

Word Order Overrides Number Agreement: Dutch Children’s Interpretation and Production of *which*-Questions

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1. Introduction

Wh-questions in Dutch are structurally ambiguous between a subject-question and object-question interpretation. In contrast to many other languages, Dutch has no case marking on the *wh*-phrase, nor are there any word order differences between subject and object questions. In Dutch *which*-questions, however, subject-verb agreement can offer cues for disambiguation. Compare (1) and (2):

- (1) *Welke boerin wast de prinsessen?*
which farmer-FEM-SG wash-SG the princesses-PL
‘Which farmer is washing the princesses?’ (subject question)
- (2) *Welke boerin wassen de prinsessen?*
which farmer-FEM-SG wash-PL the princesses-PL
‘Which farmer are the princesses washing?’ (object question)

In (1), the singular finite verb agrees in number with the singular *wh*-phrase in first position, and there is no number agreement with the postverbal NP. Hence, the *wh*-phrase must be the subject. In (2), on the other hand, the plural finite verb does not agree in number with the singular *wh*-phrase, but rather with the plural noun phrase in postverbal position. Hence, (2) is interpreted as an object question.

Several studies have found that, cross-linguistically, subject questions are easier for children than object questions. The aim of the present study is to determine whether there is also a subject-object asymmetry in the acquisition of Dutch *which*-questions, and more specifically, whether Dutch children are sensitive to agreement cues in determining the grammatical role of the *which*-phrase. In the next section, we discuss previous studies and accounts of children’s acquisition of *wh*-questions. In section 3, we present an alternative account within the framework of Optimality Theory, which predicts that children who make errors in their comprehension of object questions nevertheless produce object questions in an adult-like way. Our study tests this prediction with a comprehension task and a production task administered to the same children, as presented in Sections 4 and 5. Section 6 discusses the implications of our findings.

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2. Background

There is an asymmetry in children's comprehension of *wh*-questions: subject questions are easier than object questions (see Stewart & Sinclair, 1975, on English learners between 5 and 8; van der Meer, van Atteveldt, Coopmans & Philip, 2001, on Dutch learners between 4 and 6; Friedmann, Belletti & Rizzi, 2009, on Hebrew learners between 3 and 5; see also studies comparing typically developing children with children with SLI ranging in the ages between 3 and 10, Hebrew: Friedmann & Novogrodsky, 2011; French: Jakubowicz, 2011; English: Deevy & Leonard, 2004; van der Lely, 1998). Children interpret subject questions correctly from early on (depending on the language, by age 4 or earlier). However, they show difficulties interpreting object questions up to the age of 9 (De Vincenzi, Arduino, Ciccarelli & Job, 1999 for Italian; Metz, van Hout & van der Lely, 2010 for Dutch). One type of explanation that has been advanced for the comprehension delay with object questions refers to their syntactic complexity. The structure of object questions is more complex than that of subject questions, because the subject interferes in the *wh*-movement relation between the *wh*-phrase and its trace in object position (Friedmann et al., 2009; Friedmann & Novogrodsky, 2011, Jakubowicz, 2011, van der Lely, 1998). Another explanation employs a processing argument: the filler-gap dependency between an object *wh*-phrase and its gap is longer than between a subject *wh*-phrase and its gap; the filler must be kept in working memory longer, requiring more processing resources (Avrutin, 2000; Deevy & Leonard, 2004; Metz *et al.*, 2010, 2012).

These complexity and processing accounts have been applied to explain the observed asymmetry between subject and object questions in children's comprehension, but have not been used to generate explicit predictions about children's production of subject and object questions. Syntactic accounts generally do not predict differences between production and comprehension, and so they would expect the same subject-object asymmetry in production as in comprehension. Processing models tend to be restricted to either comprehension or production, but if the processing argument is extended from comprehension to production, a similar difficulty in terms of a longer filler-gap dependency for object questions would be expected in production. Interestingly, in a *wh*-question elicitation study in Italian, Guasti, Branchini and Arosio (2012) indeed find an asymmetry between subject and object questions in children's production, but only for *who*-questions: four and five-year-old Italian children produced more correct subject questions than object questions in the case of *who*-questions. For *which*-questions, on the other hand, no significant difference was found between subject and object questions. This seems to suggest that there is an additional asymmetry in acquisition: between children's production and their comprehension of *which*-questions.

3. Optimality Theory account

A more specific explanation for children's errors in their comprehension of *which*-questions can be formulated in terms of interacting constraints, as in Optimality Theory (OT). In OT, a form is grammatical if it satisfies the set of hierarchically ranked constraints of the grammar better than any of its competitors. Likewise, the interpretation of a form is the meaning that satisfies the same set of ranked constraints better than any of its competitors. Violation of weaker constraints is tolerated if this results in satisfaction of a stronger constraint. Violable constraints that may play a role in accounting for children's interpretation of subject and object questions are AGREEMENT, WH-FIRST and SUBJECT-FIRST. These constraints have been motivated independently (Bouma, 2008; de Hoop & Lamers, 2006) to account for word order in Dutch as well as for Dutch adults' online processing of word order.

AGREEMENT:	The verb agrees with the subject.
WH-FIRST:	A <i>wh</i> -element comes first in a sentence.
SUBJECT-FIRST:	The subject comes first in a sentence.

Adult constraint ranking: AGREEMENT >> WH-FIRST >> SUBJECT-FIRST

The constraints WH-FIRST and SUBJECT-FIRST refer to the linearly first position in the sentence. The constraint SUBJECT-FIRST refers to the subject argument of a semantic predicate (in transitive sentences such as those in our study typically the agent), not to a certain position in a syntactic tree. For Dutch

adults, AGREEMENT is stronger than SUBJECT-FIRST. This explains why questions such as (2) are interpreted as object questions, violating the weaker SUBJECT-FIRST but satisfying the stronger AGREEMENT. Furthermore, WH-FIRST is stronger than SUBJECT-FIRST, given that *wh*-objects are fronted in Dutch, leaving subjects in sentence-internal position.

We can account for children's comprehension errors with object questions if we assume that Dutch children have not yet ranked their constraints in an adult-like way (in line with the way language acquisition is commonly explained in OT, see Tesar & Smolensky, 1998; Boersma & Hayes, 2001). If for Dutch children SUBJECT-FIRST is stronger than AGREEMENT, they will assign a subject-question interpretation to subject questions such as (1). This interpretation satisfies all constraints. However, employing the same constraint ranking, Dutch children will also assign a subject-question interpretation to object questions such as (2), thus making reversal errors with object questions (see Fig. 1a). This is because object questions give rise to a conflict between the constraints SUBJECT-FIRST and AGREEMENT. Either the *wh*-element is interpreted as the subject, violating AGREEMENT but satisfying SUBJECT-FIRST, or the *wh*-element is interpreted as the object, violating SUBJECT-FIRST but satisfying AGREEMENT. Because SUBJECT-FIRST is stronger than AGREEMENT according to the child's grammar, it is more important to satisfy SUBJECT-FIRST than to satisfy AGREEMENT. Hence, the *wh*-element is interpreted as the subject in object questions too.

	Input form: Sentence (2) <i>Welke boerin wassen de prinsessen?</i> which farmer-FEM-SG wash-PL the princesses-PL	WH- FIRST	SUBJECT- FIRST	AGREEMENT
☞	Subject-question interpretation			*
	Object-question interpretation		*!	

Fig. 1a: OT tableau of children's interpretation of object questions. The input is a form (here an object question such as sentence (2)), and the output is the optimal interpretation of this form (indicated by the pointing hand).

	Input meaning: WASH(princesses, ?farmer)	WH- FIRST	SUBJECT- FIRST	AGREEMENT
	<i>Welke boerin wast de prinsessen?</i> which farmer-FEM-SG washes-SG the princesses-PL (= sentence (1))		*	*!
☞	<i>Welke boerin wassen de prinsessen?</i> which farmer-FEM-SG wash-PL the princesses-PL (= sentence (2))		*	
☞	<i>Welke boerin wordt door de prinsessen gewassen?</i> which farmer-FEM-SG is-SG by the princesses-PL washed (= passive question)		*	
	<i>De prinsessen wassen welke boerin?</i> the princesses-PL wash-PL which farmer-FEM-SG (= <i>wh</i> -in-situ question)	*!		

Fig. 1b: OT tableau of children's production of object questions. The input is a meaning (here, the semantic predicate WASH with a subject argument and a *wh*-object argument), and the output consists of the optimal forms for expressing this meaning (indicated by the pointing hands).

The same OT constraints that account for comprehension also play a role in production. However, they do not always have the same effect in production as in comprehension (Hendriks, de Hoop & Lamers, 2005). In comprehension, the language user chooses one meaning among various meanings for the interpretation of a given form; in production she chooses one form among various forms in order to express a given meaning. When the speaker wishes to express a subject-question meaning, she can choose to place the *wh*-subject in first position, as in the subject-question form in (1), or to place some

other phrase in first position. Obviously, a subject-question form is the best choice, as this form satisfies all constraints: the semantic subject is in first position, the *wh*-element is in first position, and the verb agrees with the subject.

A different situation arises when the speaker wishes to express an object-question meaning (see Fig. 1b). In this case, the speaker can decide to place the *wh*-object, the non-*wh*-subject, or some other phrase in first position. Now the ranking of the constraints becomes relevant here, as there is no form that satisfies all three constraints. Candidate question forms that have the *wh*-object in first position violate SUBJECT-FIRST, while candidate question forms that do not have the *wh*-object in first position violate WH-FIRST. Note that the passive-question form *Welke boerin wordt door de prinsessen gewassen?* ('Which farmer is being washed by the princesses?') violates SUBJECT-FIRST too, as this constraint refers to the semantic subject (i.e., the subject argument of the semantic predicate in the input, so 'princesses' in Fig. 1b). Because the semantic subject appears in a *by*-phrase rather than in first position in a passive-question form, this form violates SUBJECT-FIRST. The only assumption specific to passives is that agreement in passives is between the verb and the semantic object.

If WH-FIRST is stronger than SUBJECT-FIRST, the optimal form must be selected among the candidates with the *wh*-element in first position, even though they might violate SUBJECT-FIRST. Candidate forms satisfying WH-FIRST are, among others, the subject-question form (1), the object-question form (2), and the passive-question form. The subject-question form in (1) violates AGREEMENT if it is used to express an object-question meaning: if the *wh*-phrase in (1) is the intended object, there is no number agreement between the verb and the postverbal subject. Because AGREEMENT is the strongest of the three constraints in the adult grammar, using a subject-question form like (1) to express an object-question interpretation is ruled out by AGREEMENT.

Crucially, even if AGREEMENT is the weakest of the three constraints, as in the grammar we hypothesize for children, AGREEMENT is decisive for expressing an object-question meaning. Because a subject-question form violates AGREEMENT whereas the object-question form and the passive-question form do not, the latter two forms satisfy the constraints of the grammar better than the subject-question form and hence are the optimal forms for expressing this meaning. Thus, the OT account predicts that both adults and children will produce object questions and passive questions for expressing an object-question meaning, even though the constraints of their grammars are ranked differently.

Comparison of Figures 1a and 1b illustrates an important property of the constraint-based framework OT that distinguishes it from rule-based linguistic frameworks: a weak constraint such as AGREEMENT can be decisive in some situations (here: the production of object questions) but not in other situations (here: the comprehension of object questions) due to the pattern of constraint violations of competing candidates. In OT, constraints can be violated, but only to avoid violation of a stronger constraint. This is the case in Fig. 1a, where violation of AGREEMENT by choosing a subject-question interpretation is the only way to avoid a violation of SUBJECT-FIRST triggered by an object-question interpretation. In Fig. 1b, on the other hand, violation of AGREEMENT is not inevitable, as there are competing candidates that satisfy the stronger constraints equally well and, in addition, do not violate AGREEMENT.

The hypothesis that Dutch children rank SUBJECT-FIRST above AGREEMENT leads to two predictions. First, we expect adult-like comprehension of subject questions, but non-adult-like comprehension of object questions (i.e., a reversal interpretation). Second, this constraint ranking predicts that children's production of subject and object questions will not deviate from adults' questions. In particular, children and adults are both predicted to produce object questions and passive questions for object-question meanings. Moreover, children are predicted not to make any agreement errors in their questions. Hence, the OT account predicts an asymmetry between children's production and the same children's comprehension of object questions. In this way, the OT account not only explains the previously found delay in children's comprehension of object questions in Dutch and Italian (see Metz *et al.*, 2010, 2012; De Vincenzi *et al.* 1999), but it may also explain the absence of a difference between subject and object *which*-questions in their production (Guasti *et al.*, 2012).

In order to test this hypothesis for Dutch *which*-questions, we carried out a comprehension task and a production task with the same group of Dutch-speaking children and adults. The aim of this experiment is to investigate (i) how Dutch children interpret subject and object questions in the presence of disambiguating number agreement cues, (ii) how they produce subject and object questions, and (iii) whether they make any agreement errors with questions.

4. Children's and adults' interpretation of *which*-questions

4.1. Pretest

Before we administered the comprehension task, we carried out a pretest to see whether the children were sensitive to number agreement as expressed on finite verbs in declarative sentences. Thirty-four children between the ages of 6;2 and 7;10 (mean: 7;0) participated in this pretest. The pretest involved a Picture Selection Task, in which a pair of pictures was shown on a computer screen, while a pre-recorded sentence was presented auditorily. The children were asked to select the picture that best matched the sentence.

We used sentences like *Ze heeft/hebben de verpleegster gefilmd* ('pronoun has-SG/have-PL the nurse filmed'). The Dutch subject pronoun *ze* is ambiguous and can refer to a singular feminine referent ('she') as well as a plural referent ('they'). In these sentences, therefore, the number of the subject referent is exclusively determined by the number marking on the finite verb. Each picture pair consisted of one picture corresponding to the singular interpretation of the subject and the other one corresponding to the plural interpretation of the subject. The sentences either contained a singular (*heeft*) or a plural auxiliary (*hebben*). For the pretest, we used a total of 16 items (8 in the singular condition, 8 in the plural condition), with four reversible transitive verbs (*filmen* 'to film', *slaan* 'to hit', *schoppen* 'to kick', and *schilderen* 'to paint'). The position of the target picture (left or right) and the position of the subject referent on the pictures were balanced over four lists.

Of the 34 children, 23 passed the pretest on a criterion of scoring 7 or 8 out of 8 correct items in both conditions. With these children we can be sure that they are sensitive to the number information provided by the verbal inflection, since that was the only cue to select the correct picture. Therefore, we only analyzed the *wh*-comprehension results and *wh*-production results of these passers. The observation that about a third of our 6- and 7-year old Dutch participants failed to pass the pretest with declarative sentences is in line with the finding of late acquisition of subject-verb agreement in declarative sentences in English (Johnson, de Villiers & Seymour 2005) and Spanish (Pérez-Leroux 2005), but contrasts with the finding of early mastery in French (Legendre, Barrière, Goyet & Nazzi 2010).

4.2. Participants

The 23 passers of the pretest (13 male, age range: 6;6-7;10, mean: 7;1) participated in two tasks involving *which*-questions: a comprehension task and a production task. In addition, we tested 27 adults (undergraduate students at the University of Groningen) as a control group (6 male, age range: 19;11-32;2, mean: 23;8).

4.3. Materials and design

To test the comprehension of *which*-questions in Dutch, we carried out a Picture Selection Task using a visual world paradigm. As in the pretest, two pictures were shown side by side (e.g., Fig. 2) while a prerecorded sentence was presented auditorily. The participants were instructed to press the left button on a button box to select the left picture as the picture that best corresponds to the sentence, and the right button to select the right picture. The design manipulated two factors: Question Type (subject or object question) and *Wh*-phrase (singular or plural). As a result, four different question types were tested: singular subject questions (SubSing), plural subject questions (SubPlur), singular object questions (ObjSing), and plural object questions (ObjPlur).

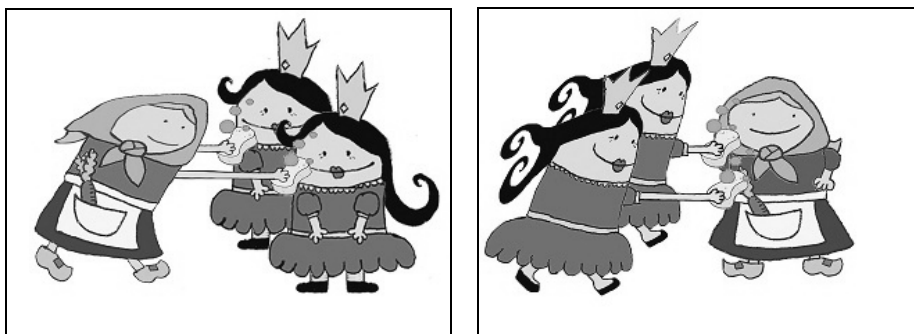


Fig. 2: Example of a picture pair. The left picture corresponds to the subject-question interpretation of sentence (3), and the right picture corresponds to the object-question interpretation of sentence (3).

- (3) SubSing:
Welke boerin heeft de prinsessen gewassen?
 Which farmer-SG have-SG the princesses-PL washed
 ‘Which farmer has washed the princesses?’
- (4) SubPlur:
Welke boerinnen hebben de prinses gewassen?
 Which farmers-PL have-PL the princess-SG washed
 ‘Which farmers have washed the princess?’
- (5) ObjSing:
Welke boerin hebben de prinsessen gewassen?
 Which farmer-SG have-PL the princesses-PL washed
 ‘Which farmer have the princesses washed?’
- (6) ObjPlur:
Welke boerinnen heeft de prinses gewassen?
 Which farmers-PL have-SG the princess-SG washed
 ‘Which farmers has the princess washed?’

All pictures contained three figures: one agent and two patients, or two agents and one patient. One picture matched the subject question interpretation of the *which*-question (Fig. 2, left), the other picture matched the object question interpretation (Fig. 2, right). As in the pretest, the test sentences were in the present perfect. The difference between singular and plural verbal inflection on the auxiliary (*heeft* vs. *hebben* ‘has vs. have’) was highly salient; the two forms differ in number of syllables and vowel quality. We used six reversible transitive verbs: *duwen* ‘push’, *kietelen* ‘tickle’, *slaan* ‘hit’, *schoppen* ‘kick’, *vangen* ‘catch’ and *wassen* ‘wash’. Every verb was used once in every condition, leading to 24 (6x4) test items. There were also eight filler items. These expressed an intransitive action (e.g. ‘Which pilot has slipped?’) or a non-reversible action with an inanimate object (e.g. ‘Which nurse has spilled the soup?’). The filler items were used to check whether children understood the task. Again, the position of the target picture and the agent within the pictures were balanced over four lists.

4.4. Procedure

As in the pretest, the picture pairs were shown on a computer screen and participants had to select the picture that matched an auditorily presented sentence. The Picture Selection Task was designed and ran by E-Prime 2.0 Professional software. The task was presented on a 17" Tobii T120 eyetracker with a screen resolution of 640 x 480 using firmware 1.1.7. We only present the offline answers of the comprehension task; the gaze data are presented elsewhere (Schouwenaars, 2012). The test items were preceded by two practice items with intransitive verbs, to make sure the participants understood the task.

4.5. Results and discussion

Table 1 shows children's and adults' mean accuracy scores in the four conditions.

	Children		Adults	
	Mean proportion correct	SE	Mean proportion correct	SE
SubSing	.99	.010	.99	.009
SubPlur	.99	.007	1.00	.000
ObjSing	.25	.037	.93	.020
ObjPlur	.16	.031	.92	.021

Table 1: Mean accuracy scores of children's and adults' comprehension of *which*-questions.

As predicted, children were less accurate with object questions than with subject questions. In fact, children's scores on object questions were very poor. A factorial repeated-measures ANOVA on the arcsine transformed data was computed with two levels: Question type (subject, object) and *Wh*-phrase (singular, plural). There was a main effect of Question type ($F(1,22) = 152.74, p < 0.001, \eta_p^2 = 0.874$) and *Wh*-phrase ($F(1,22) = 5.76, p < 0.05, \eta_p^2 = 0.207$). No interaction effects were found. Note that the size effect of *Wh*-phrase is small.

These mean accuracy scores do not reveal whether the low accuracy on object questions is due to a generally low pattern of accuracy across children, or whether some children responded incorrectly on all object questions while other children responded correctly on all of these items. Inspection of the individual results showed that just a few children ($n=2$ for ObjSing and $n=1$ for ObjPlur) responded correctly on all items. Most children ($n=15$ for ObjSing and $n=19$ for ObjPlur) scored zero or one object question correctly. So most children consistently interpreted object questions as subject questions.

The adults also scored lower on object questions than on subject questions, although this difference is much smaller than for children. A factorial repeated-measures ANOVA on the arcsine transformed data shows a main effect of Question type ($F(1,26) = 7.81, p < 0.05, \eta_p^2 = 0.231$). There were no other main effects or interactions.

The OT analysis presented in Section 3 predicted that children would interpret object questions as subject questions, and so they did. Children correctly interpreted subject questions (SubSing: 99%, SubPlur: 99%), but scored very poorly on object questions (ObjSing: 25%, ObjPlur: 16%), interpreting them instead as subject questions. The adults scored at ceiling on subject questions (SubSing: 99%, SubPlur: 100%) and near-ceiling on object questions (ObjSing: 93%, ObjPlur: 92%); even though it was small, this difference was significant. These results will be further discussed and compared with the production results in Section 6.

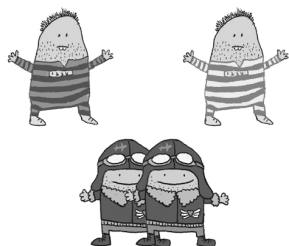
5. The production of *which*-questions by children and adults

Our OT analysis predicts that children show a non-adult-like reversal interpretation of object questions, but simultaneously predicts that children express object-question meanings in an adult-like way, producing object questions as well as passive questions. In this section, we present the production task we carried out with the same participants who took part in the comprehension task. One adult was excluded because he did not understand the task and only produced non-target-like forms (e.g. '*Which colour clothes are the pilots wearing that are being pushed by the thief?*'). This left 23 children and 26 adults in the production task.

5.1. Materials and design

We carried out an elicited-question task modelled after the Diagnostic Evaluation of Language Variation test (DELV; Seymour, Roper & De Villiers, 2003). Every item involved a sequence of three pictures that were shown one by one (Fig. 3).

Picture 1: Introduction



Picture 2: Question elicitation



Picture 3: Wrap-up



(7) *Hier zie je een rode dief, een gele dief en twee piloten.*
 ‘Here you see a red thief, a yellow thief and two pilots.’

(8) *Dit gaat over kietelen. Stel me de goede vraag en ik laat je het antwoord zien.*
 ‘Here you see tickling. Ask me the right question and I’ll show you the answer.’

(9) *Wat is er gebeurd?*
 ‘What happened?’

Fig. 3: Sample item for object questions in the elicited-question task.

The first picture was accompanied by an introductory sentence introducing the characters of the event. The characters had differently colored clothes, and were referred to as such. The second picture showed an action, but with crucial parts of the agent(s) or patient(s) covered by a white spot. This way, participants could see what was happening in the picture, but they could not see which agent (in subject question items) or which patient (in object question items) was involved. Using the instruction in (8), a *which*-question was elicited. A *which*-question is appropriate here (in contrast to a *who*-question), because two potential agents (or patients) had been introduced. Finally, picture 3 was shown so as to provide an answer to the participant’s question, and a description of this final picture was asked, eliciting a declarative sentence. This allowed us to check whether the participants had interpreted the action shown in picture 2 correctly.

The production task consisted of 24 test items, preceded by 5 (children) or 2 (adults) practice items with intransitive verbs. The same four types of questions were targeted as in the comprehension task (SubSing, SubPlur, ObjSing and ObjPlur). The position of the agent within the pictures and the order of items were balanced over four lists.

5.2. Procedure and scoring

The questions produced by the participants were recorded via E-prime. Because the production task took about 20 minutes, most children and some adults did not complete the production task. For this reason we only analyzed the first four items of each condition, so that for each participant we had 16 data points. For every condition, we scored the participants’ responses as: Subject questions, Object questions, Passive questions, Agreement Errors (involving incorrect number of the noun or verb) and Other (incorrect argument structure, other question, or no response).

5.3. Results and discussion

When the target form was a subject question, adults indeed produced subject questions (SubSing: 102/104, SubPlur: 100/104). When the target form was an object question, adults produced two kinds of forms: object questions and passive questions (ObjSing: 102/104, ObjPlur: 104/104). For target subject questions, children mostly produced subject questions (SubSing: 86/92, SubPlur: 83/92). For target object questions, children generally produced object questions and passive questions (ObjSing: 72/92, ObjPlur: 73/92). Fig. 4 shows the distribution of produced forms.

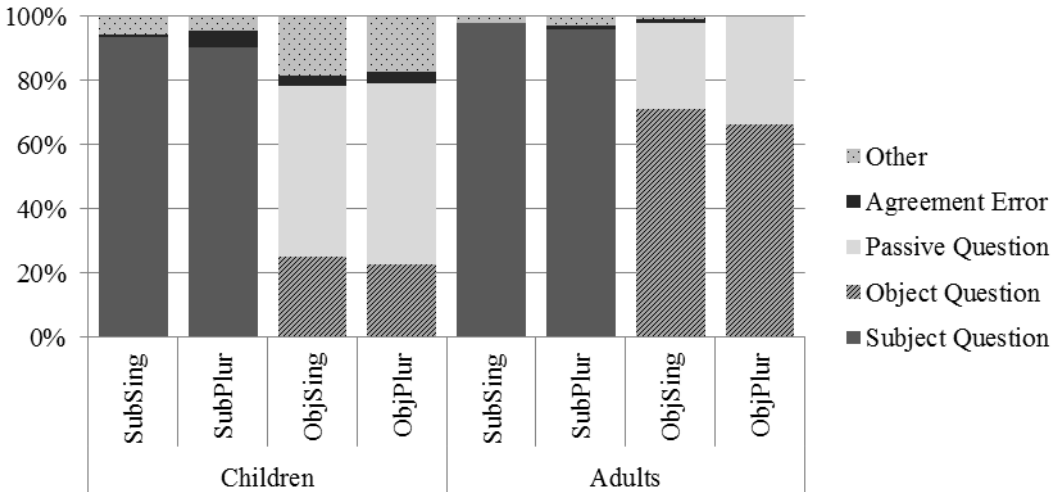


Fig. 4: Children's and adults' production of *which*-questions (percentages).

A repeated-measures ANOVA with 4 factors was computed: Question type (subject, object), Verb number (singular, plural), Produced question form (subject question, object question, passive question, agreement error) and Age (adults, children). There were several main effects and interactions. Since we are interested in whether the children are adult-like in their production, we only report the main effects and interactions between the age groups. There was a main effect of Age ($F(1,47)=14.32$, $p < 0.001$, $\eta_p^2=0.234$). There was also an interaction between Age and Question type ($F(1,47)=12.40$, $p < 0.01$, $\eta_p^2=0.209$) and an interaction between Age and Produced question form ($F(1,47)= 10.14$, $p < 0.001$, $\eta_p^2=0.919$). Thus, the children's production pattern of *which*-questions differed significantly from that of the adults. When a target object question was elicited, children produced more passive questions and fewer object questions than adults.

So the children performed as predicted by the OT account: for target subject questions, they produced subject questions in nearly 100% of the cases. For target object questions, they produced mainly object questions and passive questions, although in a different distribution than the adults. Crucially, children made virtually no agreement errors in their questions.

6. General discussion

We now compare the comprehension and production results, discussing them in relation to the predictions of our OT account in terms of violable and ranked constraints. We hypothesized that Dutch children's grammars have a different constraint ranking than those of Dutch adults. Specifically, Dutch children rank the SUBJECT-FIRST constraint above the AGREEMENT constraint, in contrast to Dutch adults. This hypothesis makes two predictions. First, we expect that children will tend to interpret all question types as subject questions, despite a possible number mismatch this might create. For adults, on the other hand, number agreement is the decisive factor, which will allow them to properly differentiate subject and object questions. Second, in contrast to the grammatical interference accounts and the processing accounts, our OT account expects no differences in children's and adults' production patterns of *wh*-questions, despite the hypothesized differences in constraint rankings. Because all potential forms either violate SUBJECT-FIRST or WH-FIRST, the AGREEMENT constraint is decisive in production, irrespective of the constraint ranking. Hence, both groups are predicted to produce object questions and passive questions for object-question meanings, since these forms satisfy the stronger WH-FIRST constraint as well as the AGREEMENT constraint. Our OT account thus not only predicts an asymmetry between the comprehension of subject questions versus object questions; it also predicts an asymmetry between children's target-like production of object questions and the same children's errors in comprehension. With our comprehension task and production task we aimed to investigate (i) how Dutch children interpret subject and object *which*-questions with disambiguating

number agreement cues, (ii) how they produce subject and object questions, and (iii) whether they make any agreement errors with questions.

With a pretest we selected Dutch 6 and 7-year-olds who were able to use number agreement as a cue for subjecthood in their interpretation of declarative sentences. In the *wh*-comprehension task however, these children failed to use number agreement as a cue in the interpretation of object questions, as they interpreted all *which*-questions as subject questions. Apparently then, the children considered word order (SUBJECT-FIRST) to be more important than number agreement between verb and subject (AGREEMENT), which leads to a reversal interpretation of object questions. This finding aligns with previous studies that found a subject-object asymmetry with *wh*-questions (Ervin-Tripp, 1970; Metz *et al.*, 2010; De Vincenzi *et al.* 1999).

In the production task, the same children produced subject questions in the *wh*-subject condition. In the *wh*-object condition, they produced object questions (24%) and passive questions (55%). This percentage of correct object questions in our Dutch children is comparable to the results of the study with Italian children by Guasti *et al.* (2012). A high number of passives may seem surprising, given that speakers generally tend to avoid passives. Nevertheless, in our elicitation task, a passive question is a good alternative to an object question, since it avoids a violation of the AGREEMENT constraint. As compared to the adults, who also produced object questions as well as passive questions, the children produced fewer object questions than the adults. We believe that the adults' production of so many object questions might have been a priming effect of the preceding comprehension task, which contained object questions but no passive questions. As children's memory skills are still developing, they may have been less susceptible to this priming effect. Whether or not priming plays a role in the adults in our study can be investigated by reversing the order of the tasks (first production, then comprehension), to see if adults will produce more passive questions and fewer object questions when they are not primed.

The Dutch children made hardly any agreement errors in their production (less than 4%). This stands in stark contrast to the acceptance of number agreement errors in their comprehension of object questions (80%). These production results show that subject-verb agreement is firmly acquired, which confirms the results of the pretest with declarative sentences. The contrast in sensitivity to number in the production and comprehension tasks raises the question why children, who have acquired number agreement and are able to produce correct agreement in object questions in the production task, are not sensitive to number cues when interpreting object questions in the comprehension task. On our OT account, we expected a difference between comprehension and production, with correct production but incorrect interpretation of object questions. The difference in sensitivity to number cues in the comprehension versus production task thus falls out from our OT analysis. On the interference accounts or the processing accounts, on the other hand, the same asymmetry between subject and object questions would be expected in production as in comprehension: the subject poses a similar interference effect for the speaker as for the listener, and the larger distance between filler and gap in object questions (compared to subject questions) is the same in production as in comprehension.

In our test sentences we chose to use a present perfect instead of simple present tense. By doing so, the number cues on the verb (*heeft* 'has' and *hebben* 'have') were more salient than if we had used present tense forms (e.g., *wast* 'washes' versus *wassen* 'wash' for the item in Figure 2). The two auxiliary forms differ in number of syllables; furthermore they contain different consonants and vowels. The saliency of the number cues strengthens the idea that children's poor comprehension of object questions is not a matter of a failure to perceive the inflection on the verb. Rather, they seem to disregard number agreement, and find word order more important. As a consequence, Dutch children interpreted object questions as subject questions.

Our account gives rise to several further predictions. Assuming that SUBJECT-FIRST is ranked above AGREEMENT in Dutch children's grammar, our account predicts that Dutch children who make errors in their interpretation of object questions should also fail to use number agreement information in declarative OVS sentences. This prediction can easily be tested in a comprehension experiment. Furthermore, as *wie* 'who' in Dutch is not specified for number, we predict that there will not be a similar production/comprehension asymmetry for *who*-questions in Dutch. Because Dutch *who*-questions always allow a subject-question interpretation, there is no intrinsic conflict between word order and agreement information. Hence, an immature constraint ranking will not result in a non-adult-like output and no difficulty is expected for children's comprehension of *who*-questions.

Comparing object questions across the two tasks, the percentage of object questions produced by the children (24%) is only slightly higher than their accurate interpretations (20%). This relatively low number of object questions is due to the availability of another form: a passive question. This apparent ‘avoidance’ of object questions should, however, not be taken as evidence that children have general difficulties with object fronting. First of all, adults ‘avoided’ object questions somewhat in the production task too, in over 30% of the cases. Second, the children produced passive questions, which they should not be able to if they have general difficulties with long-distance movements. Furthermore, it is possible that passive questions are simply more frequent than object questions or that the choice between passive questions and object questions is determined by additional factors such as definiteness or animacy. Unfortunately, there does not seem to be any literature on the distribution of passive questions and object questions. The distribution of subject questions and object questions in Dutch is addressed in a corpus study by Kaan (1997). Her study reveals that in main clauses with any type of predicate, subject-initial *which*-questions (n=85, 61%) were more frequent than object-initial *which*-questions (n=54, 39%). However, considering both main and embedded clauses and restricting these counts to questions of the type we used in our study (transitive predicates only), object questions (n=218, 79%) were more frequent than subject questions (n=57, 21%). Animacy may be an additional factor in the production of object questions, as most object questions had an animate subject and inanimate object (148 of the 218), whereas in most subject questions the subject and object were equal in animacy (34 of the 57).

Both object questions and passive questions are optimal forms from the perspective of the grammar. Seeing that the children gave reversal interpretations of object questions but produced correct forms for object questions, we conclude that there is an asymmetry in the acquisition of object questions: correct production of Dutch *which*-questions precedes correct comprehension.

7. Conclusions

In this study, we investigated Dutch 6 and 7-year-old children’s comprehension and production of *which*-questions. We found that children who are able to use number agreement as a cue for subjecthood in their interpretation of declarative sentences, nevertheless do not use number agreement in *which*-questions when it conflicts with word order cues. In contrast to Dutch adults, Dutch children considered word order to be a more important cue for subjecthood than agreement. As a result, they misinterpreted object questions as subject questions. These results align with previous findings regarding the acquisition of *wh*-questions. In addition to this subject-object asymmetry with *which*-questions, we found another asymmetry in Dutch child language, namely between children’s comprehension of object questions and their production of object questions. The same children who misinterpreted object questions as subject questions, produced object questions and passive questions to express object-question meanings, like adults. They hardly made any agreement errors in production. This pattern of incorrect comprehension but correct production was predicted by our OT account, which proceeded from the hypothesis that children have not yet ranked the constraints of their grammar in an adult-like way.

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