of the focal constituent, as in (1) and (2). Different types of focus are distinguished mainly via phonetic uses of prosody but can be distinguished in some cases via word order in Dutch. Regarding prosody, Hanssen et al. (2008) found that sentence-medial focused words in declarative sentences were spoken with a longer stressed syllable, an earlier peak, and a steeper fall in contrastive narrow focus (hereafter contrastive focus) and narrow focus than in broad focus. But no clear difference was found in the realisation of contrastive focus and narrow focus. Regarding word order, a focal constituent can be moved to the position immediately preceding the finite verb (i.e. the prefield), regardless of whether it is contrastive or not. The OVS word order can thus be used when the object is in narrow focus or contrastive focus. Further, a non-subject contrastive topic can also occur in the prefield (Bouma 2008). This suggests that OVS can be used when the object is a contrastive topic. However, fronting an object to the prefield is not common in Dutch. For example, Bouma (2008) examined V2-clauses (N = 71,934) available in the Spoken Dutch Corpus (Oostdijk 2000) and found that among the 70,458 prefield occupants distributed over 69,917 V2-clauses, 70% of them are subjects, 14.3% direct objects, and 4.5% indirect objects. For all the three grammar categories, the most common linguistic form is nominal phrases (>90%). In order to obtain a more comprehensive picture of children's focus marking in Dutch, we have examined for the first time how Dutch-speaking four- to five-year-olds use word order and prosody in the marking of focus types.

(1) Speaker A: What happened?
     Speaker B: [Uncle Paul rented a boat]. (broad focus)
     Speaker C: No. [Aunt Mary bought a horse]. (contrastive broad focus)

(2) Speaker A: Did Uncle Paul rent a car?
     Speaker B: (No.) Uncle Paul rented [a boat]. (contrastive narrow focus on object)

Recently, Sauermann et al. (2011) and Arnhold et al. (2016) have addressed similar questions in German- and Finnish-speaking children. Like Dutch, German uses prosody, and to a lesser degree, word order to distinguish focus types (Féry 2006; Baumann et al. 2007). The prefield can be filled by both a contrastive focal object and an object in broad focus in OVS sentences in German; fronting a focal object to the prefield is relatively common in German (Féry 2006; Frey 2006). Word order plays a much bigger role in focus marking in Finnish than in Dutch and German (Vilkuna 1995). The constituent in the prefield conveys topical information; the constituent preceding the prefield conveys contrastive topical or focal information. Non-contrastive focal information appears in sentence-final position. For example, while unmarked SVO can occur in different focus conditions, OVS is felicitous only if the subject is in non-contrastive narrow focus. Prosody is used for focus-marking in tandem with word order in Finnish. For example, a broad-focus sentence is typically spoken with a fall-rise pitch accent in all content words but finite verbs. But a focal word is spoken with a larger pitch span, a longer duration, and higher intensity in narrow focus than in broad focus. Typologically, Dutch, German and Finnish form a continuum of relative importance between word order and prosody in focus marking: Dutch (word order $<<$ prosody), German (word order $<$ prosody), Finnish (word order $\approx$ prosody). Findings from German- and Finnish-speaking children may thus be predictive of Dutch children's use of word order and prosody in distinguishing different focus types.

Sauermann et al. (2011) and Arnhold et al. (2016) used an answer-reconstruction game to elicit, from four- to five-year-olds, SVO and OVS sentences in different focus conditions: broad focus (BF), narrow focus (NF) on subject and object, and contrastive focus (CF) on subject and object. In the game, children watched a robot answering the experimenter's questions on a number of pictures. The robot's answers lacked sentence-level prosody and had either SVO or OVS word order, which might or might not be contextually appropriate. Children were asked to reconstruct the robot's answers in a way that they found acceptable in order to show the robot how to speak properly. It has been found that in both German and Finnish, the children almost always retained SVO regardless of focus conditions when SVO was used in the robot's speech, indicating a strong preference for SVO, but they varied their choice of word order in different focus conditions when OVS was used in the robot's speech (Table 1). The German-speaking children were more likely to use OVS than SVO in

Table 1: German- and Finnish-speaking four- to five-year-olds' use of word order in different focus conditions (broad focus – BF, narrow focus – NF, contrastive focus – CF) as reported in Sauermann et al. (2011) and Arnhold et al. (2016) respectively.

Word order received	SVO	OVS
German-speaking children	Almost always SVO regardless of focus conditions	Likelihood of OVS, relative to SVO: BF>CF/NF CF>NF NF/CF-obj>NF/CF-sub
Finnish-speaking children	Almost always SVO regardless of focus conditions	Likelihood of OVS, relative to SVO: BF>CF-object

The '<' and '>' signs mean 'smaller or bigger than' respectively regarding the likelihood of OVS. The abbreviations 'sub' and 'obj' stand for 'subject' and 'object' respectively. For example, 'NF/CF-sub' refers to the focus conditions NF-subject and CF-subject.

BF than in CF and NF, in CF than in NF, and in focus-object than in focus-subject; the Finnish-speaking children were more likely to use OVS than SVO in BF than in CF-object. The German-speaking children's frequent use of OVS in BF and more frequent use of OVS in CF than in NF and in object-focus than in subject-focus largely conforms to the fact that the prefield can be filled by both a contrastive focal object and an object as part of broad focus in German. The Finnish-speaking children's more frequent switch from OVS to SVO in the CF-object condition would seem to suggest that they have not acquired the use of the sentence-initial position for marking contrast at first sight. But OVS is infelicitous in the CF-object condition, because the non-focal subject should appear in the prefield. Changing OVS to SVO, which is felicitous in all the focus conditions thus made the word order in the CF-object condition felicitous again (Arnhold et al. 2016). The Finnish-speaking children thus showed rather sophisticated knowledge of the use of word order in focus marking.

Regarding the use of prosody (Table 2), the German-speaking children did not use duration but used pitch in the subject nouns in both SVO and OVS sentences to distinguish focus types. They realised a subject noun with a higher pitch-maximum and larger pitch span in NF-subject and CF-subject than in BF in SVO sentences and with a larger pitch span in NF-subject than in BF in OVS sentences (Table 2: row 3, columns 2 & 4 respectively). The Finnish-speaking children appeared to use prosody more extensively than the German-speaking children. In both SVO and OVS sentences, they realised an object noun with a shorter mean syllable duration in NF-subject and CF-subject than in BF (Table 2: row 4, columns 3 & 5). In OVS sentences, they realised a subject noun with a larger pitch span in CF-subject than in NF-subject and BF and an object noun with a larger pitch span in CF-object than in NF-object and BF (Table 2: row 5, columns 4 & 5).

The above-reviewed findings suggest that a more equal role of word order and prosody in focus marking in the ambient language can stimulate more extensive use of word order variation and prosody when children

Table 2: German- and Finnish-speaking four- to five-year-olds' use of prosody in different focus conditions (broad focus – BF, narrow focus – NF, contrastive focus – CF) as reported in Sauermann et al. (2011) and Arnhold et al. (2016) respectively.

Word order produced	SVO		OVS	
	Subject nouns	Object nouns	Subject nouns	Object nouns
German-speaking children	Pitch-max & pitch-span: NF/CF-sub>BF		Pitch-span: NF-sub>BF	
Finnish-speaking Children		Mean syllable duration: NF/CF-sub<BF		Mean syllable duration: NF/CF-sub<BF
			Pitch-span: CF-sub>NF-sub & BF	Pitch-span: CF-obj>NF-obj&BF

The '<' and '>' signs mean 'smaller or bigger than' respectively regarding the prosodic measurement in the same cell. The abbreviations 'sub' and 'obj' stand for 'subject' and 'object'. For example, 'NF/CF-sub' refers to the focus conditions NF-subject and CF-subject.

are presented with both SVO and OVS sentences. Considering that Dutch uses word order to a lesser degree than German and Finnish and relies primarily on prosody, we hypothesize that Dutch-speaking children should use word order variation and prosody in marked word order more restrictedly than German-speaking children, and even more so than Finnish-speaking children. The predictions stemming from this hypothesis are as follows: (1) Dutch-speaking children's choice of word order is independent of focus conditions; (2) they do not use prosody to distinguish focus types, similar to their peers in Chen (2009), but may vary pitch to distinguish contrastive focus from broad focus only in sentence-initial subjects in SVO sentences, similar to English-speaking three- to four-year olds reported in Wonnacott and Watson (2008).

2 Method

We have adopted the answer-reconstruction game used in Sauermann et al. (2011) and Arnhold et al. (2016) to elicit from four- to five-year-olds SVO and OVS sentences in five focus conditions: BF, NF-subject, NF-object, CF-subject and CF-object.

2.1 Materials

The target words in the robot's answer sentences were either the noun of the subject NP or the noun of the object NP. All NPs were definite NPs. There were four target subject-nouns (animate nouns) and four target object-nouns (inanimate nouns). Each target noun occurred in each word order and in each focus type. Forty-eight question-answer dialogues were composed to accommodate all tokens of the target nouns (4 subject-nouns × 2 word orders × 3 focus types + 4 object-nouns × 2 word orders × 3 focus types). Each combination of a target noun and a non-target noun occurred only once during the experiment. Table 3 illustrates the six dialogues composed for the target subject noun *meisje* 'girl'.

The robot's sentences did not contain sentence-level prosodic properties. They were concatenated from isolated words, which were recorded in a randomized word list by a female native speaker of Dutch. The original pitch pattern of the words was erased and the pitch level was set at 200 Hz using Praat (Boersma 2001). The words belonging to the same sentence were then spliced together with a 200 ms pause in between to form the sentence.

2.2 Participants

Fourteen monolingual Dutch-speaking children (mean age: 5;1, range: 4;4–5;5, 7 boys & 7 girls) participated in the experiment. None of the children had indications of delay or impairment in language development.

Table 3: Dialogues composed for the target subject-noun *meisje* 'girl'.

	SVO in robot's speech		OVS in robot's speech	
	Question	**SVO-Answer**	**Question**	**OVS-Answer**
BF	Wat gebeurt er? *What's happening?*	Het meisje veegt de straat. The girl is *sweeping the street*.	Wat gebeurt er? *What's happening?*	Het gras maait het meisje. The grass is mowing the girl.
NF	Wie baakt de taart? *Who is baking the cake?*	Het meisje bakt de taart. The girl is baking the cake.	Wie leest de krant? *Who is reading the newspaper?*	De krant leest het meisje. *The newspaper is reading* the girl.
CF	Bouwt de man de muur? *Is the man building the wall?*	Het meisje bouwt de muur. The girl is *building the wall*.	Opent de jongen de deur? *Is the boy opening the door?*	De deur opent het meisje. *The door is opening* the girl.

2.3 Procedure

The children were tested individually in a quiet room at their school by an experimenter, who was a female native speaker of Dutch. Each session was recorded digitally with a sampling rate of 48 kHz and a resolution of 16-bit. Prior to the game, the child was told that Robby, a robot, was learning to speak Dutch, and she sounded a bit odd and sometimes ordered the words in a weird way. The child was asked to help Robby to learn Dutch by showing her how to speak properly. On each trial, the child was first shown a picture with part of it or most of it covered by a shape. The experimenter then talked a bit about the visible part of the picture with the child and Robby, and asked Robby a question about the occluded part of the picture. The questions and preceding contextual sentences were different in different focus conditions, as illustrated in English in (3). The occluded part of the picture was made available 0.5 seconds before the robot answered the question in either SVO or OVS word order. The experimenter repeated the question to the child and the child then reconstructed the robot's answer in a way that he reckoned acceptable in Dutch in the corresponding context.

(3) a. Broad focus
         Experimenter: Look! The picture is completely covered. Robby, what is happening?
         Robby: The girl is sweeping the street.

     b. Narrow focus – subject
         Experimenter: Look! It seems that someone is baking a cake. Robby, who is baking the cake?
         Robby: The girl is baking the cake.

     c. Contrastive focus - subject
         Experimenter: Look! It seems that someone is building a wall here. Robby, is the grandma building the wall?
         Robby: The girl is building the wall.

2.4 Data annotation

The recording from each child was first segmented and orthographically transcribed at the trial level using Praat (Boersma 2001). The data from three children (2 boys and 1 girl) were considered unusable because of poor recording quality. The usable full-sentence responses (N = 446) from the remaining children were included for word-order analysis. A subset of these responses (N = 228) were included for phonetic analysis. In the selected responses, the robot's word order was retained such that any prosodic differences found could be attributed to the effect of focus type. Further, they were spoken as one intonational phrase without disfluency or any kind of speech errors. These sentences were then segmented at the word level and the target words (subject and object nouns) were annotated for pitch-maximum, pitch-minimum and word duration, following standard procedures.

# 3 Analysis and results

3.1 Word order

We used the mixed-effect (binary) logistic regression model in SPSS (IBM SPSS version 22) to statistically assess the effect of focus type and the robot's word order on the children's choice of word order. The outcome variable of the model was WORD ORDER PRODUCED (by the children), including two categories (SVO, OVS). The predictor variables included three main effects, i.e. FOCUS TYPE, including three categories (BF, CF, and NF), WORD ORDER RECEIVED (from the robot), including two categories (SVO, OVS), and LOCUS OF FOCUS, including two categories (subject, object), and three two-way interactions, i.e. FOCUS TYPE × WORD ORDER RECEIVED, FOCUS TYPE × LOCUS OF FOCUS, LOCUS OF FOCUS × WORD ORDER RECEIVED, and one three-way interaction,

Table 4: Summary of the results of the mixed-effect (binary) logistic regression model on the prediction that OVS was used by children.

	Coefficient	Std.Error	Sig.	95% Confidence Interval	
				Lower	Upper
Intercept (CF, OVS received, focus on object)	−0.393	0.571	0.491	−1.515	0.728
Focus type (BF)	4.785	1.126	**0.001**	2.572	6.998
Focus type (NF)	0.622	0.541	0.251	−0.441	1.685
Word order - received (SVO)	−3.779	1.102	**0.001**	−5.946	−1.612
Focus type × word order-received					
BF:SVO	−15.655	207.657	0.94	−423.794	392.483
NF:SVO	−11.578	221.514	0.958	−446.952	423.797
Locus of focus (subject)	0.617	1.101	0.271	−0.484	1.718
Focus type × locus of focus					
BF:subject	−1.953	1.33	0.143	−4.567	0.661
NF:subject	−0.475	0.779	0.542	−2.005	1.005
Locus of focus × word order - received					
Subject:SVO	−11.444	236.763	0.961	−476.788	453.901
Focus type × word order-received × locus of focus					
BF:SVO:subject	23.522	314.926	0.94	−595.447	642.492
NF:SVO:subject	22.324	324.23	0.945	−614.933	659.581

The reference category was SVO for the outcome variable, CF for the fixed factor focus type, OVS for the fixed factor word order – received and object for the fixed factor locus of focus. Significant p-values are in bold.

FOCUS TYPE × WORD ORDER RECEIVED × LOCUS OF FOCUS. In addition, one random variable was added to the model, i.e. PARTICIPANT.[1] As can be seen in Table 4, only the variables FOCUS TYPE and WORD ORDER RECEIVED had a significant effect on choice of word order in children's production. Specifically, the children were significantly more likely to use OVS in the BF condition than in the CF and NF conditions, regardless of the locus of focus and the robot's word order, whereas there was no significant difference in the likelihood of using OVS between the NF and CF conditions, as illustrated in Figure 1 (left panel). Furthermore, the children were significantly less likely to use OVS than SVO when the robot used SVO and almost always used SVO when the robot used SVO, as shown in Figure 1 (right panel).
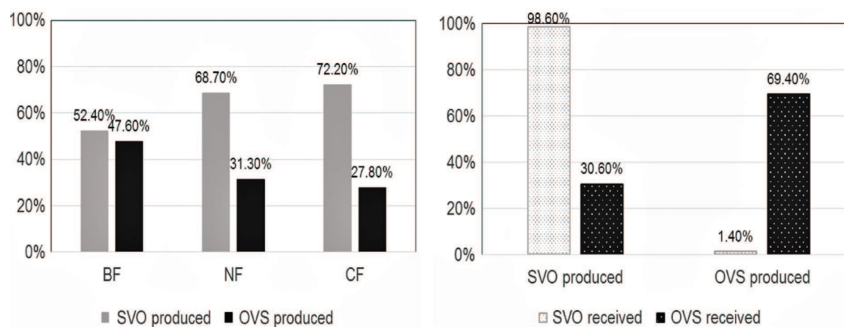
Figure 1: Distribution of SVO and OVS produced by all participating children over different focus types (broad focus – BF, narrow focus – NF, contrastive focus – CF) (left panel) and in different word orders received from the robot (left panel).

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1 The variable ITEM, referring to the sentences produced by the children, was not included as a random factor because of the small sample size of our data.
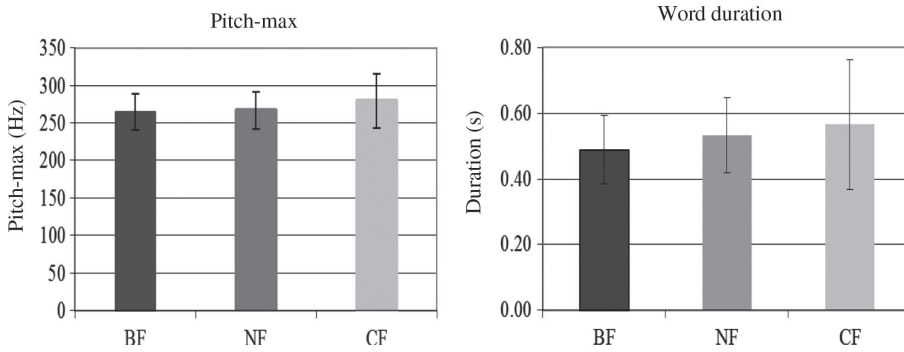
Figure 2: Mean pitch-maximum, word duration and standard deviation in different focus conditions (broad focus – BF, narrow focus – NF, contrastive focus – CF) in subject nouns in children's SVO responses produced when receiving SVO in the robot's speech.

3.2 Prosody

We conducted mixed-effect modelling (with only random intercepts) in R on each of the prosodic parameters (i.e. pitch-maximum, pitch-minimum, pitch span, and word duration) for the subject and object nouns separately in the SVO and OVS sentences (59 subject nouns and 70 object nouns in SVO sentences, 56 subject nouns and 43 object nouns in OVS sentences).[2] In total, four analyses were conducted for each prosodic parameter. In these analyses, the predictor variable was FOCUS TYPE (BF, NF, CF); the variables PARTICIPANT and ITEM were treated as random factors.

We did not find a main effect of focus type in the OVS responses. Regarding the SVO responses, we found a significant main effect of FOCUS TYPE on the pitch-maximum and duration, but not on the pitch-minimum and pitch-span. However, the effect of FOCUS TYPE was restricted to the subject nouns. The subject nouns were spoken with a significantly higher pitch-maximum ($p = 0.026$) and longer duration ($p = 0.011$) in the CF-subject condition than in the BF condition and a significantly higher pitch-maximum ($p = 0.047$) in the CF-subject condition than in the NF-subject condition, as shown in Figure 2. The difference in duration between BF and NF-subject ($p = 0.38$) and between NF-subject and CF-subject ($p = 0.131$) did not reach significance.

4 Discussion and conclusions

We have examined Dutch-speaking four- to five-year-olds' use of word order and prosody in distinguishing focus types via an interactive answer-reconstruction game. Our results show interesting differences between Dutch-speaking four- to five-year-olds and their German- and Finnish-speaking peers.

First, Dutch-speaking four- to five-year-olds almost always retain SVO when receiving SVO, and are more likely to use OVS than SVO in BF than in NF and CF when receiving OVS (possibly due to the memory load involved in reconstructing all-new sentences), largely similar to German- and Finnish-speaking four- to five-year-olds. But they show no evidence of varying the choice of word order between the focus conditions which license the use of OVS, i.e. NF-object and CF-object, and the focus conditions that may not license the use of OVS, i.e. NF-subject, CF-subject and BF. Dutch-speaking children's use of word order is thus independent of focus conditions, as predicted, and different from German- and Finnish-speaking children, whose choice

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2 The variable LOCUS OF FOCUS was not included as a predictor variable into the model. Instead, we modelled the prosodic variation for subject nouns and object nouns separately, because differences in pitch or duration between focal-subject nouns and focal object nouns are confounded by a difference in their positions in a sentence (e.g. sentence-final nouns are longer than non-sentence-final nouns, everything else being equal), thus not necessarily reflecting a child's ability to use prosody for focus-marking purposes.

of word order reflects the use of word order in marking focus types in their ambient language. Furthermore, Dutch-speaking children vary prosody in the subject nouns to distinguish focus types only in SVO sentences, different from German- and Finnish-speaking children, who use prosody in subject and object nouns in both SVO and OVS sentences. Dutch-speaking children realise subject nouns with a higher pitch-maximum and longer duration in CF-subject and NF-subject than in BF, resembling English-speaking three- to four-year-olds reported in Wonnacott and Watson (2008). This result is partially unexpected, given that Dutch-speaking four- to five-year-olds in Chen (2009) use neither pitch nor duration to distinguish narrow focus from non-focus in subject nouns in SVO sentences. It may imply that the use of phonetic means is acquired at different rates for different focus marking purposes.

The differences between Dutch-speaking children and German- and Finnish-speaking children suggest that typological differences in the relative importance between word order and prosody can lead to differences in children's use of word order and prosody in unmarked and marked word orders. A more common use of word order next to prosody can encourage more extensive use of prosody in the marked word order (e.g. Finnish, and to a lesser degree German), whereas a more limited role of word order can restrict the use of prosody in the unmarked word order (e.g. Dutch). Together with the studies of German- and Finnish-speaking children, our study contributes to a better understanding of how typological differences in prosodic focus marking affect acquisition of prosodic focus marking across languages.

A limitation of our study is that its sample size is relatively small, even though the case to variable ratio was reasonable in the analyses reported in Section 3.[3] Because of individual variation in children's use of prosody in this age range (Chen 2011a), using the production from a small number of children can undermine the generalisablity of our findings. Future replication studies are needed to find out whether our findings hold for other Dutch-speaking four- to five-year-olds.

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