

Extending ellipsis research: The acquisition of sluicing in Dutch

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We investigated the acquisition of sluicing, i.e. sentence ellipsis, in Dutch to assess if Dutch preschool children are able to produce and comprehend sluicing sentences in an adult-like way. While other types of ellipsis have been intensively studied in language acquisition, sluicing has received very little attention. So far, one grammaticality judgment study tested sluicing sentences with English children (Wood 2009), but no previous comprehension or production studies have been reported in the literature. To fill this gap, we developed a novel paradigm to test comprehension and production of sluicing. 25 Dutch preschoolers (μ 5;5, range 4;9-6;1) were at ceiling in comprehension, and produced many sluices (67%) as compared to full, non-elliptical sentences (11%). We conclude that Dutch 5-year-olds have no trouble with sluicing. Our conclusions are in line with studies on NP ellipsis (e.g. Wijnen et al. 2004) and VP ellipsis (e.g. Thornton and Wexler 1999; Foley et al. 2003), supporting the view that children at this age are fully able to reconstruct the antecedent of ellipsis, in our case by integrating the sluice in the discourse. This study thus contributes to theories on the acquisition of ellipsis and also to theories about the acquisition of anaphoricity in discourse more in general.

1 Introduction

Do Dutch preschool children correctly produce and interpret sluicing sentences? That is the question guiding the acquisition experiments described in this paper. Sluicing is a type of ellipsis where a whole TP is elided (*someone kicked a ball, but I didn't saw who*). While other ellipsis types have been the subject of numerous child language acquisition studies (e.g. Thornton and Wexler 1999; Foley et al. 2003; Goksun et al. 2007; Santos 2009), sluicing has hardly been looked at. Our study starts to fill this gap by providing first time data on the acquisition of sluicing in Dutch. Because the interpretation of elliptical sentences is provided by previous discourse, research on the acquisition of ellipsis ties in with research on the acquisition of anaphora. The broader question underlying the research described here is: How do children interpret and produce discourse anaphora?

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Section 1.1 will illustrate some ellipsis types and provide some background on the theoretical analysis of ellipsis in generative grammar. Section 2 discusses previous acquisition research on ellipsis, and section 3 the setup of our two experiments. The results of the experiments are given in section 4, after which a discussion and conclusion follow in section 5.

1.1 Ellipsis in generative syntax

Ellipsis is the linguistic phenomenon where linguistic structure (sound or writing) is missing, but interpretation nevertheless remains. In various theoretical frameworks ellipsis is analyzed as a special type of anaphora, because the meaning of the silent part of an elliptical sentence needs to be recovered from the discourse context, as is the case with other types of anaphora (Winkler 2006). A number of different types of ellipsis have been identified, depending on how much structure is left out. The place where structure is missing is often called the ellipsis site, indicated by the ‘___’ in the example sentences below. See examples (1a), (2a), and (3a), for different types of ellipsis.¹

- (1) *NP Ellipsis + non-elliptical counterpart*
 - a. Sam is waving with two hands, and Anna waves with one ___.
 - b. Sam is waving with two hands, and Anna waves with one hand.

- (2) *VP Ellipsis + non-elliptical counterpart*
 - a. Mark and Sam play the guitar, but Anna doesn't ___.
 - b. Mark and Sam play the guitar, but Anna doesn't play the guitar.

- (3) *Sluicing + non-elliptical counterpart*
 - a. Someone is making noise, but I don't know who ___.
 - b. Someone is making noise, but I don't know who is making noise.

The first example presents NP ellipsis; after the word *one* the hearer/reader has to go back to the first part of the sentence and insert the NP *hand* from the antecedent clause into the ellipsis site. In (2) the whole VP *play the guitar* has to be reconstructed, and in (3) the whole clause after the question word *who* is left out. These elliptical structures all occur frequently in natural language and they have the same meaning as their non-elliptical counterparts, given in examples (1b), (2b), and (3b). As mentioned above, the acquisition experiments in this paper focus on sluicing, also called sentence or TP ellipsis.

The properties of sluicing have been extensively studied within the field of generative syntax, ever since the phenomenon was first described and given its current name in a seminal paper by Ross (1969). The major questions in theoretical research on sluicing, and ellipsis more in general, are whether or not there is syntactic structure present in the ellipsis site, and in which contexts ellipsis is licensed. Furthermore, the question of how the meaning of the ellipsis site is recovered from the antecedent clause also plays an essential role (Johnson 2001; Merchant 2011).

The question about the underlying structure of the ellipsis site is important in relation to the acquisition of these structures, because different analyses here make different predictions for

¹ This is not an exhaustive set of possible ellipsis types; only the ones relevant for this paper are discussed here. For more complete discussions see e.g. Winkler (2006), Merchant (2011), and van Craenenbroeck and Merchant (2013).

children's behavior. The difference between analyses comes down to how much structure is posited in the ellipsis site. On the one hand there is the so-called 'What You See Is What You Get' (WYSIWIG) approach that claims there is no underlying structure present (e.g. Culicover and Jackendoff 2005). On the other hand the 'move-and-delete' account claims that a full underlying embedded wh-question is present in the ellipsis site (e.g. Merchant 2001). In between are analyses that posit a minimal structure in the ellipsis sites, either in the form of a null pronoun (e.g. Hardt 1993; Chung et al. 1995), or in the form of a 'cleft-analysis', where a full, but smaller structure than in the move-and-delete approach is present and no wh-movement takes place (e.g. van Craenenbroeck 2010). What these analyses mean for the complete structure of a sluicing sentence is shown in the following examples (deleted material is indicated between < >).

- (4) *WYSIWYG approach*
Someone is making noise, but I don't know who.
- (5) *Move-and-delete approach*
Someone is making noise, but I don't know who₁ < is making noise ~~who~~₁ >.
- (6) *Cleft-analysis approach*
Someone is making noise, but I don't know who < it is >.
- (7) *Null pronoun approach*
Someone is making noise, but I don't know who *pro*.

In the first approach, in (4), no structure at all is present in the ellipsis site and hence no deletion of linguistic material occurs. In the second approach, in (5), a full embedded question is built in narrow syntax and the wh-phrase is moved as in regular question formation. It is after this, at the phonological interface, that the linguistic material following *who* is deleted, i.e. it is there but not pronounced. In this second approach recovering the meaning of an ellipsis site is straightforward since there is no mismatch between syntactic and semantic structure. This is more difficult for the first analysis where the meaning needs to be added completely at the semantic interface. The fourth option, in (7), with a silent *pro* also relies strongly on the semantic interface. The cleft-analysis, in (6), is seen as a variation on the approach in (5), positing linguistic structure in the ellipsis site, but a slightly simpler and shorter structure, which is argued to solve some connectivity problems of the move-and-delete approach, while holding on to the easy recoverability of the meaning of the ellipsis site. The first approach is also called a 'non-structural approach', while the other approaches fall under the header of 'structural approaches'. We adopt a structural approach to ellipsis and believe that the arguments in favor of the move-and-delete approach are strong, but also agree with van Craenenbroeck (2010) that the cleft-analysis can be used as a last resort option.²

There is much more to say about the theoretical analysis of sluicing, but we believe the above discussion is sufficient for the purpose of this paper. In the next section research on the acquisition of ellipsis will be discussed, focusing on the ellipsis types exemplified in (1)-(3) above.

² See Lindenbergh (2013) for a discussion of why these analyses are adopted for sluicing in Dutch.

2 Acquisition of ellipsis

Acquisition research on ellipsis has focused mainly on verb phrase and noun phrase ellipsis (VPE and NPE from now on), and only one study looked at the acquisition of sluicing. Before discussing results from experimental studies on the acquisition of ellipsis, it is interesting to look at some examples from spontaneous speech data provided in the literature. It stands out that young children are already quite capable of dealing with ellipsis and that child directed speech contains a lot of elliptical structures, probably because for children ‘shorter is easier’ (Roeper 2007).³ Looking at corpus data from Childes (MacWhinney 2000) we see that, for example, a 2-year-old already produces structures containing NPE, as evidenced by Nina (2;3 years):

- (8) Mother: Whose hat is that?
Child: Mrs. Wood’s ___.

(Thornton and Jensen 2008)

However, production of a structure does not imply comprehension or full control over the structure at hand, and looking at corpus data from Sarah when she was 2;4 years old (Brown 1973), we see that ellipsis in child directed speech can also lead to communication failure:

- (9) Mother: Do you want some milk or do you want some juice?
Child: I milk juice [?]
Mother: huh?
Child: milk juice
Mother: No, you can either have one or the other. You can’t have both.
Child: milk juice

(Roeper 2007: 129)

The child is obviously confused by the first question of her mother, but when the mother tries to help, she uses an elliptical sentence which does not make it any clearer for the child. The mother’s phrase “No you can either have one or the other. You can’t have both” should be reconstructed by the child as: “No, you can either have one of the milk or the juice or the other of the milk and the juice. You can’t have both the milk and the juice.” It appears the child is not yet capable of doing this at this age (Goksun et al. 2007; Roeper 2007). While ellipsis is frequent in children’s language input and they produce some simple forms of ellipsis already from the age of 2, mastering all elliptical structures and being able to reconstruct previous linguistic information from the discourse might not be so simple for young children.

Looking at the literature on how children deal with discourse integration in other domains than elliptical structures, it has been argued that discourse integration is quite a late achievement in language development. Research from Karmiloff-Smith (1980) showed that children up until the age of six rather use deictic information than anaphora resolution to interpret definite noun phrases and pronouns in a story context. They thus prefer to use visual information over discourse information. This and other converging evidence has led a number of researchers to claim that differences between child and adult language use arise not because of a difference in syntactic ability but

³ However, Matsuo (2007) notes she performed an informal search of part of the Brown corpus in the Childes database in which no examples of VPE in coordinate constructions were found.

because of a difference at the interface between syntax and discourse (e.g. Hoekstra and Hyams 1998; Kramer 2000; Schaeffer 2000). But, as Santos (2009) points out, other studies question this idea and show that adult L2 learners make some of the same mistakes as the children in the above mentioned studies, showing that these mistakes cannot be due to a delay of pragmatic development (De Cat and Unsworth 2003).

Since the beginning of the 1990s quite a number of experimental studies have looked into children's comprehension and production of VPE and NPE in order to determine the acquisition path of elliptical structures in more detail. At the same time these studies further investigate the relation between the acquisition of syntax and the acquisition of semantics and discourse integration, precisely because elliptical structures "appear to straddle the interface between syntax and pragmatics" (Matsuo and Duffield 2001: 307).

Matsuo and Duffield (2001) looked at the acquisition of VPE in relation to the acquisition of another related structure, called verb phrase anaphora (VPA). These structures only differ slightly from each other, but have a different distribution, for example with regard to voice, see (10) and (11).⁴

(10) *Active antecedent*

Someone had to take out the garbage...

- | | | |
|----|--------------------------------|-----|
| a. | ...but I didn't want to __. | VPE |
| b. | ...but I didn't want to do it. | VPA |

(11) *Passive antecedent*

The garbage had to be taken out...

- | | | |
|----|--------------------------------|-----|
| a. | ??...but I didn't want to __. | VPE |
| b. | ...but I didn't want to do it. | VPA |

(Matsuo and Duffield 2001: 302)

In order for children to interpret and produce these structures correctly they have to identify the differences between these two structures. This means they need to learn that VPE is degraded in contexts where there is an active-passive mismatch (11a), but VPA is not (11b). The grammaticality judgment experiment Matsuo and Duffield performed showed that all children (12 in total, age range 3;11-6;7, mean age 5;8) behaved adult-like and were able to distinguish these two structures from each other. This shows that children are sensitive to the structural restrictions on VPE, but the method used does not yet tell us anything about children's comprehension.

A study that looks at comprehension of VPE is Foley et al. (2003). They show that children are sensitive to the specific restrictions that govern interpretation in structures containing VPE. They looked at children's comprehension of VPE in coordinated structures where an elided possessive pronoun can have different interpretations, see (12), and (13)-(14) for the different interpretations.

(12) Oscar bites his apple and Bert does too __.

(13) *Sloppy interpretation*

- a. O bites O's apple and B bites B's apple.

⁴ VPE is also degraded when the antecedent is a nominal clause (??John wanted a kiss, but Mary didn't want to __). VPA is in that case also perfectly acceptable (Matsuo and Duffield 2001).

(14) *Strict interpretations*

- b. O bites O's apple and B bites O's apple.
- c. O bites B's apple and B bites B's apple.
- d. O bites E's apple and B bites E's apple.

(Foley et al. 2003: 53)

Crucially, this variation in interpretation is constrained by the possibilities given in (13)-(14). Although logically there are five other possible interpretations, these are unacceptable in English, and children need to pick up on this constraint. Foley et al. used both an act-out task and a truth value judgment task, and tested 86 children in four age groups between the ages of 3;0 and 7;11.⁵ The results show that even the youngest children are able to correctly act out all the different sloppy and strict readings of the experiment. Correct responses increase with age, and a strong preference for the sloppy interpretation is found. The truth value judgement task confirms these results and furthermore shows that children correctly reject infelicitous interpretations of VPE. For Foley et al. this supports a Strong Continuity version of the innateness hypothesis, and more specifically indicates that operator-variable binding is already available for the youngest participants.

That young children correctly resolve operator-variable binding in VPE structures is confirmed by experiments performed by Thornton and Wexler (1999). Thornton and Wexler looked at the acquisition of Principle B and VPE, in structures as in (15).

(15) The caveman kissed the dinosaur and Fozzie bear did too __.

(Thornton and Wexler 1999: 178)

This sentence was given to their subjects in combination with a picture where Fozzie bear kisses his own hand instead of the dinosaur. They found that children correctly reject this non-adult like interpretation of the pronouns in these structures 100% of the time.

Matsuo (2007) used a truth value judgment task to look at the same type of VPE structures with either a sloppy or a strict reading, and also found that English children (mean age 5;8) correctly interpret both these readings of VPE in coordinated structures.

The results of these studies on VPE in acquisition show that 5-year-olds correctly interpret these structures and moreover show that they know the constraints on the interpretation of the ellipsis site. This challenges the above-mentioned literature that claimed that children up to the age of six have difficulties integrating discourse information.

Wijnen, Roeper, and van der Meulen (2004) also question the idea that children generally have poor abilities in integrating discourse information, looking at the acquisition of nominal ellipsis to investigate this further. Wijnen et al. looked at the acquisition of NP ellipsis in sentences presented at the end of a short story such as (16).

- (16) Here's a playground. It's great to do all kinds of funny things when you're out in the playground, like swinging, making a sand castle or climbing on the monkey bars.
There are some kids playing in the sand box.
Are two __ upside down?

(Wijnen et al. 2004: 507)

⁵ All children participated in the act-out task and only a subset of 35 children also participated in the truth value judgment task.

They used a truth value judgment task and presented this story with three different pictures to see if children know how to reconstruct the final, elliptical sentence. In order to correctly interpret this sentence the whole NP *kids playing in the sandbox* needs to be filled in after *two*. The picture where two children outside of the sandbox are standing upside down should be rejected, and the results show that English 4-year-olds do this 74,4% of the time. While they do not respond at ceiling, this is a pretty good result and it shows that these children are quite capable of integrating the linguistic discourse, and can ignore the conflicting visual information. This conclusion does not support the claim that children until the age of six are not capable of discourse integration.

Goksun et al. (2007) extended these results on the acquisition of NPE to the acquisition of VPE. They argue that children first make use of pragmatic information in interpreting elliptical utterances. During the course of development they start to rely on linguistic information and only then behave adult-like with these structures. Goksun et al. furthermore argue that children first learn to deal with NPE and only later with VPE, which implies an acquisition path for ellipsis. However, to fully determine the acquisition path of elliptical structures we would need to know how children interpret other types of ellipsis than NPE and VPE, such as sluicing.

But, we know of only one study that looked at the acquisition of sluicing so far. This is a study by Wood (2009) who looked at the acquisition of sluicing in English. He also noted this gap in acquisition research and claims that looking at the acquisition of sluicing can open some doors, since this elliptical structure is cross-linguistically far more frequent than VPE. Looking at sluicing can thus provide interesting cross-linguistics comparisons. Wood performed a grammaticality judgment task looking at different degrees of semantic parallelism between the antecedent clause and the ellipsis site of sluicing in coordinated sentences. The five test conditions are given in (17)-(21).

(17) *Structural antecedent*

Somebody is feeding the dog, but I don't know who.

(18) *Semantic antecedent*

The mouse is playing tennis, but it doesn't know how.

(19) *Antecedent with no overt correlate*

The boy is hiding, and I know where.

(20) *No antecedent (ungrammatical)*

*The ball is bouncing, but I don't know who.

(21) *Full structure not sluiced (control)*

Somebody is painting a picture, but I don't know who is painting a picture.

(Wood 2009: 144)

Wood tested two groups of English speaking children, the youngest group ranged in age from 4;5-5;5 and the older group had an age range from 6;8-7;8 years. In his experiment the children had to indicate whether or not the test sentences spoken by a puppet who wants to learn English were acceptable in English or not. His results show that the 16 children in the youngest age group did not accept the sluicing sentences as grammatical. They did reject the ungrammatical sluice 70% of the time, but on all the other types of sluicing sentences they gave at chance responses. Important to

note here is that the children also rejected the non-elliptical control sentence 35% of the time. The 18 children from the older age group responded adult-like and accepted both the sluicing sentences and the non-elliptical control items. Wood concludes from these results that the youngest children have a problem with sluicing. He argues they have not yet fully acquired the syntax of embedded questions, as evidenced by their problems with the non-elliptical control condition. Since the older children showed no problems at all, Wood further concludes that the acquisition of sluicing takes place between the ages of his youngest and oldest groups, thus around the age of six.

We find Wood's claim that the younger age group cannot cope with embedded questions remarkable in the light of other research that argues that embedded question are fully acquired by the age of 4 or earlier (Thornton and Crain 1994; Guasti 2001). This lead us to doubt Wood's methodology and therefore we decided to develop different tasks that test comprehension and production of sluicing. We employed our new tasks with Dutch preschoolers.

It is important to note that the interpretation of the ellipsis site for adults is very restricted. The sluicing sentence in (22) can only have the meaning of its non-elliptical counterpart in (23) and nothing else. Even though there might be another visually salient referent or logically available alternative action for the elided part of the second conjunct, the sluicing sentence in (22) can never be used to carry the meaning of the sentences in (24).

(22) Someone is washing a car, but I can't see who.

(23) Someone is washing a car, but I can't see who is washing a car.

- (24) a. Someone is washing a car, but I can't see who is driving a car.
b. Someone is washing a car, but I can't see who is washing a bike.

The ellipsis site can only be filled by the antecedent from the previous linguistic discourse. Our question is: at what age do children become sensitive to this restriction?

Wood's (2009) experiment was a grammaticality judgment task and did not test comprehension of sluicing sentences. Our study aims to extend the research described above on the acquisition of NPE and VPE in order to shed more light on the acquisition path for elliptical structures. It is the first study that investigates sluicing comprehension in children, and moreover compares comprehension to production. Because our study looks at the acquisition of Dutch it furthermore expands the acquisition data for ellipsis which has mostly been English up to this point. By answering the research questions in (25) we will also shed light on the more general question of how children deal with anaphora and discourse integration more in general.

(25) *Research questions*

1. Do Dutch preschool children comprehend sluicing sentences in an adult-like way, i.e., show the same restrictions in interpreting the ellipsis site?
2. Do Dutch preschool children produce sluicing sentences in an adult-like way?

We hypothesize that children use the linguistic discourse to find the antecedent of anaphora (Thornton and Wexler 1999; Foley et al. 2003; Wijnen et al. 2004; Matsuo 2007), so we expect that they will also do this correctly in sluicing sentences, both in comprehension and production.

3 Experiments

The only previous acquisition experiment that looked at sluicing was a grammaticality judgment task (Wood 2009). Comprehension of sluicing has never been tested in children. The goal of our study is to see if preschool children apply the same restrictions when they interpret the ellipsis site in sluicing sentences as adults, and produce sluicing sentences in an adult-like way. We developed a novel paradigm for testing comprehension and production, focusing on sluicing in coordinated sentences in Dutch of the type in (26).

- (26) Iemand duwt een auto, maar ik zie niet wie.
someone pushes a car but I see not who
'Someone is pushing a car, but I can't see who.'

All test items had this form and they all used the same question word *wie* 'who' as introducer of the sluice. Interpretation was tested with a picture-selection task and production with an elicitation task.

The sluicing items all involve embedding (*see* takes a complement clause) so we developed a pretest to make sure the participants could handle embedded structures. The pretest has the same setup as the comprehension experiment, so the first two items of the pretest effectively functioned as training items for the comprehension experiment. This way the pretest was used both to make sure the children understood the task as well as to make sure they could interpret simple embedded sentences.

Section 3.1 describes the participants and general procedure for both experiments. The specific methods, materials, and procedures for the comprehension and production experiment are given in sections 3.2 and 3.3 respectively.

3.1 Participants and general procedure

We tested 30 Dutch children from a primary school in the city of Groningen.⁶ The children, 13 girls and 17 boys, all attended the second year of preschool ('groep 2' in the Dutch primary school system), and their age ranged from 4;9 to 6;1 years, with a mean of 5;4. This age range was chosen based on the previous research discussed above. All subjects participated in the pretest and in both the comprehension and the production experiment. The experiments were held in two sessions and took place in a quiet room at the children's school. All subjects first participated in the pretest and comprehension experiment, and did the production experiment in a second session. Both sessions lasted about 20 minutes, and all children were able to perform the tasks. There was always at least a day in between the two sessions, to prevent a strong priming effect from the comprehension experiment to the production experiment. The pretest and comprehension experiment were scored by the experimenter during the sessions. The responses from the production experiments were also audio-taped to check appropriate scoring. Next to the target group of 30 children 5 adult Dutch native speakers participated in both experiments to function as a control group. All the experiments and the scoring of the answers was performed by the same experimenter to ensure a consistent procedure.

⁶ All children were monolingual Dutch speakers, except for 1 girl and 2 boys. One of the boys failed the pretest and was excluded from further analysis, the other two children performed in line with the rest of the subjects, so we saw no reason to exclude them.

3.2 Comprehension experiment

With the comprehension experiment we wanted to determine if preschool children have the same restrictions on interpretation of the ellipsis site as adults, so the distractor pictures are intended to test precisely this. The pictures that were used will be discussed in more detail after the introduction of the test sentences.

The comprehension experiment has a total of six different conditions, two of which are the crucial test conditions, four are control conditions. The test conditions are sluicing sentences either with negation (SluiceNeg) or without negation (SluicePos), examples are given in (27) and (28).

(27) *SluiceNeg*

Iemand tekent een bloem, maar ik zie niet wie.
someone draws a flower but I see not who
'Someone is drawing a flower, but I can't see who.'

(28) *SluicePos*

Iemand trekt een boot en ik zie wie.
someone pulls a boat and I see who
'Someone is pulling a boat and I can see who.'

The distinction between negated and non-negated sentences was made to bring some variation in the test items and in the pictures that accompany them. We did not expect negation to influence the results of the comprehension experiment.

For all the items of the pretest and the comprehension experiment a set of four pictures was created. The pictures showed either a man or a woman performing an action with an inanimate object. Figure 1 displays an example of a picture set used for one of the negated test sentences, and Figure 2 shows a picture set used for one of the non-negated test sentences. The blue squares that cover the subject in some of the pictures represent a paper 'door' that was attached to the picture sheet. This door could be folded back by the children to uncover the subject in question.

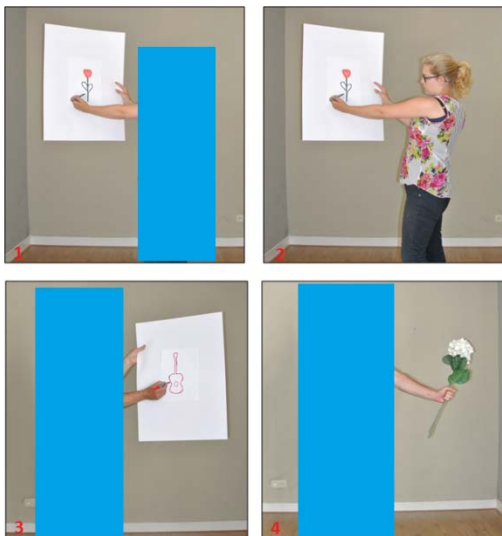


Figure 1 – Set of pictures for negated test item, (27): 'Someone is drawing a flower, but I can't see who'.



Figure 2 – Set of pictures for non-negated test item, (28): ‘Someone is pulling a boat and I can see who’.

In Figures 1 and 2, picture 1 is the target picture, picture 2 is a control picture, and pictures 3 and 4 are distractor pictures. The function of the control picture is to make sure the children not only listen to the first part of the test sentence, but have to wait till they hear the second conjunct. If they only listened to the first conjunct, both picture 1 and 2 would be accurate, because picture 2 contains the same action and object as picture 1, the only difference is the absence or presence of a door. Picture 3 shows the same action, but with a different object and picture 4 shows the same object, but with a different action than the target picture. Pictures 3 and 4 represent situations that are not compatible with the sluicing interpretations in adult grammars. However, if children allow a less restricted, non-adult like interpretation of the ellipsis site, these situations might be a valid option for the children.

The pictures show a minimal amount of variation and there are no other items or persons portrayed in the background that could distract from the crucial scenes. On half of the pictures the subject appeared on the right of the object, and on the other half it appeared on the left. The four pictures were printed on an A4-size sheet of paper, and the pictures were randomly distributed across the sheet, to make sure no preference for a locus on the picture sheet could interfere with the results.

The first set of control items consists of the non-elliptical counterparts of the sluicing items (CounterNeg and CounterPos), see (29) and (30). These conditions were added to be able to see if the children interpret sluicing sentences in the same way as non-elliptical sentences. At the same time, these items were used to possibly exclude children who had not understood the task. The final set of control items consisted of regular coordinated sentences in the same form as the non-elliptical counterparts of the sluicing sentences, but in these sentences the second conjunct of the sentence contained either a different object (CoordObj) or a different action (CoordAct), see (31) and (32). These control items were added to make sure the children kept paying attention to the end of the test sentences.

(29) *CounterNeg*

Iemand trekt een koffer, maar ik zie niet wie een koffer trekt.
someone pulls a suitcase but I see not who a suitcase pulls
'Someone is pulling a suitcase, but I can't see who is pulling a suitcase.'

(30) *CounterPos*

Iemand tekent een gitaar en ik zie wie een gitaar tekent.
someone draws a guitar and I see who a guitar draws
'Someone is drawing a guitar and I see who is drawing a guitar.'

(31) *CoordObj*

Iemand leest een tijdschrift, maar ik zie niet wie een kaart leest.
someone reads a magazine but I see not who a card reads
'Someone is reading a magazine, but I can't see who is reading a card.'

(32) *CoordAct*

Iemand pakt een koffer in, maar ik zie niet wie een koffer openmaakt.
someone packs a suitcase in but I see not who a suitcase opens
'Someone is packing a suitcase, but I can't see who is opening a suitcase.'

A total of eight transitive verbs was selected, based on the following criteria: they occur frequently in child language, are easily depictable in photos, and possible to combine with several, good recognizable objects. These eight verbs all occurred in the two sluicing conditions, resulting in 16 test items. To restrict the number of items to a testable amount, the four control conditions all occurred with two of the eight verbs, resulting in a total number of eight control items. To make sure there was enough variation in the pictures each verb was combined with several different objects. The verbs used in the items are listed in (33).

- (33) trekken (*pull*), duwen (*push*), tekenen (*draw*), snijden (*cut*), vasthouden (*hold*), lezen (*read*), openmaken (*open*), wassen (*wash*)

The pretest was set up in the same way as the comprehension experiment. The goal of the pretest was to see if children were able to interpret simple embedded questions, to make sure they had no trouble with the complex structure of the second conjunct of the sluicing sentences. To make the pretest items compatible with the pictures used in the comprehension task the same eight verbs were used, and the embedded sentences also occurred either with or without negation. See (34) and (35) for examples of the pretest items in both conditions. Every verb occurred once in the pretest, resulting in eight pretest items, four of which included negation. The first two items were training items, where the children received positive or negative feedback to make sure they understood the task. The pretest had six items in total.

(34) *PrePos*

Ik zie wie een bord wast.
I see who a plate washes
'I can see who is washing a plate.'

- (35) *PreNeg*
 Ik zie niet wie een wortel snijdt.
 I see not who a carrot cuts
 'I can't see who is cutting a carrot.'

The procedure for pretest and comprehension experiment was the same. The task was introduced to the children by telling them they would participate in a game with pictures, and that sometimes part of a picture was covered up with a small door. This was illustrated with one picture with a door on it, so the children would be familiar with this part of the experiment. The children were told that the game would have a lot more pictures and that their task was to choose the right picture. At this point a hand puppet was introduced to the children. The experimenter told the children that the puppet wanted to participate in the game: the puppet would say something about the pictures and ask the children to help choose the correct picture. Now the practice would begin and the experimenter introduced the set of four pictures for the first time. The instruction used for all the items of the pretest and comprehension experiment is given in (36).

- (36) "Here are the pictures, now listen closely to the puppet."
 - Puppet says test item -
 "Where should the puppet look?"

During the training the children were corrected if they chose the control or distractor pictures and positive feedback was given for the target answer. After two practice items, all the children were told they were very good at helping the puppet, and that now the game would really begin. During the experiment no more positive or negative feedback was given, just a neutral confirmation of the child's choice. After the child pointed to a specific picture, the puppet had a closer look at that picture and thanked the child for helping him.

3.3 Production experiment

For the production experiment we developed an elicitation task with the goal of eliciting the second half of a coordinated sluicing sentence of the type used in the comprehension experiment. With this experiment we wanted to find out if children are able to produce sluicing sentences, and with the setup of the experiment we could also test if they preferred to use elliptical sentences over full non-elliptical counterparts.

To get children to produce sluicing sentences is not easy, but we believe the experiment we developed served the task well. The production experiment was modeled after the sentences used in the comprehension experiment, specifically the sluicing sentences with negation, i.e. where the agent cannot be seen. To produce a sentence in the form of 'yes, but I can't see who' is quite natural in a context where someone expects the child to see who is performing the action and the child needs to correct that assumption ('I can't see who'). We created this context in the form of a card game: the children were expected to tell the experimenter who is doing what on the picture cards. In every round of the game, the children were given three pictures, and asked three questions, all relating to one of the pictures. The third question was the critical one targeting a sluicing sentence. Example pictures and accompanying questions with the target answers are given in Figure 3 and (37)-(39).



Figure 3 – Set of pictures for one item of the production experiment. The third picture is the critical one targeting a sluicing response.

- | | |
|--|--|
| (37) Is er iemand gitaar aan het spelen?
'Is someone playing the guitar?' | <i>Target answer:</i> Ja, een mevrouw.
'Yes, a woman.' |
| (38) Is er iemand een plant water aan het geven?
'Is someone watering a plant?' | <i>Target answer:</i> Ja, een meneer.
'Yes, a man.' |
| (39) Is er iemand een bootje aan het trekken?
'Is someone pulling a boat?' | <i>Target answer:</i> Ja, maar ik zie niet wie.
'Yes, but I can't see who.' |

The first two questions are about the pictures where the agents are visible and these function to create a context where the child is able to give an answer and tell the experimenter who is doing what. These two questions always preceded the critical question about the third picture, which was intended to elicit a sluicing sentence, because this time the agent was hidden behind a curtain and the child could not tell who was performing the action.⁷

For the critical items the eight verbs of the comprehension experiment were used, resulting in eight test items.

At the beginning of the experiment, the children were told that they would participate in another game (they all already participated in the comprehension experiment prior to participating in the production experiment), and that in this game they were the ones to say something about the pictures, just as the puppet had done in the previous game. In the previous game the puppet would sometimes say that he could see something, but he also sometimes said that he could not see something.⁸ Then the experiment was introduced as a card game ('kwartet' in Dutch) and practice cards were shown to the children. The experimenter told the children that in the actual game the children were to hold the cards so that the experimenter could not see them. However, the experimenter wanted to know what was on the card, so the child should tell the experimenter who was doing something on the cards.

⁷ It was brought to our attention by Marlies Kluck that the answers to the filler questions, (37) and (38), are considered to be elliptical sentences by some of the ellipsis literature. These structures are called fragment answers in the literature and are sometimes argued to be a form of sluicing too (Merchant 2004).

⁸ The fact that the puppet said that he could not see something proved to be important for the children. In trial runs of the production experiment it became clear that children at this age do not like to admit they cannot see something, and without this specific instruction they would instead guess whether it was a man or a woman standing behind the curtain.

With a practice item the children were specifically trained to answer the two filler questions in the way displayed in (37) and (38) instead of only with ‘yes’. It is only in this way that the sluicing answer to the third question comes naturally. The experimenter asked one of the filler questions and let the child answer spontaneously, then correcting the answer to ‘yes, a man/woman’. This was practiced until the children got it (usually after two or three practice questions). Then the picture with the curtain covering the agent was introduced and the experimenter told the child what he should answer to a question about such a picture in the following way:

- (40) “If you see a picture like this, where you cannot see the person, and I ask the question ‘is someone pulling a boat?’, you can answer by saying:
‘yes, but I cannot see who is pulling a boat.’
Can you repeat this answer?”

This was practiced by the children, and they all repeated this full non-elliptical answer to the critical question. Note that this practice item does not involve a sluice, but the full non-elliptical answer, so no sluices were trained. After the practice items the experiment started. If the children forgot to answer the filler questions as practiced the experimenter would remind them to answer in the way of (37) or (38), but no extra feedback was given on the critical questions.

4 Results

Everyone in the adult control group responded at ceiling on the comprehension task and produced mainly sluices in the production task.⁹ After analyzing the results from the pretest, 5 children were excluded from analysis because they had made two or more mistakes with the embedded wh-questions.¹⁰ In the following sections the results from the comprehension and production experiment are discussed, using the data of the 25 children who passed the pretest. The age of this group ranged from 4;9 to 6;1, with a mean age of 5;5.

4.1 Results comprehension experiment

In the comprehension task, the possible answers were: the target picture, the control picture with the same action and object, the picture with a different object, and the picture with a different action. Figure 4 shows the picture choices per condition.

⁹ The adult data for the production task made it very evident how natural it was to use sluicing sentences instead of the full counterparts in this experiment. The children were trained to answer with a non-elliptical sentence to the critical question, and the same introduction was given to the adults. However, when presenting adults with this non-elliptical answer they all immediately commented that it would be unnatural for them to use, and that they would rather give the sluiced version.

¹⁰ The other exclusion criterion was 2 or more mistakes on the full counterpart control items, but this did not occur in the data.

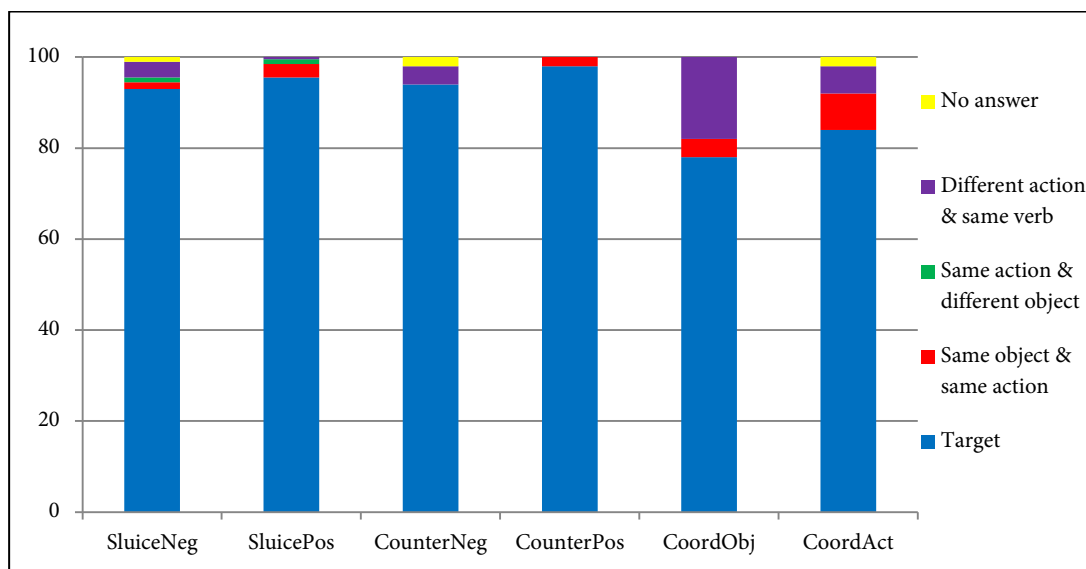


Figure 4 – Overall results of the comprehension experiment. Represented here is the proportion (y-axis) of answer type per condition (x-axis).

The results reveal an unambiguous picture: averaging over all conditions, 90% of the answers are target answers. When we specifically look at the test conditions, namely *SluiceNeg* and *SluicePos*, we see that the children respond near ceiling, choosing the target picture 94% of the time. When we look at the first set of control items, the full counterparts of the sluicing sentences (*CounterNeg* and *CounterPos*), we see the same near-ceiling pattern (96% of target). There is no difference in how children respond to the sluicing sentences and the non-elliptical sentences. Whether an item included negation (*SluiceNeg* and *CounterNeg*) or not (*SluicePos* and *CounterPos*) also had no effect on the results, as was expected. Looking at the other control items, the coordinated sentences without ellipsis (*CoordObj* and *CoordAct*), we see that the children performed slightly worse by giving target answers only 81% of the time. This was due to experimental factors. The control group of adults pointed out that for these control items, the pictures did not match the test sentences as well as the rest of the material, because these test sentences contained two agents both performing their own action, while all pictures only contained one agent. Because these control items are not important for any conclusions made in this paper, we leave these results out of the discussion.

Looking at the subjects or items individually gave no extra interesting results. No outliers were found in the data. The overall results are clear: all the children responded near or at ceiling.

4.2 Results production experiment

To analyze the results of the production experiment all the 200 responses to the critical question were categorized in five different types, as illustrated in (41)-(45). All the given answers could be categorized into these categories, where the groups labeled ‘other answer’ and ‘evasive answer’ contain answers of various constructions. The results of the production task are shown in Figure 5.

- (41) *Sluice*
 Ja, maar ik zie niet wie.
 ‘Yes, but I can’t see who.’

- (42) *Full counterpart*
 Ja, maar ik zie niet wie een boot trekt.
 ‘Yes, but I can’t see who is pulling a boat.’
- (43) *Cleft construction*
 Ja, maar ik zie niet wie het is.
 ‘Yes, but I can’t see who it is.’
- (44) *Other answer*
 Ja, maar ik zie hem niet.
 ‘Yes, but I cannot see him.’
- (45) *Evasive answer*
 Ik denk een jongen.
 ‘I think a boy.’

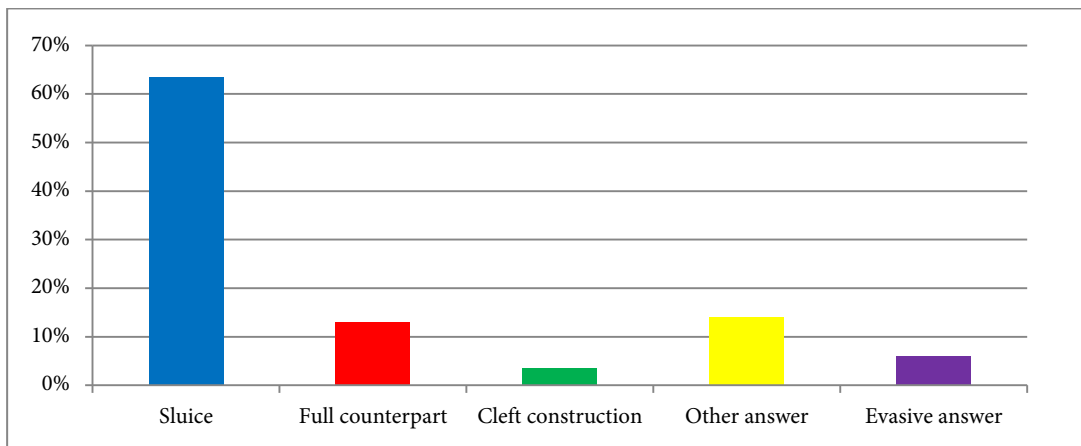


Figure 5 – Overall results of the production experiment. Represented here is the proportion of answers (y-axis) per type of answer (x-axis).

The results are quite clear: the majority of the answers were sluicing sentences. The goal of the task was to see if 5-year-old children are able to produce sluicing sentences, and we can clearly see in Figure 5 that they are: 63% of all answers consisted of sluices. All the other responses that were given, were also valid responses to the question and they have been categorized into four groups, see (42)-(45). The first option is the non-elliptical full counterpart of the sluicing sentence, see (42). This was the model used in the training session and 13% of the answers involved this construction. The second answer type is the cleft construction in (43). Although this cleft construction is only given in 3,5% of the cases, it is nevertheless interesting that the children produced this in light of the discussion about the underlying structure of the ellipsis site, which is sometimes argued to be a cleft structure. The other two categories of answers consist of a mixed set of answers given by the children, either telling in another way that they could not see who was performing the action, see (44), or giving an ‘evasive’ answer, for example by guessing who was behind the curtain, see (45).

Looking at the children individually we found that 5 of the 25 children did not produce any sluices. We cannot conclude that this is because they cannot produce them, since the other answer

possibilities are of course valid ways of responding to the questions. Important is that none of the children produced illicit elliptical sentences. They only produced adult-like sluicing sentences or gave other valid responses.

5 Discussion and conclusion

The results of the comprehension and production experiment give a clear picture: Dutch children with an average age of 5;5 comprehend sluices in an adult-like way, and they are also able to produce sluicing sentences correctly. In the adult grammar the directly preceding linguistic discourse (the first conjunct of the coordinated sluicing sentences) serves as antecedent to recover the meaning of the ellipsis site in a sluicing sentence. The comprehension experiment was developed to see if children obey this same restriction when they interpret sluicing sentences or whether they are more liberal, allowing partial recovery of the preceding antecedent (by choosing same verb with different object, or different verb with same object pictures). Our results strongly indicate that children are as restricted as adults. The fact that all children responded at ceiling indicates that they strongly prefer an adult-like interpretation of the sluicing sentences above the other options presented in the distractor pictures. The non-target answers in the comprehension experiment visually provided other objects and actions that could in principle have been used to fill the ellipsis site, but they understood perfectly well that they were not supposed to do that.

The production results are also quite striking, because they show that the children really preferred to produce sluicing sentences over full non-elliptical counterparts. In the training session of the production experiment the children were told to give the full answer: “yes, but I can’t see who is pulling a boat.” This is the non-elliptical counterpart of the sluicing sentence we tried to elicit, and during the training session all the children repeated this sentence. The fact that most of them proceeded to answer the test items with sluices indicates that they believe (subconsciously of course) an elliptical sentence is better suited as an answer in this context. This corresponds to the responses received from the adult control group who immediately commented that they could produce the non-elliptical sentence, but that it would be quite unnatural for them to do so.

Connecting the results found in our study to the results found in previous work on other types of ellipsis, we see that studies on VPE and NPE found that children are quite proficient in interpreting and producing elliptical structures (Thornton and Wexler 1999; Matsuo and Duffield 2001; Foley et al. 2003; Wijnen et al. 2004; Goksun et al. 2007). While our data is thus in line with these studies, it goes against the results found by Wood (2009) for sluicing in English children. Using a grammaticality judgment task, he found that his youngest age group, with an age range similar to ours of 4;5-5;5, did not accept sluicing sentences as grammatical. But, as discussed previously, his methodology does not test comprehension of sluicing sentences, but tries to elicit meta-linguistic knowledge. The task is rather artificial, and it is not clear that children at this age are capable of showing such knowledge. Our task on the other hand tests interpretation and production in a natural and playful way, because the experiments resemble children’s games. Based on the children’s poor results on non-elliptical control items, see (46), Wood concluded that children at this age have trouble with sluicing, because they have not yet acquired question embedding in non-elliptical sentences.

(46) Somebody is painting a picture, but I don’t know who is painting a picture.

(Wood 2009: 144)

However, our pretest with embedded questions of the type in (47), showed that almost all children at this age are capable of interpreting embedded questions, questioning Wood's conclusion even more.

- (47) Ik zie wie een bord wast.
'I see who washes a plate.'

As discussed in section 2 a number of studies on discourse integration outside of elliptical structures casted doubt on the idea that children up to the age of six are capable of integrating discourse information (Karmiloff-Smith 1980; Hoekstra and Hyams 1998; Kramer 2000; Schaeffer 2000). Our results show that children under the age of six are quite capable of giving precedence to the verbal discourse context instead of visual information when interpreting this type of anaphora, the reconstruction of the ellipsis site in a sluicing sentence. Based on the results of studies on other types of ellipsis, such as NPE and VPE, that also found that children around the age of 4 use the verbal discourse in resolving the ellipsis site, we hypothesized that children would also do this with the ellipsis site in sluicing sentences, and that is precisely what we have found.

The question that comes up next is what do younger children do? This is something future research should look into; with the experimental paradigms we developed this can now be done. During the sessions with the children it became clear they had no trouble with the experimental method and we believe children from the age of 3;5 can be tested with these materials. When we know at what age children begin to understand and produce sluicing sentences, we can further determine the acquisition path for ellipsis by including sluicing next to NPE and VPE. This acquisition path for ellipsis represents the results found by Goksun et al. (2007) showing that children first acquire NPE and then VPE. Looking at how much structure is elided in these ellipsis types we expect sluicing to be acquired later than VPE.

Our method showed that children prefer an adult-like interpretation of sluicing sentences, but it cannot show that they would never allow a non-adult like interpretation. A follow-up experiment could use the same test sentences and pictures, but then in a truth value judgment paradigm. By presenting the children with one of the distractor pictures of Figure 1 or 2 and seeing if they accept a sluicing sentence for such a picture, we can tell if they are also able to reject non-target interpretations.

Other interesting points for future research include testing sluicing in other languages, and looking at different sluicing structures. By looking at different types of sluicing, for example sentences where an adverb is included in the antecedent clause, see (48), we can determine more precisely how much structure is reconstructed by children.

- (48) Someone is reading a book out loud, but I can't see who.

Do children behave adult-like and reconstruct the entire antecedent including the adverbial phrase 'out loud', or do they (at first) reconstruct only the verb and its object?

In section 1 four different theoretical analyses of sluicing and ellipsis were discussed, see (4)-(7). Numerous arguments for all four of these approaches have been put forward in the literature. At this stage, it was not our goal to distinguish between these analyses with our experimental data, but this is an interesting angle for follow-up experiments. If the underlying structure of an ellipsis site in

sluicing is indeed an embedded wh-question, we predict a correlation between the acquisition of sluicing and the acquisition of wh-movement. However, if there is no underlying wh-clause, but rather a null pronoun or an underlying cleft, then this link between the acquisition of sluicing and the acquisition of wh-movement is not expected.

Our results unambiguously show that ellipsis for Dutch 5-year-old children is easy to interpret and to produce, supporting the idea that ellipsis is acquired early. Other work shows that other types of ellipsis are already produced by 2-year-olds (Thornton and Jensen 2008; Santos 2009). When theoretically analyzing elliptical structures it is not obvious that these structures should be easy for children, since they involve a number of complicated steps and their interpretation is restricted in quite specific ways. But, as Roeper (2007) shows with an example dialogue without any form of ellipsis: “Life would be impossibly inefficient without ellipsis [...] – no conversation would be bearable without it” (Roeper 2007: 128). Children seem to pick this up quickly, even when it involves leaving out almost a whole sentence, as is the case in sluicing. Future research is needed to determine precisely at what age sluicing is acquired, but with our research we have contributed a novel paradigm for testing sluicing that can be used to further determine the acquisition path of sluicing in Dutch and other languages.

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