

Understanding *who* and *which* questions in five to nine-year-old Dutch children: the role of number

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1. Wh-questions in Dutch and the role of number

This paper focuses on the processing of wh-questions in typically developing Dutch children from 5 to 9 years old.¹ Wh-words are words which introduce a question, such as *wie* ‘who’, *wat* ‘what’, *waar* ‘where’, *wanneer* ‘when’ and *welke* ‘which’. In interrogative sentences, wh-phrases occur in first position and relate to a gap further on in the sentence. In generative syntax, it is assumed that this is a case of filler-gap dependency in which wh-phrases move from their original position inside the clause to the beginning of the sentence. This movement creates a gap in the underlying sentence structure, as illustrated in (2), which is the object question related to (1).

- (1) The boy washes Mark.
(2) Who does the boy wash ___ ?
↑
└──────────────────┘

Dutch wh-questions with *wie* ‘who’, *wat* ‘what’ and *welke* ‘which’ are structurally ambiguous between a subject and an object reading of the wh-phrase. The Dutch question *Wie wast de jongen?* (literally: ‘Who washes the boy?’) in (3) has two interpretations: The wh-phrase *wie* ‘who’ can be interpreted as subject or object. This is illustrated in (4).

- (3) *Wie wast de jongen?*
who wash-SG the boy
‘Who is washing the boy?’ and ‘Who is the boy washing?’
- (4) a. Subject question: *Wie ___ wast de jongen?*
↑
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b. Object question: *Wie wast de jongen ___ ?*
↑
└──────────────────┘

Wh-questions in Dutch thus differ from those in English and many other languages where word order and/or case-marking signals the structural difference between subject and object questions.

¹This research is part of the EU-funded COST A33 project “Crosslinguistically Robust Stages of Children’s Linguistic Performance, with Applications to the Diagnosis of Specific Language Impairment” (P.I. U. Sauerland, 2006-2010). Researchers from twenty-five different countries participate. The goal is to provide a cross-linguistically uniform picture of 5-year-olds’ knowledge of grammar, which can serve as the basis for further research into clinical markers for the detection of SLI. The COST research themes include pronouns, quantification, implicatures, passives, tense and aspect, and questions.
<http://www.zas.gwz-berlin.de/index.php?id=47&L=1>

The structural ambiguity of Dutch *wh*-questions is sometimes resolved by the number marking on the finite verb. Number marking does not help interpretation, when number on the verb and postverbal NP match. The verb agrees with the postverbal NP as well as the *wh*-phrase *wie* ‘who’, and so there is ambiguity, as we just saw in (3). This holds even when the verb is plural, as in (5). The verb agrees with the plural NP *de jongens* ‘the boys’ which can thus be subject. But it also agrees with the *wh*-word *wie* ‘who’, which can also be subject. In the latter case the plural verb implies that the variable under question is a plurality and the answer must be a plurality too (e.g., ‘the mothers are washing the boys’).

- (5) *Wie wassen de jongens?*
who wash-PL the boys
‘Who is washing the boys?’ and ‘Who are the boys washing?’

The structural ambiguity disappears, however, when there is a number mismatch between verb and postverbal NP, as in (6). Here the number on the verb provides a clue for determining that the question is a subject question. In (6a) the verb is singular. The postverbal NP *de jongens* ‘the boys’ cannot be the agreeing subject because it is plural, hence the *wh*-phrase *wie* ‘who’ must be subject (cf. ‘the mother is washing the boys’). (6b) is the mirror image: the verb is plural and so the postverbal NP *de jongen* ‘the boy’ cannot be subject because it is singular, hence *wie* ‘who’ must be subject (cf. ‘the mothers are washing the boy’). So number effectively disambiguates these questions.

- (6) a. *Wie wast de jongens?*
who wash-SG the boys
‘Who is washing the boy?’
b. *Wie wassen de jongen?*
who wash-PL the boy
‘Who is washing the boy?’

Note that the Dutch question word *wie* ‘who’ is underspecified for number. As subject it is compatible with both singular and plural verbs. This is different for *wh*-phrases with *welke* N ‘which N’ where the noun determines the number of the *wh*-phrase. In *welke* ‘which’ questions with a number mismatch between verb and postverbal NP, there are therefore two overt clues. Consider (7) where the *wie*’s ‘who’ from (6) have been replaced by *welke* ‘which’ phrases. In (7) the verb does not agree with the postverbal NP, like (6). In addition, the *welke* ‘which’ phrase agrees with the verb and thus overtly qualifies as subject, so these are subject questions (cf. ‘the mother is washing the boys’ in (7a) and ‘the mothers are washing the boy’ in (7b)).

- (7) a. *Welke vrouw wast de jongens?*
Which woman wash-SG the boys
‘Which woman is washing the boy?’
b. *Welke vrouwen wassen de jongen?*
which women wash-PL the boy
‘Which women are washing the boy?’

Subject-verb agreement in *welke* ‘which’ questions can also work as an indirect parsing clue. In (8) the verbs have the opposite number as the verbs in (7) which turns the interpretation around. In (8) the verb agrees with the postverbal NP.

Moreover it does not agree with the *welke* ‘which’ phrase, which therefore cannot be subject. Hence these are object questions with the postverbal NP as agreeing subject (cf. ‘the boys are washing the mother’ in (8a) and ‘the boy is washing the mothers’ in (8b)).

- (8) a. Welke vrouw wassen de jongens?
Which woman wash-PL the boys
‘Which woman are the boys washing?’
b. Welke vrouwen wast de jongen?
which women wash-SG the boy
‘Which women is the boy washing?’

Summarizing the cues which disambiguate Dutch wh-questions, in *wie* ‘who’ questions with a number mismatch between verb and postverbal NP there is a parsing inference that the question word *wie* ‘who’ must be the subject, (6). In *welke* ‘which’ questions with the same mismatch, the subject-verb agreement between verb and wh-phrase directly establishes the *welke* ‘which’ phrase as subject, (7). In *welke* ‘which’ questions with a number mismatch between verb and *welke* ‘which’ phrase, the number match between verb and postverbal NP leads to the parsing inference that the wh-phrase must be the object.

In this study we investigate children’s sensitivity to number in the processing of wh-questions. After reviewing the literature on children’s comprehension of wh-questions (section 2), we formulate our research questions and hypotheses in section 3. We describe the study in section 4 and the results in section 5. Section 6 presents the discussion and in section 7 we draw our conclusions.

2. Acquisition of wh-questions: A subject-object asymmetry

Children’s acquisition of wh-questions has been extensively studied for English. Ervin-Tripp (1970) found that children understand *what* and *where* questions between 1;9 and 2;5 years. At three years of age, children also understand *who* questions. *When* questions were acquired last, around the age of 4.

Stewart and Sinclair (1975) investigated the development of comprehension in children from 4;10 to 8;11 years old. They found that children were at ceiling with *who* questions. Object questions with *which* were the hardest (only 51% of the participants answered these correctly). Furthermore, younger children performed worse than older children.

Valian and Casey (2003) note that children can get around potential problems with questions, because for many questions it is not necessary to use all the syntactic information available. For example, for a question like *Where can Sally play?*, a child can make a very reasonable guess at interpretation with just the words *where*, *Sally* and *play*, and thus answer the question correctly without processing its structure. In other questions, however, such shortcuts can easily lead to wrong interpretations, in particular, for pairs with subject vs. object questions, as used in the Stewart and Sinclair study, (9)-(10).

- (9) Which bear knocked over the monkey?
(10) Which bear did the monkey knock over?

Both questions contain the same content words, but their meaning is different, of course. Stewart and Sinclair find that children have difficulties interpreting *which-*

object questions such as (10) (51% correct), but not *which*-subject questions such as (9) (94,4% correct). Tyack and Ingram (1976) similarly establish that children had a better understanding of *who*-subject questions (80% correct) than *who*-object questions (56% correct). Philips, Coopmans, van Atteveldt and van der Meer (2001) find that English children continue having difficulties with object questions much longer than with subject questions. The most frequent mistake children make with object questions is that they produce subject answers, thus interpreting object questions as subject questions.

The latter study was also conducted in Dutch (van der Meer, van Atteveldt, Coopmans & Philip, 2001). Van der Meer and colleagues employed the ambiguity of Dutch questions to see which interpretation children from 4;3 to 6;9 as well as adults would give for ambiguous *wh*-questions. The authors used a story which provided a context for two possible interpretations (an object and a subject interpretation) of the following two questions: *Wie zei je dat het beertje natspoot?* (literally, ‘who said you that the bear wet-squirted?’) and *Wie zei je dat een olifant natspoot?* (literally, ‘who said you that a bear wet-squirted?’). There was a preference for interpretation as subject questions both in children and adults.

The studies reviewed above suggest that object questions are somehow harder than subject questions. O’Grady (1997) relates the differences between the two types of questions to different demands on working memory: working memory load would be lower in subject questions than in object questions, because longer movement places larger demands on working memory. In Frazier’s (1987) Garden Path model, segments of incoming verbal input are structured in a syntactic representation. After interpretation of a bit of structured material, working memory can let go of it and the next segment of the input can be structured and interpreted, and so forth. When interpreting questions, the question word has to be kept in working memory until the gap has been reached further on in the sentence, because the information cannot be processed until the gap has been identified. This means that in object questions, more material has to be kept in working memory for a longer period of time than for subject questions (Deevy & Leonard, 2004).

Deevy and Leonard (2004) argue that children have more difficulties with object questions than adults, because the process of interpretation is not as much automatized as it is in adults. Even so, adults too have more difficulty with object questions than with subject questions. This implies that interpretation is influenced by other processes besides processing automatization, in particular, working memory is at play. Deevy and Leonard suggest that object questions have a higher risk for misinterpretation, because more information has to be kept in working memory for a longer time. This can be explained as follows: when the parser interprets the first part of a sentence incorrectly, it will have to go back to the beginning of the sentence once it discovers its mistake, to reinterpret the whole sentence from scratch. However, if there is not enough working memory capacity available, it may not be possible for the parser to retreat from this garden path, which then results in wrong interpretations. Working memory thus serves to explain not only children’s specific problems with object questions, but also adults’ difficulties with that type of questions.

Summarizing, several studies in the L1 acquisition literature find a subject-object asymmetry in children’s interpretation of *wh*-questions. One prominent explanation explains this asymmetry with reference to processing resources: children’s working memory would not be sufficiently automatized to correctly parse object questions (Deevy & Leonard, 2004; O’Grady, 1997). Working memory furthermore explains the

higher rate of difficulties of adults with object questions, as more material must be kept active on the parsing stack for a longer time than with subject questions.

3. Research questions and hypotheses

Previous research has established that type of wh-word (*who*, *what*, *which*, etc.) and type of wh-question (subject or object) are important factors in children's processing of wh-questions. Including these two factors as variables, the current study focuses on the role of number agreement with the verb as a clue for distinguishing subject and object questions, and the age at which children can make use of it. The wh-words under investigation are *wie* 'who' and *welke* 'which'. We ask the following two questions: (i) Is number on the verb used to correctly interpret wh-questions as subject or object questions? (ii) What is the effect of age on the comprehension of *who* and *which* sentences?

By answering these questions, this paper will give more insights in the development of the interpretation of wh-questions in Dutch. We contribute data from a novel language in a field that is dominated by research with English learners (with the exception of the Van der Meer et al. (2001) study on Dutch). More importantly, Dutch wh-questions provide an ideal testing ground for examining the pure contribution of the role of number in processing wh-questions, because Dutch wh-questions are structurally ambiguous (in contrast to other languages) and so no other clues such as word order or case interfere in the process.

We expect that children will show a better understanding of *wie* 'who' questions than *welke* 'which' questions, since previous research has established that *who* is understood earlier than *which* (Ervin-Tripp, 1970; Tyack & Ingram, 1976). Regarding subject versus object questions, it is hypothesized that children, as well as adults, show a better understanding of subject sentences (Coopmans et al., 2001; Deevy & Leonard, 2004; Stewart & Sinclair, 1975; van der Meer et al., 2001).

With regard to age, it is expected that the older children in our study will show a better understanding of all wh-questions than the younger ones (Ervin-Tripp, 1970). Furthermore, since previous research showed that children up until 8 years of age do not show the same level of target-like understanding as adults (Stewart & Sinclair, 1975), it is hypothesized that even the oldest children in our study (9-year-olds) may perform worse than adults in interpreting wh-questions.

4. Method

4.1 Participants

The participants in our study are Dutch children from 5 to 9 years old. Children from three different primary schools participated in the study: one in the city of Groningen, one in a small town near Groningen and one in a town near Zwolle.² Sixty children from these different schools participated in the current study; ten adults were also included in the study. The children were divided into groups depending on their grade in school, as can be seen in Table 1. Every group consisted of 10 girls and 10 boys; the adult group consisted of 5 men and 5 women.

² We thank the teachers and pupils from the *Apolloschool*, Hoogeveen, the *Groningse Schoolvereniging* (GSV), Groningen, and the *De Tol* in Zuidlaren for their cooperation in this research project.

Table 1: Mean age in years (plus age range) and number of participants

	Mean age (age range)	<i>N</i>
Group 1	5;6 (5;0-5;8)	20
Group 2	8;1 (7;6-8;4)	20
Group 3	9;2 (8;6-10;3)	20
Adults	38;0 (20;3-64;3)	10

4.2 Design

The independent variables are Wh-word (*wie* ‘who’ or *welke* ‘which’), Question (subject or object question) and Age. The dependent variable is number of correct interpretations of the test questions. There are six items in every condition. The items from the four conditions form a total of 24. They were pseudo-randomly distributed.

4.3 Materials

All children and adults participated in a picture selection task which was presented with a PowerPoint presentation developed within the framework of COST A33 (van der Lely et al., in preparation). Two lists were constructed, with a different order of the items; the two lists were evenly distributed across the participants. The presentation was shown to the participants on a laptop with prerecorded questions.

For each item we showed a slide with four different pictures. Participants heard a wh-question such as *Wie voert de elfjes?* (‘Who is feeding the fairies?’), and had to choose the right option among the four possibilities in the pictures (see Figures 1 and 2 for two sample items). The four options were constructed in such a way that only one was the right answer (the target), one option showed role reversals compared to the target, one option showed a different action than the target action, and one option showed a different number than the target. The different types of options allow us to analyze the types of mistakes.

Number was manipulated to disambiguate the wh-questions (see section 1). In *wie* ‘who’ and *welke* ‘which’ questions with a number mismatch between verb and postverbal NP, number provided the disambiguating cue. For example, the question in Figure 1 is necessarily a subject question, similar to (6a) above; *wie* ‘who’ must be subject and *de elfjes* ‘the fairies’ object, because the latter is plural and does not agree with the singular verb. In *wie* ‘who’ questions with a number match between verb and postverbal NP, the question itself was ambiguous, but the set of picture options led to disambiguation. In these cases the set of pictures was compiled in such a way that exactly one of the pictures matched one of the two interpretations, while there was no matching picture for the other interpretation. Thus, the question in Figure 2 is ambiguous between a subject question (‘Who-PL are washing the queens?’) and an object question (‘Who are the queens washing?’). In Figure 2 picture 1 matches the object-question interpretation and there is no picture that matches the subject-question interpretation, hence only one correct response is available: object question.



Figure 1: Sample subject question with *wie* ‘who’: *Wie voert de elfjes?* ‘Who is feeding the fairies?’ 1: Different verb, 2: Target, 3: Role reversal, 4: Different number.



Figure 2: Sample object question with *wie* ‘who’: *Wie wassen de koninginnen?* ‘Who are the queens washing?’ 1: Target, 2: Different verb, 3: Role reversal, 4: Different number.

After initial analysis of the answer patterns of the adults, we discovered unexpected patterns for some items. Upon further inspection, we found that one item was recorded incorrectly. Another item showed a deviating answer pattern with one reversal mistake and five verb mistakes (out of a total of ten). These two items were removed from the analysis. So the design and final number of items was as given in Table 2. Furthermore, the adults had difficulty distinguishing the actions of catching and pulling in the pictures, which led to semantic errors for two items. Because of this ambiguity in the pictures, we counted the “Different verb” option correct in these two cases (marked with * in Table 2).

Table 2: Design with sample questions and number of items in different conditions

	<i>Who</i>	<i>Which</i>
Subject	6 items <i>Wie voert de elfjes?</i> 'Who is feeding the fairies?'	5 items <i>Welke vrouw kietelt de oma's?</i> 'Which woman is tickling the grannies?'
Object	5* items <i>Wie wassen de koninginnen?</i> 'Who are the queens washing?'	6* items <i>Welke prinses duwen de danseressen?</i> 'Which princess are the dancers pushing?'

4.4 Procedure

The participants were tested individually in a separate, quiet room. The participant sat in front of the computer and the experiment leader sat to the right of the child and clicked through the slides. The answers were scored with paper and pencil. They were later scored into the four categories of possible answers: target, role reversal, different verb, and different number.

Before starting the experiment, all the figures that would appear in the experimental items were introduced on a slide (see Figure 3) to make sure that the participant knew all the nouns. After this introduction, the participant repeated the descriptions of the figures. The experiment leader then told the participant that all upcoming pictures look very similar, but they are slightly different. The participant was instructed to look carefully at all four of the pictures and listen carefully to the question. If the participant wanted to hear the question again, the question was played again.



Figure 3: Introduction slide with all figures that appear in the test items: the women, the dancers, the princesses, the grandmas, the fairies, and the queens.

There were two practice items with which the experiment leader would correct the children, if necessary, and tell them why they made a mistake. The two practice items were two subject *wie* ‘who’ questions in which number disambiguated the questions: *Wie draagt de danseressen?* (‘who is carrying the dancers?’) and *Wie voert de vrouwen?* (‘who is feeding the women?’). There was no more correction with the test items. However, if during the test a participant systematically identified certain figures incorrectly, the experiment leader asked her or him how the character was really called and corrected whenever necessary.

5. Results

5.1 Differences within groups

Figure 4 shows the mean percentages of correct answers for the four conditions for each of the four age groups. After checking the normality of the distributions for the variables with the use of histograms, we performed paired t-tests for the comparisons within the groups. Table 3 summarizes the results of these analyses.

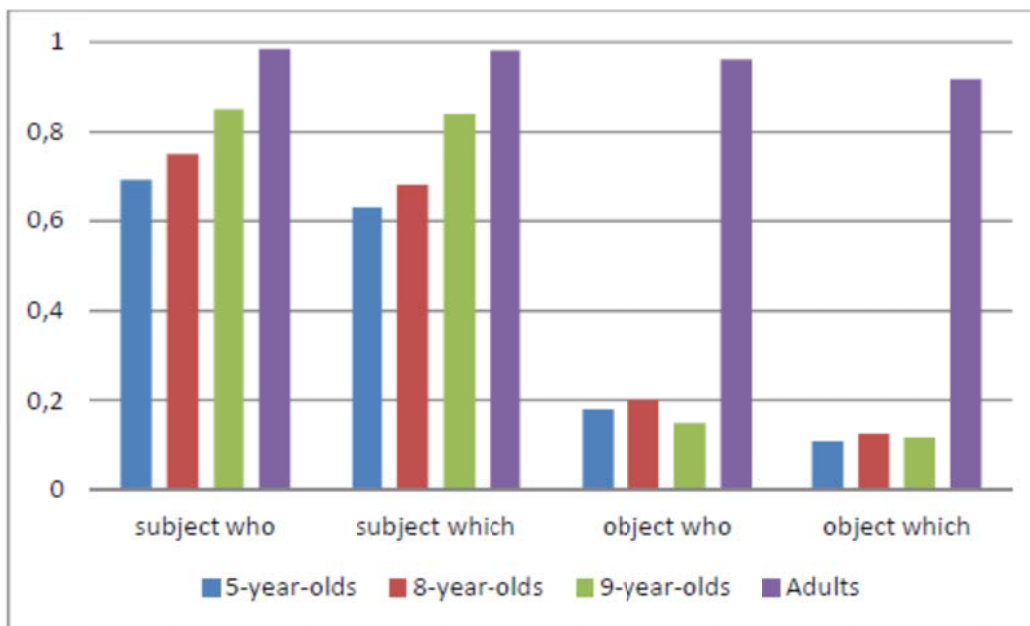


Figure 4: Percentages of correct answers for subject and object *wie* ‘who’ questions and subject and object *welke* ‘which’ questions for the four age groups.

The results show very clearly that all groups had more difficulties with object questions. This is statistically confirmed in all comparisons except for the adults. In the comparisons for the adults, only the difference between the total number of correctly answered subject and object questions is significant. Furthermore, *wie* ‘who’-questions elicited slightly more correct answers than *welke* ‘which’ questions. While this difference is significant when all groups are taken together, the differences within each group are not significant

Table 3: Results of paired-samples t-tests with *t*-values for the comparisons within groups for differences between *wie* ‘who’ and *welke* ‘which’ questions, with a distinction between subject and object questions. Results are based on percentages of correct answers.

	Group 1	Group 2	Group 3	Adults
Subject <i>who</i> – Subject <i>which</i>	1,22	1,20	0,23	0,12
Object <i>who</i> – Object <i>which</i>	1,62	1,18	0,94	0,813
Subject <i>who</i> – Object <i>who</i>	6,99***	7,17***	11,29***	0,69
Subject <i>which</i> – Object <i>which</i>	7,33***	6,19***	15,11***	1,68
Total <i>who</i> – Total <i>which</i>	3,26**	2,70**	2,89***	1,00
Total Subject– Total Object	8,14***	7,70***	14,55***	3,00**

* $p \leq 0,1$ ** $p \leq 0,05$ *** $p \leq 0,01$

5.2 Differences between groups

The number of correctly answered subject questions rises steadily across the three child groups, showing improvement with age. Table 4 shows the results of one-way ANOVAs for comparisons between the groups. The results indicate that there are no differences between Groups 1 and 2. Groups 1 and 3 show differences on both types of subject questions and on the total number of *welke* ‘which’-questions. Groups 2

and 3 differ only on subject *welke* ‘which’ questions, the total number of *welke* ‘which’ questions, and the total number of subject questions. Adults differ significantly from all the other groups on all conditions, as expected.

It should be noted that the differences between the children and the adults become smaller as children become older. Differences are smallest between children of group 3 and adults for the measure of subject *wie* ‘who’ questions, subject *welke* ‘which’ questions and their combination, which implies a development towards the adult level. However, even these 9-year-olds do not reach the adult level of question understanding on any condition. This indicates that the development of wh-questions reaches an adult level at a later age than 9.

Table 4: Results of one-way ANOVAs, with specified contrasts for the comparisons between groups for differences between *who* and *which* questions, with a distinction between subject and object questions. Equal variances are not assumed in this analysis. Results are based on the percentage of correct answers.

		Group 2	Group 3	Adults
Group 1	Subject <i>Who</i>	0,70	2,47**	5,12***
	Subject <i>Which</i>	0,54	2,65**	5,12***
	Object <i>Who</i>	0,29	-0,47	14,75***
	Object <i>Which</i>	0,38	0,20	18,01***
	Total <i>Who</i>	0,72	1,69	13,57***
	Total <i>Which</i>	0,77	2,22**	14,93***
	Total <i>Subject</i>	0,69	2,87**	5,75***
	Total <i>Object</i>	0,43	-0,20	23,16***
Group 2	Subject <i>Who</i>	X	1,39	3,56***
	Subject <i>Which</i>	X	2,01*	4,38***
	Object <i>Who</i>	X	-0,72	12,94***
	Object <i>Which</i>	X	-0,17	15,27***
	Total <i>Who</i>	X	0,62	10,14***
	Total <i>Which</i>	X	1,67	16,06***
	Total <i>Subject</i>	X	1,92*	4,49***
	Total <i>Object</i>	X	-0,58	21,33***
Group 3	Subject <i>Who</i>	X	X	3,52***
	Subject <i>Which</i>	X	X	2,85**
	Object <i>Who</i>	X	X	15,33***
	Object <i>Which</i>	X	X	15,77***
	Total <i>Who</i>	X	X	15,46***
	Total <i>Which</i>	X	X	12,56***
	Total <i>Subject</i>	X	X	3,87***
	Total <i>Object</i>	X	X	19,76***

* $p \leq 0,1$ ** $p \leq 0,05$ *** $p \leq 0,01$

5.3 Error analysis

Figures 5 and 6 summarize the kinds of mistakes the participants made. Figure 5 shows the error patterns for subject questions. The three error categories are: “Role reversal” where subject and object roles are reversed; “Different verb” showing a different action; and “Different number” showing a singular object when the question has a plural object, and vice versa. While there are a few errors in the first two

categories, most errors in the child participants are in the category “Different number” (between 3-23%). For example, a subject question like *Wie voert de elfjes?* ‘Who is feeding the fairies?’, which is illustrated in Figure 1, is interpreted with a singular object instead of a plural object (*Wie voert het elfje?* ‘Who is feeding the fairy?’).

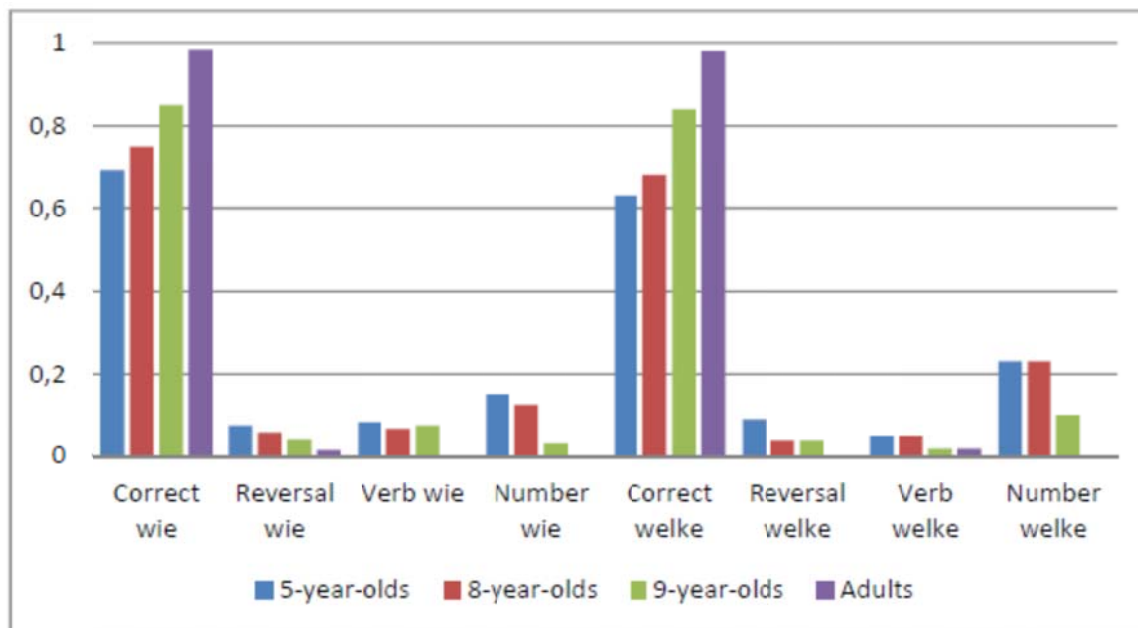


Figure 5: Percentages of correct answers and three error types for subject *wie* ‘who’ and *welke* ‘which’ questions for the four age groups.

The error patterns for object questions, shown in Figure 6, are very different: by far most of the errors are of the type “Role reversal” (between 68-84%). In other words, object questions are very often misinterpreted as subject questions. In fact, the rates of Reversal errors are almost as high as the target interpretations of subject questions, which suggests that all test questions are taken to be subject questions, despite our design in which we manipulated number to create subject versus object questions. For example, the object question illustrated in Figure 2, *Wie wassen de koninginnen?* ‘Who are the queens washing?’, is structurally ambiguous. However, given the set of pictures, only the object interpretation is available. There is no picture alternative that shows that some people (a plurality because the verb is plural) are washing the queens. Still, this question type is most often interpreted as a subject question, with someone (singular) washing the queens. This means that the plural number on the verb is ignored as a cue for interpreting the question variable as a plurality, as if it were *Wie wast de koninginnen?* ‘Who is washing the queens?’. The mistake is more remarkable in the *welke* ‘which’ object questions, which are unambiguous: the noun in the wh-phrase does not agree with the verb (noun is singular, verb is plural), while the postverbal noun is plural and agrees with the verb, and so the question variable targets a single referent with the role of object. Nevertheless, the “Role reversal” error for *welke* ‘which’ object questions such as *Welke prinses duwen de danseressen?* ‘Which princess are the dancers pushing?’ was to choose a picture with a princess who is pushing two dancers.

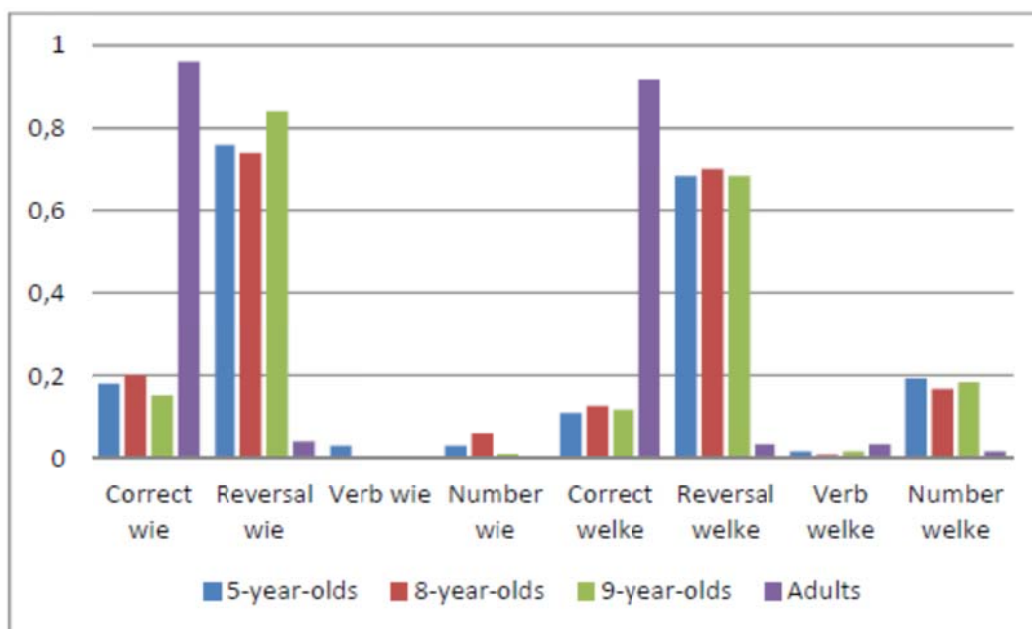


Figure 6: Percentages of correct answers and three error types for object *wie* ‘who’ and *welke* ‘which’ questions for the four age groups.

6. Discussion

The current study tried to answer the question whether the comprehension of the wh-questions *wie* ‘who’ and *welke* ‘which’ improves between 5 and 9 years of age, and whether there are any differences between subject and object questions in this development.

Regarding differences between subject and object questions, it was expected that children (and adults) would have more difficulties with object questions than with subject questions (Ervin-Tripp, 1970; Frazier & Flores d’Arcais, 1989; Stewart & Sinclair, 1975; Tyack & Ingram, 1976; van der Meer et al., 2001). This prediction was indeed confirmed for all groups. In fact, the children often misinterpreted the object questions as subject questions, and hardly gave any target object question interpretations at all (between 11-20% only).

The differences within groups show that the hypothesis that children have more difficulties with *which* than with *who* questions (Brown, 1968; Ervin-Tripp, 1970; Tyack & Ingram, 1976) is not supported. Although performance on *wie* ‘who’ and *welke* ‘which’ questions for all groups and all conditions together was significantly different, there were no differences within the groups between subject *wie* ‘who’ and *welke* ‘which’ and object *wie* ‘who’ and *welke* ‘which’.

As for differences between groups, it was hypothesized that with age, the comprehension of questions will improve (Ervin-Tripp, 1970; Tyack & Ingram, 1976). This is not supported for the development between children from group 1 (5;9 years old) and children from group 2 (8;1 years old), who do not differ on any of the comparisons. So, comprehension of questions does not improve between the ages of 5 and 8, which is quite surprising given this wide age range. On the other hand, there is a general development between group 2 (age 8;1) and 3 (age 9;2), as indicated by the significant differences on several conditions between these two groups. Thus, there is some improvement between the ages of eight and nine. Nevertheless, the 9-

year-olds have lower scores on all variables than the adults. The results imply that children of age 9 have not yet reached adult-levels of question comprehension.

7. Conclusions

The current experiment has added new data about the development of wh-question comprehension in Dutch children. We tested children from 5 to 9 years old and a control group of adults on their understanding of *wie* 'who' and *welke* 'which' questions, comparing subject and object questions. We found that children have more difficulties with object questions than with subject questions. Even adults occasionally make mistakes with *welke* 'which' object questions. Furthermore, while children did not seem to develop between the ages of 5 and 8, there was some improvement in the 9-year-olds. Even so, the 9-year-olds performed worse than the adults, never reaching adult levels.

Dutch wh-questions are structurally ambiguous between subject and object questions. By manipulating number on the verb, the post-verbal NP and the noun in the *welke* 'which' questions, all items in the test were unambiguous. Nevertheless, the object questions were very often mis-parsed by the children, and interpreted as subject questions instead. Apparently, number does not offer a sufficiently strong cue for properly parsing wh-questions. In fact, when giving a subject interpretation for the object questions, the children assumed an ungrammatical parse, ignoring number all together. We conclude that the preference for parsing wh-questions as subject questions is so strong that children follow it at the expense of allowing (number) ungrammaticality. This strong subject preference may be due to limited working memory capacity in children. The parsing of object questions is more demanding than subject questions, because movement is longer in object questions (Deevy & Leonard, 2004; Frazier & Flores d'Arcais, 1989). Further research is needed to gain more insight into the effects of parsing and working memory load and the role of number in Dutch subject and object questions.

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