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Elicited Production of Wh-Questions in Cantonese-Speaking Children

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Abstract

This study examined children's elicited production of wh-questions, to supplement findings from spontaneous data in the existing literature. Thirty-six Cantonese-speaking children from age 3;06 to 6;00 were asked to produce 24 questions from 6 different question types upon verbal prompt and picture stimuli. The inferred order of development was generally consistent with prior research: what/who > where > why > how/when. Subject-object asymmetry of what and who questions was found. Differences in the pattern of the asymmetry of these two question types suggested that communicative function might play a role in the development of questions, in addition to animacy effect and input frequency. The absence of argument-adjunct asymmetry in where questions suggested that semantic, but not syntactic complexity, of wh-words was responsible for the developmental order of wh-questions.

Elicited Production of Wh-Questions in Cantonese-Speaking Children

Preschool children from about 1;06 (year; month) begin to ask wh-questions, but learning to produce questions of various types is a slow and gradual process (Fletcher, 1985). Children at age two produce what questions only, to be followed by where, who and why questions, and how and when questions appear at age four and five (James & Seebach, 1982). There is individual variability in the exact time when a certain wh-question type is learned, but generally children do not use the full set of wh-questions until age four or five. Studies on the development of wh-questions have generally looked at the order of acquisition and the different factors affecting the order.

There are different wh-questions, which are generally classified into two groups. Argument questions ask about a major constituent in a sentence, and they include all what and who questions and some of the where questions (e.g. *Where* did Mary go?). Adjunct questions ask about the semantic relation of the entire event encoded in the sentence, and they include all why, how and when questions and some of the where questions (e.g. *Where* did Mary meet John?) (Stromswold, 1988). Argument questions can be subdivided into subject questions and object questions. Subject questions ask about the identity of the subject in a sentence (e.g. *who* is kicking the girl?), while object questions ask about the identity of the object in a sentence (e.g. *who* is the girl kicking?) (Stromswold, 1988).

Factors determining the order of development of wh-questions

Argument questions have consistently be reported to develop before adjunct questions, specifically, in the order of what/where > who > how > why > which/whose/when (Smith, 1933, Bloom, Merkin & Wootten, 1982 & Tyack & Ingram, 1977).

One of the factors determining the order of acquisition across question types is the cognitive/semantic complexity of the wh-words. Different wh-words carry different underlying concepts. Tyack and Ingram (1977) suggested that what and where questions,

encoding more concrete concepts of objects and places, are acquired before why, how and when questions, representing more abstract concepts of causality, manner and time.

Results in Bloom et al. (1982) reported that the acquisition order of wh-questions can be determined by the relative syntactic function of the wh-words and the nature of the verbs used in those questions. What, who and where questions encode pronominal references and copula or general-purpose verbs (e.g. do and go) are used in those questions. In contrast, why, how and when questions encode sentential references and more descriptive verbs (e.g. push and kick) are used in those questions (Bloom et al., 1982).

In addition to the semantic complexity and syntactic function of the wh-words, the communicative function served by each wh-question type also plays a role in determining its acquisition order. Clancy (1989) reported that the two children in her study used most of their early questions to seek for toys during play (e.g. Where is it?), and that questions used for information exchange were not observed. It was suggested that wh-questions with functions that match the children's current interests and needs were used more frequently and thus, developed earlier (Clancy, 1989).

Input frequency is another factor affecting the acquisition order of wh-questions. Clancy (1989) reported significant correlation between the order children produced wh-questions and their mother's frequency of use of those questions. The child who was exposed to more frequent input of how questions, acquired the question type earlier than the other child.

In most of the studies, authors often came to the conclusion that a combination of factors is responsible for the acquisition order of wh-questions. For example, Clancy (1989) suggested that cognitive complexity and communicative function of wh-questions together with input frequency determined the order of acquisition. However, a more recent study (Rowland, Pine, Lieven, & Theakston, 2003) put its emphasis on input frequency and it was

found that the input frequency of particular "wh-word + verb" combination predicts the acquisition order better than semantic and syntactic factors.

Subject-object asymmetry in argument questions

Findings on the order of acquisition of subject and object argument questions are more controversial. Stromswold (1988) reported that children learned object questions before subject questions, while opposite results were reported by Hanna & Wilhelm (1992). Tyack and Ingram (1977) also suggested that the direction of asymmetry was different in different question types.

There are at least three possible factors involved in the subject-object asymmetry in English-speaking children. The first possible factor is wh-movement. Wh-words always occupy the sentence initial position in English. Therefore, in object questions, the usual subject-verb-object word order in English is no longer followed (O'Grady, 1997). This may make object questions more difficult for young language learners to produce and comprehend when compared to the subject questions, which follow the usual word order. This factor favours the results reported in Hanna and Wilhelm (1992) that children learned subject questions before object questions.

Another possible factor suggested in Tyack and Ingram (1977) was the animacy of the wh-words. Wh-word *who* representing an animate entity is more likely to be encoded as the subject, while wh-word *what* usually representing an inanimate entity is more likely to be encoded as object. This explains the results reported in Tyack and Ingram (1977) that children comprehended what object questions more easily than what-subject questions, and who-subject questions more easily than who-object questions.

Input frequency was also reported as a possible reason for explaining subject-object asymmetry. An analysis of the frequency of subject and object questions in an English-speaking adult's speech to a young child was reported in Wong, Leonard, Fletcher and Stokes

(submitted). Uneven distribution of what and who questions was found. In the sample, there were 72 (92%) who-subject questions, but only 6 (8%) who-object questions. The opposite pattern was found for what questions, with 699 (80%) object questions, but only 177 (20%) subject questions. The low frequency of input of who-object and what-subject questions may determine the later development of these questions.

Cantonese studies on the production of wh-questions

There are three large-scale studies on the development of wh-questions in Cantonese-speaking children, and two of which examined production (Cheung, 1996; Wong & Ingram, 2003). Cheung (1996) examined the development of wh-words in eight children who were between 1;05 and 2;08 at the beginning of the study. These children were part of a large-scale study on language development in Cantonese-speaking children reported in Lee, Wong, Leung, Man, Cheung, Szeto et al. (1996). They were seen in average once a month for a year and spontaneous language samples were collected. Cheung (1996) examined the use of wh-questions in these children's language samples with the investigators. What and where identification questions (e.g. *Mat1je5 lei4 gaa3? "*What is this?"), in which the identity of objects and places are asked and the copula verb is used, were reported to be developed first. Then the following acquisition order was reported: What/ Where > Who/ Why/ How.

Using the data set from Lee et al. (1996), as in Cheung (1996), Wong and Ingram (2003) reported similar findings on the order of acquisition. In addition, Wong and Ingram (2003) reported the age of acquisition of different questions types: What (<2;02) > Where (2;04) > Why (2;08) > Who/ How (2;10) > Which (3;02). It also showed evidence of subject-object asymmetry in Cantonese-speaking children. Specifically, what-object questions were used more frequently than what-subject questions, while who-subject questions were used more frequently than who-object questions (Wong & Ingram, 2003).

In addition to providing information on the age and order of acquisition of wh-

questions in Cantonese-speaking children, some of the factors affecting the acquisition order, which have been studied in other languages, were also examined in these two studies. First, Wong & Ingram (2003) supported the cognitive complexity explanation about the acquisition order of wh-words, as the order of acquisition found was comparable in studies of other languages.

The effect of input frequency was also investigated. Wong and Ingram (2003) reported that adults asked questions more often than children and there was no direct correlation between children's and adults' use of questions. The results were not conclusive since the adult samples used only involved children's conversation with the investigator instead of their parents or main caregivers. Therefore, these samples were not representative to the children's total linguistic input (Wong and Ingram, 2003).

Wong and Ingram (2003) also reported subject-object asymmetries in what, who and where questions. Children were found to use more object than subject what and where questions, and more subject than object who questions. Unlike English, wh-movement does not take place at the surface level in Cantonese. Wh-words in Cantonese questions remain in situ as what they represent in declaratives (Wong & Ingram, 2003). In both subject and object questions, the order of subject-verb-object order retains and difficulty about word order does not impose on either type of question. Therefore, the wh-movement account cannot explain the subject-object asymmetry in Cantonese, other explanations were suggested. Wong and Ingram (2003) used the animacy effect to explain the subject-object asymmetry that was found in Cantonese.

Cheung (1996), however, focused her investigation on whether verb semantics and the order of verb acquisition had an effect on the order of acquisition of wh-questions. The results revealed that verbs that assigned unique theta role to their arguments were easier for children than those that assigned multiple theta roles (Cheung, 1996). Hence, copula verbs, with fixed

theta roles for both external and internal arguments, are developed at an early age. Questions that usually occur with these early developing verbs are acquired earlier (Cheung, 1996). The tendency for children to use certain verb types with certain question types was also investigated. Cheung (1996) proposed that if the semantic notion carried by the theta role assigned by a verb matched well with that of the wh-word, this particular verb has a higher tendency to occur with that wh-question type. For example, locative verbs that assigned the theta role of location are more likely to occur with where questions, which carries the same semantic notion. The lists of verbs that children used together with different types of questions were given in her study.

Motivations for this study

As mentioned earlier, the two production studies on Cantonese analyzed the same set of data from eight children. The number of participants was relatively small. They were young and fell into a narrow age range (1;05 to 2;08). Similar to their English-speaking peers, Cantonese-speaking children would probably learn the full range of questions gradually over times. So it was not sure whether the two studies reviewed earlier captured the entire process of wh-questions acquisition or just their emergence.

In addition to the narrow age range used, the criterion of acquisition was not reported in Cheung (1996), while Wong & Ingram (2003) used the criterion of "an individual wh-question type was considered acquired when at least four of the children had used it (at least one time)". Given the potentially unlimited number of opportunities for a child to produce different types of questions in spontaneous samples of about 8680 utterances on average, the criterion of acquisition used was very loose. As far as argument questions are concerned, questions in one sentence position are acquired later than questions in the other position. It is highly likely that the early use of argument questions was restricted to one sentence position, e.g. what questions are produced only in the object position. It may not be appropriate to

conclude that a certain question type was acquired if the child only produced it once, or if the question word only occurred in one of the syntactic positions.

Generally speaking, data of target forms obtained from spontaneous samples are usually restricted in types and tokens. The variable and limited number of questions across types made it difficult to draw a solid conclusion from the observed results in previous studies. They also investigated argument-adjunct and subject-object asymmetry, but their change in pattern over time was not examined. The investigation in argument-adjunct asymmetry was done by comparing argument questions (what and who) with adjunct questions (why, how and when). In addition to syntactic differences, the two groups of questions were also different in their conceptual complexity (Stromswold, 1988). For example, argument what questions represent a more concrete concept of object, while adjunct why questions, represent a more abstract concept of causality. Therefore, conclusions made about syntactic asymmetry were confounded.

In the present study, a cross-sectional design with a larger number of participants from a wider and older age range was used to capture a fuller picture of the development of different types of wh-questions (what, who, where, why, how and when) in Cantonese-speaking children. Elicitation procedure was specifically designed to collect the same and sufficient token of targets within a short period of time (Thornton, 1996). The data would be useful to supplement the existing results from spontaneous language samples. Data from a small group of children with a wider age range would also be useful for further development into a clinical tool for assessing wh-question productions. With a cross-sectional design, the study would capture any subject-object asymmetry of what and who questions and their changes over time. Argument-adjunct asymmetry was also investigated within where-questions, so as to control for the conceptual differences of different question types. Finally, errors that were not described in detail in previous studies were analyzed qualitatively to

examine any subtle developmental changes.

Method

Participants

Fifty-three preschool children were recruited in this study. Forty-five of the children were recruited from four kindergartens and nurseries, and the remaining eight children were invited for participation through personal contact. All children were screened by a parent questionnaire in which parents were asked to check off speech and language developmental milestones relevant to their children's age group, and by the Hong Kong Cantonese Receptive Vocabulary Test (CRVT) (Lee & Cheung, 1996). This was to ensure that all participants in the study were within normal limits in their speech and language development, as well as average performers. Eleven children were screened out. They were below average performers who scored more than 1 SD below the mean, or above average performers who scored more than 1.5 SD above the mean for their age on the CRVT. One child who was reported to have and was presented with significant articulation errors was also excluded from this study.

The remaining 41 children participated in the study. Five of them gave responses that showed a lack of comprehension of the task procedure and demands in all 24 test items. These unscorable responses took the form of adding the wh-word *dim2gaai2* "why" in front of the verbal prompt, or repeating the verbal prompt. Since their responses were not reflecting their true ability to use wh-questions, these five children were excluded from data analysis. The remaining 36 children, 17 boys and 15 girls, fell into three age groups: I (3;06-4;00), II (4;06-5;00) and III (5;06-6;00). Each group consisted of a comparable number of boys and girls. A summary of the mean age and CRVT score of each of the three groups is provided in Table 1.

Table 1 *Mean, range and standard deviations for each group for age and CRVT raw score*

Participant Group	Age			CRVT	
	Mean	Range	SD	Mean	SD
Group I	45.42	42-49	2.27	52.17	5.72
Group II	58.33	54-61	2.19	57.92	3.94
Group III	68.50	65-72	2.32	61.00	2.30

Materials and Stimuli

Six training items and 24 test items were constructed to sample six different wh-question types (what, who, where, why, how and when). Among the test items, wh-words were included in the subject and object positions for what and who questions, in the argument and adjunct positions for where questions and in the adjunct position only for why, how and when questions. There were four items for each question type, with two items for each subtype in what, who and where questions.

As reviewed earlier, verb semantics play a role in wh-questions acquisition and there are tendencies for some types of verbs to co-occur with particular question types in Cantonese (Cheung, 1996). Therefore, the most facilitative type of verbs was used in each of the question types to minimize the effect of verb semantics on the acquisition order of wh-questions. Following Cheung's (1996) findings, transitive state verbs (e.g. *sik1* "know") were used in what-subject questions, locative action verbs (e.g. *heoi3* "go") were used in where-argument questions, and transitive action verbs (e.g. *tek3* "kick") were used in all other question types.

Each of the training items and test items were elicited by a verbal prompt and a picture stimulus. Verbal prompts were designed to provide a felicitous condition for participants to ask a question (Thornton, 1996). The same phrase was used in the verbal prompt to elicit questions of the same type. The sentence final particle *wo4*, which gave an impression that the event described by the sentence was unexpected (Lee & Law, 2001), was used in the verbal

prompts to create a sense of curiosity that is expected to motivate the child to ask questions. The following illustrates an example of the verbal prompt used for each of the six question types. The whole set of verbal prompts of the six training items and the 24 testing items is provided in Appendix A.

What-object question: *Ba4baa1 jam2 gan2 jat1_di1_je5_ wo4.*

Father   drink ASP one CL   thing SFP

Father is drinking something.

Who-subject question: *Jau5__jan4__ tek3 baa4baa1 wo4.*

Have person kick   Father   SFP

Somebody is kicking Father.

Where-argument question: *Mui4mui2 heoi3 gan2 jat1_dou6_dei6 fong1_ wo4*

Sister   go   ASP one CL   place   SFP

Sister is going to some place.

Why question: *Maa4maa1 jan1wai6 jat1_di1 jyun4jan1 am2   sat4 ji5zai2 wo4.*

Mother   because one CL reason   cover   tight   ear   SFP

Because of some reason, mother is covering her ears.

How question: *Baa4baa1 gam2jeong2_ sik6 daan6gou1 wo4.*

Father   in some way   eat   cake   SFP

Father is eating a cake in some way.

When question: *Mui4mui2 jau5_zan6_si4 taan4 kam4 wo4.*

Sister   have CL   time play   piano SFP

Sister is playing the piano during some time.

Each item was also elicited by two coloured pictures of size 10x15cm. In the first picture (scene 1) of each pair, an area was left blank (uncoloured) to elicit a question. The blank area represented a missing piece of information which the child would have to find out

by asking a particular type of question. For example, to elicit a who question, the area where the head of a person belonged was left blank. The second picture (scene 2) was used to show the child what the missing piece of information was after he posed a question. The events shown in the pictures and the answers were sometimes out of the ordinary, such as a pig climbing a tree. These generated a sense of uncertainty and increased the motivation of the child to ask questions.

Procedure

Each child was seen individually in a quiet room in his or her school or home. The experiment, together with background testing, was completed in 40 minutes on average and short breaks were introduced when there was a change in tasks. A puppet Teddy, pretended by the investigator (INV) was introduced to the child (CHI) at the beginning of the task and the child was asked to read the picture stimulus book with Teddy. The investigator explained to the child that Teddy was smart and the child could ask Teddy for information that was missing in the pictures.

Six training items, one for each question type, were first presented. In each training trial, the child's correct response was acknowledged and repeated, and an imitation of the target question was required if the child gave no, or an incorrect, response. The training trials were used to familiarize the child to the task procedure and to illustrate the full range of questions that could be asked in the task. The 24 test items were first randomized to eliminate any learning effect on a particular type of questions. They were presented to the children one by one in the same order. No feedback was given in all the testing items. On occasion, the investigator would complement the child for making attempts to ask great questions in order to keep the child motivated. The following illustrates the elicitation procedure of a typical test item.

(Scene 1 was presented to the child)

INV: *Baa4baa1 jam2 gan2 jat1 di1 je5   wo4*!

     Father   drink ASP one CL thing   SFP

     Father is drinking something!

INV: *Nei5 man6 haa5 hung4zai2 aa1*.

     You ask   DEL Teddy   SFP

     Ask Teddy a question.

(INV was pointing to the 'blank area')

CHI: *Baa4baa1 jam2 gan2 mat1je5 aa3*?

     Father   drink ASP what   SFP

     What is father drinking?

(Teddy turned to the next page which showed scene2 and gave an answer to the child)

An early version of the test procedure was piloted with six children aged 3;00-8;00 and was modified to the current version. This was to ensure that the test procedure could be understood by most children.

Scoring and Analysis

Each of the child's responses received two scores. The semantic score, which was given to all six question types, was used to determine the order of development of different question types. One point was given when the child used the appropriate wh-word for the target question type. The syntactic score, which was only given to what, who and where questions, was used to determine the pattern of asymmetry between different syntactic positions of the wh-word within the same question type. One point was given additionally, when the child used the appropriate wh-word (succeed in getting a semantic score) and used the word at correct syntactic position in relation to the main verb. The following is an example to illustrate the kind of responses that justify a point in the semantic or the syntactic score. If the targeted question is *Bin1go3 tek3 baa4baa1?* "Who is kicking father?", response

(a): *Mat1je5 tek3 baa4baa1?* "What is kicking father?" receives no semantic score as the wrong wh-word was used, and response (b) *baa4baa1 tek3 bin1go3?* "Who is father kicking?" receives only a semantic, but not a syntactic score as the wh-word was used in the object instead of subject position.

The use of what, who and where identification questions, where the verb was either absent or it was the copular *hai6* "is", (e.g. *Mat1je5 lei6? / Nei1 go3 hai6 mat1je5 lei6?* "What is this?") received a point in the semantic score. It was used to give the child credit for the appropriate choice of the wh-word. However, no syntactic score was given because the main verb was missing and its relationship with the wh-word cannot be determined.

In Cantonese, the same question word can be realized in different ways. *Me1* and *mat1je5* are both used for what questions, and *dim2gaai2* and *zou6me1* for why questions (Matthew & Yip, 1994). Other variations of forms, include *bin1dou6, bin1go3 dei6fong1* and *mat1je5 dei6fong1* for where questions, and *gei2si6* and *mat1je5 si4gaan3* for when questions were also accepted as correct.

The semantic scores were examined by using a two-way analysis of variance (ANOVA) with age group (I, II, III) as the between-subject factor and wh-question types (what, who, where, why, how, when) as the within-subject factor to determine the order of development across different question types. Significant main effects and interaction effects were followed by post-hoc comparisons. Following group comparisons, child-by child analysis of counting the number of children in each group who used a question type correctly in at least one out of four trials was completed. This was to confirm the validity of the group results. The development of the same question type across different syntactic positions takes time and young children only use some questions in one syntactic position, as reported in Wong and Ingram (2003). As only two items were included in each of the two syntactic positions in what, who and where questions, children will need to achieve 100% (2/2)

accuracy for a particular position in reaching the criteria if more stringent criteria was used. Therefore, a low criterion of one out of four trials correct was used to capture the competence of young children who restrict the use of the question type in one syntactic position only.

The syntactic scores of what, who and where questions were also examined by using three separate two-way ANOVAs with age group as the between-subject factor and subtypes of what, who and where questions (what-subject, what-object / who-subject, who-object / where-argument, where-adjunct) as the within-subject factor respectively. The results were used to determine the subject-object asymmetry in what and who questions and argument-adjunct asymmetry in where questions. Again, child-by-child analysis examining the performance of children in using each question subtypes was done. All errors were also identified and described qualitatively.

<div align="center">Results</div>

Development of different wh-questions

The order of development of wh-questions was examined using the semantic scores. Table 2 showed the mean score for each of the six question types in the three age groups.

Table 2 *Mean semantic scores (max. = 4) of each of the six question types in each age group*

	What	Who	Where	Why	How	When	Total mean
Group I	1.83	2.08	1.08	1.00	0.25	0.00	1.04
Group II	2.00	2.08	2.42	1.92	0.50	0.25	1.52
Group III	1.92	3.00	2.58	2.67	0.33	0.17	1.78
Total Mean	1.92	2.39	2.03	1.86	0.36	0.14	

The ANOVA revealed a significant main effect for age, $F (2, 33) = 3.33$, $p = .048$. Post-hoc testing showed that Group III children ($M = 1.778$, $SD = 1.55$) were significantly more accurate than Group I children ($M = 1.042$, $SD = 1.22$, $p = 0.042$), while the differences between Group II and Group I, or between Group II and Group III were not significant. A

significant main effect for question types, F (3, 165) = 38.11, $p < .001$, was also found. Post-hoc testing showed that the scores for what ($M = 1.92$, $SD = 1.13$), who ($M = 2.39$, $SD = 1.38$), where ($M = 2.03$, $SD = 1.52$) and why ($M = 1.86$, $SD = 1.25$) questions were each significantly higher than that for how ($M = 0.36$, $SD = 0.87$) and when ($M = 0.12$, $SD = 0.49$) questions. The significance level for all the above comparisons was $< .001$. Other pairs of comparisons were not significant.

The ANOVA also revealed a significant age group by wh-question type interaction, F (10, 165) = 2.40, $p = .011$. Of the 68 interactions that were significant, only 23 of them involved a comparison of scores of the same question type across age groups, or a comparison of scores of the same age group across different question types. Only these significant interactions which are related to our research questions will be presented here. An illustration of the interaction effects is provided in Appendix B. In the examination of a particular question type across age group, post-hoc testing indicated that where questions were produced significantly more accurately by Group II ($p = .042$) and Group III ($p = .009$) children than by Group I children. It also indicated that why questions were produced significantly more accurately by Group III children than by Group I ($p = .001$) children. What, who, how and when questions did not differ in their scores across age groups. In the examination of a particular age group across question types, post-hoc testing indicated that only what and who questions were produced significantly more accurately than how and when questions by Group I children. However, what, who, where and why questions were produced significantly more accurately than how and when questions by Group II and Group III children (with significance level ranged from, $p < .001$ to $p = .009$).

Child-by-child analysis of the semantic scores confirmed the group results on the use of different question types. The analysis indicated that what and who questions were used correctly in at least one out of four trials by more than 75% of the Group I children, but not

the other four question types. However, in Group II and Group III, more than 75% of the children used what, who, where and why questions correctly in at least one out of four trials, but not how and when questions.

Asymmetry in what, who and where questions

Comparisons of children's accuracy in using the same question word in two different syntactic positions were carried out by examining the syntactic scores on what, who and where questions. A summary of the mean syntactic scores of what, who and where questions in each age group is provided in Table 3.

Table 3 *Mean syntactic score (max. = 2) in two syntactic positions in each age group of what, who and where questions*

	What-subject	What-object	Who-subject	Who-object	Where-argument	Where-adjunct
Group I	0.17	1.00	1.00	0.33	0.33	0.25
Group II	0.25	1.33	1.00	0.75	1.25	1.00
Group III	0.17	1.58	1.25	1.17	1.33	1.00
Total mean	0.19	1.31	1.08	0.75	0.97	0.75

For what questions, the ANOVA revealed a significant main effect for question type, $F(1, 33) = 120.86$, $p < .001$, indicating the children were more accurate in producing what-object questions ($M = 1.33$, $SD = 0.67$) than what-subject questions ($M = 0.19$, $SD = 0.53$). Differences in age were not significant. Children in the three groups showed similar levels of accuracy. For who questions, the ANOVA revealed a significant main effect for question type, $F(1,33) = 5.52$, $p = .025$, indicating the children were more accurate in producing who-subject questions ($M = 1.06$, $SD = 0.69$) than who-object questions ($M = 0.75$, $SD = 0.77$). Differences in age group were also not significant. For where questions, the ANOVA showed a significant main effect for age group, $F(2, 33) = 5.37$, $p = .010$. The post-hoc testing showed that Group II ($M = 1.13$, $SD = 0.90$) and Group III ($M = 1.17$, $SD = 0.87$) children

were significantly more accurate than Group I (M = 0.29, SD = 0.62, p = .024) children.

However, question type difference was not significant, children showed similar levels of

accuracy in where-argument and where-adjunct questions.

Child-by-child analysis of the syntactic scores of what and who questions subtypes

confirmed the group results. It was not carried out for where questions as the main effect for

question type was not significant. A summary of results is provided in Table 4 and Table 5.

Table 4 *Group total syntactic score and child-by-child analysis of what-subject and what-*

object questions

What	Group total score (max = 24)		Number of children (max = 12)		
questions	Subject	Object	Subject > Object	Subject = Object	Subject < Object
Group 1	2	13	0	3	9
Group 2	3	16	0	2	10
Group 3	2	19	0	1	11

Table 5 *Group total semantic score and child-by-child analysis of what-subject and what-*

object questions

Who	Raw score (max = 24)		Number of participants (max = 12)		
questions	Subject	Object	Subject > Object	Subject = Object	Subject < Object
Group 1	11	4	7	4	1
Group 2	12	9	5	4	3
Group 3	15	14	2	9	1

Three groups combined, 30 out of 36 children were more accurate in producing what-

object questions than what-subject questions. Only six children produced the two question

types at the same level of accuracy, and no children were more accurate in what-subject

questions. For who-questions, three groups combined, 14 out of 36 children were more

accurate in who-subject than in who-object questions. Only four children were more accurate in who-object questions and 17 children produced the two question types at the same level of accuracy.

Given the small sample size (of only 30 children), subtle effects in the group might not be distinguished by statistical analysis (Clegg, 1982). Therefore, the change in pattern of the asymmetry of what and who questions will be reported based on child-by-child analysis of the syntactic scores, although no significant interaction effect was revealed. In Group I, seven out of 12 children produced who-subject questions more accurately than who-object question, however, there were only two out of 12 children who showed the same pattern in Group III. Instead, a majority of children in Group III, nine out of 12, used who-subject and who-object questions at the same level of accuracy. This seems to show that subject-object asymmetry in who-questions was disappearing in older children. On the contrary, the number of children who showed asymmetry in their use of what-questions, favouring the object position, remained high (at least nine out of 12 children) and steady across the age groups.

Error pattern analysis

The two error patterns, adding the wh-word *dim2gaai2* "why" in front of the verbal prompt and repeating the verbal prompt, that were found consistently in the response of the five participants excluded from analysis were also produced by the 36 children in the study. However, all of them produced at least one correct response during the task and most of these two types of error response (70%, 224 out of 320) occurred in target how and when questions. Therefore, all of the children included in the study could understand the task procedure and their error responses only reflected an inability to use the target questions. Task difficulty was not likely to be responsible for the group differences found.

Besides the two error responses stated above, children often made substitution errors of using an earlier developing question type (e.g. intonation questions and yes-no questions)

to replace the target question. Among all the error responses, 15 (out of 545) involved the substitution of the wh-word *what* by *who* in what-subject questions and one response involved the substitution of wh-word *who* by *what* in who-object questions. No child did it vice versa.

In addition to the semantic errors made, 15% (47 out of 319) of the responses that received a point in the semantic score, did not the syntactic score. The most common response of this type was the use of identification questions, which made up 72% (34 out of 47) of the total syntactic error responses. Among the remaining 28% of the error responses, six (out of 13) of them involved the substitution of object by subject question in who question type and two (out of 13) involved the substitution of subject by object question in what question type. The vice versa did not occur. Details of other less frequent semantic and syntactic error responses will not be presented here. A summary of the number and percentage of all the semantic and syntactic errors made by each group is provided in Appendix C and D.

Reliability checks by another scorer on 15% (130 out of 864) of the transcribed responses of the participants, covering the total age range, revealed a point-to-point agreement of 98% for both the semantic and syntactic scores.

Discussion

Data analysis indicated that children in Group II and Group III were more accurate in producing where questions than children in Group I. Children in Group III were also more accurate in producing why questions than children in Group I. However, the three groups did not differ in their use of other question types.

Data analysis also showed that what and who questions were more accurate than how and when questions in Group I children, while what, who, where and why questions were more accurate than how and when questions in Group II and Group III children. These group results were confirmed by results from child-by-child analysis.

Concerning the asymmetries, children in all groups produced what-object questions

more accurately than what-subject questions, while they produced who-subject questions more accurately than who-object questions. Where-argument and where-adjunct questions did not differ in their level of accuracy. However, through child-by-child analysis, it was indicated that the pattern of asymmetry remains unchanged for what-questions, while that for who-questions was disappearing across age groups.

Order of development of different question types

What and who questions were maintained at the same level of high accuracy when compared to when and how questions for all groups of children. According to the results of child-by-child analysis, a majority of children of age 3;06-4;00 were already able to use what and who questions accurately. These suggested that what and who questions began to develop at or before 3;06-4;00.

The higher accuracy of Where questions in Group II and Group III when compared to Group I suggested that children's ability to use where questions improves significantly at 3;06-4;00 to 4;06-5;00. The improvement of Why questions appeared later and across a longer period of time from 3;06-4;00 to 5;06-6;00, as only Group III children were more accurate than Group 1 children for Why questions. Through child-by-child analysis, a majority of children of age 4;06-5;00 and 5;06-6;00 used where and why questions accurately, but not children of age 3;06-4;00. This confirmed that the development of these two question types occurred at age 4;06-5;00 and 5;06-6;00.

How and when questions maintained at the same level of low accuracy across age groups when compared to other question types. Results from child-by-child analysis showed that only a minority of children in all groups used these two question types accurately. These suggested that children of age 5;06-6;00 still had difficulties in using how and when questions.

From the above interpretation, the following order and age of development was suggested: What/Who (at/ before 3;06-4;00) → Where (4;06-5;00) → Why (5;06-6;00) →

How/When (beyond 6;00). The order of development was similar to that reported in Wong and Ingram (2003), except that with who questions were reported to be acquired after where and why questions in their study. One possible reason for the earlier development of who questions relative to where and why questions in this study was the more favourable stimuli context for who questions used in this task. As mentioned in the Method section, the area where the head of a person belonged was left blank in the picture stimulus of who questions. The missing piece of information was indicated more explicitly when compared to the place and reason that was represented in the picture stimuli of where and why questions. The more favourable stimuli context facilitated children's production of who questions.

The order of development of different wh-questions matched well with cognitive development. Question types that represent the most concrete underlying notions of objects and people developed first, followed by those representing the less concrete notion of place and lastly by those representing abstract notions such as causality, manner and time. Similarity in the developmental order of questions across studies using different methodology and on children learning different languages provided support to the explanation of semantics/cognitive complexity.

Older age of development and overall low score across question types

Even though the order of development found was comparable to earlier studies, the age of development found was older than that reported in previous studies and the overall semantic score across question types was low. The mean scores of what, who, where and why questions ranged from 1-3, while that of how and when questions were lower than 0.5 (with a maximum score of four), as shown in Table 2. There are at least three possible reasons for these findings. First, demands of the elicitation task used in this study were higher than in spontaneous conversation. In elicited production tasks, two types of constraints (meaning and form) were imposed on the utterances the children produced (Thornton, 1996). The assigned

meaning and the expected form restricted the variety of the children's productions that can be treated as correct. That is, the child had to produce a question in an item that could semantically and syntactically matched with the expected question type in order to be correct. However, in spontaneous conversation, children produced questions out of their own intention, and were not constrained by form or meaning.

Another reason that could have contributed to the unexpectedly lower scores was that the task required the children to understand the questions they produced. In situations where spontaneous data were used, it would be difficult to be sure that the children understood the questions they produced. During spontaneous conversation, children might be able to produce a question type that they are not yet able to comprehend (Clancy, 1989). In the current elicitation task, children who used the appropriate question form would probably understand it because each question was elicited for asking a particular information.

A third reason for obtaining lower scores was the inclusion of syntactic subtypes within the same question type. Both subject and object questions were included in what and who question types to investigate the effect of different wh-word syntactic positions on the order of acquisition. However, differential performance in producing questions of different syntactic positions was documented in this, as well as earlier studies. The syntactic demand increased as children were required to produce what and who questions in both syntactic positions. Together with the small number of items (two in each syntactic position for each question type) included in each of the two question types, the average scores of what and who questions were significantly lower than expected.

Subject and object asymmetry in what and who questions

The opposite direction of asymmetries found for what and who questions replicated results in Wong and Ingram (2003). Children produced what-object questions more accurately than what-subject questions and produced who-subject questions more accurately than who-

object questions. The results suggested that the animacy effect and uneven distribution in input frequency as possible factors for the asymmetries observed.

What-object and who-subject questions are probably easier for children to produce because of the association between the animacy and the syntactic role of the wh-word. The wh-word *what*, which usually refers to inanimate entities, is more likely to take the role of object, while the wh-word *who*, which usually refers to animate entities, is more likely to take the role of subject. Therefore, young children depending on this association produced what questions at object position and who questions at subject positions more easily. Some of the semantic and syntactic errors observed in this study provided support in favour of the animacy effect. There were substitutions of subject by object what questions and vice versa in who questions. Substitutions of wh-word *what* by *who* in the subject positions and substitutions of wh-word *who* by *what* in the object position were also observed. These error patterns indicated children's tendency of using the wh-word *who* in the subject position, and wh-word *what* in the object position.

An analysis of the adult's input of who questions to 70 Cantonese-speaking preschool children was reported in Wong et al. (submitted). Uneven distribution of input of who questions was reported, with 87% of the who questions were subject questions and only 13% were object questions. Uneven distribution of input, but in an opposite direction, is expected for what-questions as similar to data in English. With these discrepancies in input frequencies of what and who questions, it is possible that children use the forms they have been frequently exposed to more proficiently.

Change in pattern of asymmetry across age groups

As mention in the Result section, subject-object asymmetry in who-questions was disappearing in older children, but the asymmetry in what-questions, favouring the object position, remained across the age groups. The differences in pattern of asymmetry of what

and who questions suggested that input frequency and animacy effect might not be sufficient to account for the asymmetries in both what and who questions.

As children's language knowledge develop with age, it is likely that they are less dependent on differential input, and the association between the animacy of wh-words and the grammatical role of subject or object for their later learning of wh-questions. While these factors might explain the change in pattern of the asymmetry in who questions, a third factor, communicative function is hypothesized to be responsible for their infrequent use of what-subject questions in all three age groups. As reviewed in the Introduction section, question forms that served children's immediate communicative interests and needs will be adopted for active use earlier (Clancy, 1989). Children's primary use of interrogatives was for obtaining information in their immediate contexts (Vaidyanathan, 1988). Also reported in Ho (2000), 75% of the questions produced by children of age 2;06-5;06 served the function of information seeking for discussing observable topics and for negotiating ongoing activity. Since what-object, who-subject and who-object questions were mainly used for obtaining information about referents (object labels / person names) in the immediate context (e.g. during play), they matched well with children's communicative needs and interests. However, what-subject questions were mainly used to ask for the meaning of some unknown words (e.g. *Mat1je5 giu3 'hung4sik1'?* "What is called 'red'?") (Li & Chen, 1998) or to test someone's ability to tell an agent for a particular action (e.g. *Mat1je5 dung6mat6 sik1 jau6seoi2?* "What animal can swim?") Asking for the meaning of an unknown word required metalinguistic skills that are only developed by age five or six (DeVilliers, 1978), while asking a question when one knows the answer, as in a teacher-student testing situation, is the last stage in developing different uses of questions (Li & Chen, 1998). Therefore, the fact that what-subject questions serve less important communicative functions than what-object questions, might be responsible for the remaining difficulties in using what-subject questions in children

aged 5;06-6;00. On the other hand, both who-subject and object questions serve similar communicative functions to children, this factor does not impose difficulty on a particular type of question when the effect of input frequency and animacy constraint resolved with increased age.

Absence of asymmetry between where-argument and where-adjunct questions

Where-argument and where-adjunct questions were produced at the same level of accuracy for all three groups of children. This indicated that the asymmetry between argument questions (what and who) and adjunct questions (why, how and when) reported in earlier studies disappeared when the conceptual factor was held constant (that is to compare the use of argument and adjunct questions in the same question type). It was hypothesized that the earlier development of argument questions (what, who) than adjunct questions (why, how and when) might not be due to the syntactic functions of the wh-words, but due to the semantic complexity of question types. Results from this study were consistent with those reported in a comprehension study on Cantonese-speaking children (Cheung & Lee, 1993) in which the children answered where-argument questions as accurately as where-adjunct questions. However, due to the small number of participants and items used in this study, further study examining the asymmetry between argument and adjunct questions again with control in the conceptual factor will be needed to provide further support to this hypothesis.

Implications of current study

Preliminary findings from the present study support the use of elicited production to examine children's use of wh-questions. As noted earlier, significant development of where and why questions was observed from age 4;06 to 6;00. If a 5-year-old child produced where and why questions at a low level of accuracy, like how and when questions (i.e. his ability to produce these two types of questions are similar to children of age 3;06-4;00), further investigation in the child's language development may be indicated.

Procedures were specifically designed to elicit children's production of wh-questions in the present study. Although piloting of the procedures had been done, and modifications had been made, given findings from this study, procedures can further modified to make them more effective and efficient for use with younger children. First, one more investigator can be involved in the task to play Teddy's role. This might reduce the confusion due to the situation of one investigator playing two roles.

Another modification that can be made is to introduce training items before the first, as well as after every eighth item in the task. This will help to keep the child focused on the purpose of the task.

Giving more explicit verbal prompts can be another modification. During the task, children determined the task requirements by themselves through the investigator's acknowledgement, modeling and feedback in the training trials. By giving cues to the type of questions required in the verbal prompt in the training trials, children might find it easier to understand the requirement of the task. An example of such a procedure was used in a study on English-speaking children (Haana & Wilhelm, 1992), in which the verbal prompt was "The bear is biting someone, can you make up a question to find out who?" By making all these modifications, the task would probably be able to assess children younger than age 3;06.

Further studies should be devoted to capture the process of development of the full range of wh-questions by extending the age range of children to younger than age 3;06 and older than age 6;00. Both the subject-object asymmetry and argument-adjunct asymmetry across age groups should also be further tested with increased number of items per each question type in order to draw statistically significant conclusions on the observed results. Modifications of the task procedures for clinical use will also be useful, as it provides a way to capture children's ability to produce different wh-questions within a short period of time in a clinical session.

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Acknowledgements

Appendix A

Verbal prompt of the six training items (T) and 24 testing items (E)

What-object question	T1	*Maa4maa1 zyu2 gan2 jat1 di1 je5 wo4.*
		Mother cook ASP one CL thing SFP
		Mother is cooking something.
Who-subject question	T2	*Jau5 jan4 tek3 baa4baa1 wo4.*
		Have person kick Father SFP
		Somebody is kicking Father.
Where-argument question	T3	*Go4go1 hai2 jat1 dou6 dei6fong1 sik6 fan6 wo4.*
		Brother at one CL place eat rice SFP
		Brother is eating at some place.
Why question	T4	*Mui4mui2 jan1wai6 jat1 di1 jyun4jan1 paak3 sau2.*
		Sister because one CL reason clap hand
		Because of some reason, sister is clapping hands.
How question	T5	*Go4go1 gam2joeng2 se2zi6 wo4.*
		Brother in some way writing SFP
		Brother is writing in some way.
When question	T6	*Mui4mui2 jau5 zan6 si4 sau1 dou2 lai5mat6 wo4.*
		Sister have CL time receive PRT present SFP
		Sister is receiving presents sometimes.

What-subject questions	E1	*Jau5 di1 dung6mat6 sik1 caai2 daan1ce1 wo4.*
		Have CL animal know ride bicycle SFP
		Some animals know how to ride a bicycle.
	E2	*Jau5 di1 dung6mat6 zung1ji3 paa4 syu6 wo4.*
		Have CL animal like climb tree SFP
		Some animals like to climb trees.
What-object questions	E3	*Baa4baa1 jam2 gan2 jat1 di1 je5 wo4.*
		Father drink ASP one CL thing SFP
		Father is drinking something.
	E4	*Go4go1 diu3 dou2 jat1 di1 je5 wo4.*
		Brother (to) fish PRT one CL thing SFP
		Brother caught something.
Who-subject questions	E5	*Jau3 jan4 tung4 mui4mui2 waan2 bo1 wo4.*
		Have person with Sister play ball SFP
		Somebody is playing ball with Sister.
	E6	*Jau3 jan4 teoi1 mui4mui2 wo4.*
		Have person push Sister SFP
		Somebody is pushing Sister.
Who-object questions	E7	*Baa4baa1 sek3 jan4 wo4.*
		Father kiss person SFP
		Father is kissing somebody.
	E8	*Maa4ma1 wai3 jan4 sik6 joek6 wo4.*
		Mother feed person eat medicine SFP
		Mother is feeding medicine to somebody.

Where-argument questions E9 *Mui4mui2 heoi3 gan2 jat1 dou6 dei6fong1 wo4.*

Sister   go ASP one CL   place   SFP

Sister is going to some place.

E10 *Zoek3zai2 heoi3 gan2 jat1 dou6 dei6fong1 wo4.*

Bird   go ASP one CL   place   SFP

Bird is going to some place.

Where-adjunct questions E11 *Go4go2 hai2 jat1 dou6 dei6fong1 waak6waa2 wo4.*

Brother at   one CL place   draw   SFP

Brother is drawing at some place.

E12 *Maau1maau1 hai2 jat1 dou6 dei6fong1 diu3jyu2 wo4.*

Cat   at one CL   place   fishing

SFP

Cat is fishing at some place.

Why questions E13 *Maa4maa1 jan1wai6 jat1 di1 jyun4jan1 maat3 dei6 wo4.*

Mother   because one CL reason   mop floor

SFP

Because of some reason, Mother is mopping the floor.

E14 *Maa4maa1 jan1wai6 jat1 di1 jyun4jan1 am2 sat6 ji5zai2 wo4.*

Mother   because one CL reason   cover tight

ear   SFP

Because of some reason, Mother is covering her ears.

E15 *Tou3zai2 jan1wai6 jat1 di1 jyun4jan1 paau2 dak1*

hou2 faai3 wo4.

Rabbit   because one CL reason   run   PRT

very   fast   SFP

Because of some reason, Rabbit is running very fast.

E16 *Go4go1 jan1wai6 jat1 di1 jyun4jan1 paa4 seong5*

syu6 dou6 wo4.

Brother because one CL reason   climb up

tree   PRT SFP

Because of some reason, Brother is climbing up a tree.

How questions

E17 *Baa4baa1 gam2joeng2 sik6 daan6gou1 wo4.*

Father   in some way eat   cake   SFP

Father is eating a cake in some way.

E18 *Go4go1 gam2joeng2 zeoi1 zyu6 mui4mui2 wo4.*

Brother in some way chase PRT Sister   SFP

Brother is chasing after Sister in some way.

E19 *Maa6lau1zai2 gam2joeng2 caai2 daan1ce1 wo4.*

Monkey   in some way ride   bicycle SFP

Monkey is riding a bicycle in some way.

E20 *Mui4mui2 gam2joeng2 ke4 zyu1zyu1 wo4.*

Sister   in some way ride pig   SFP

Sister is riding a pig in some way.

When questions

E21 *Mui4mui2 jau5 zan6 si4 taan4 kam4 wo4.*

Sister   have CL time play piano SFP

Sister is playing the piano sometimes.

E22 *Maa4maa1 jau5 zan6 si4 jam2 caa4 wo4.*

Mother   have CL time drink tea SFP

Mother is drinking tea sometimes.

E23 *Tou3zai2 jau5 zan6 si4 sik6 daai6 lo4baak6 wo4.*

Rabbit   have CL time eat big carrot SFP

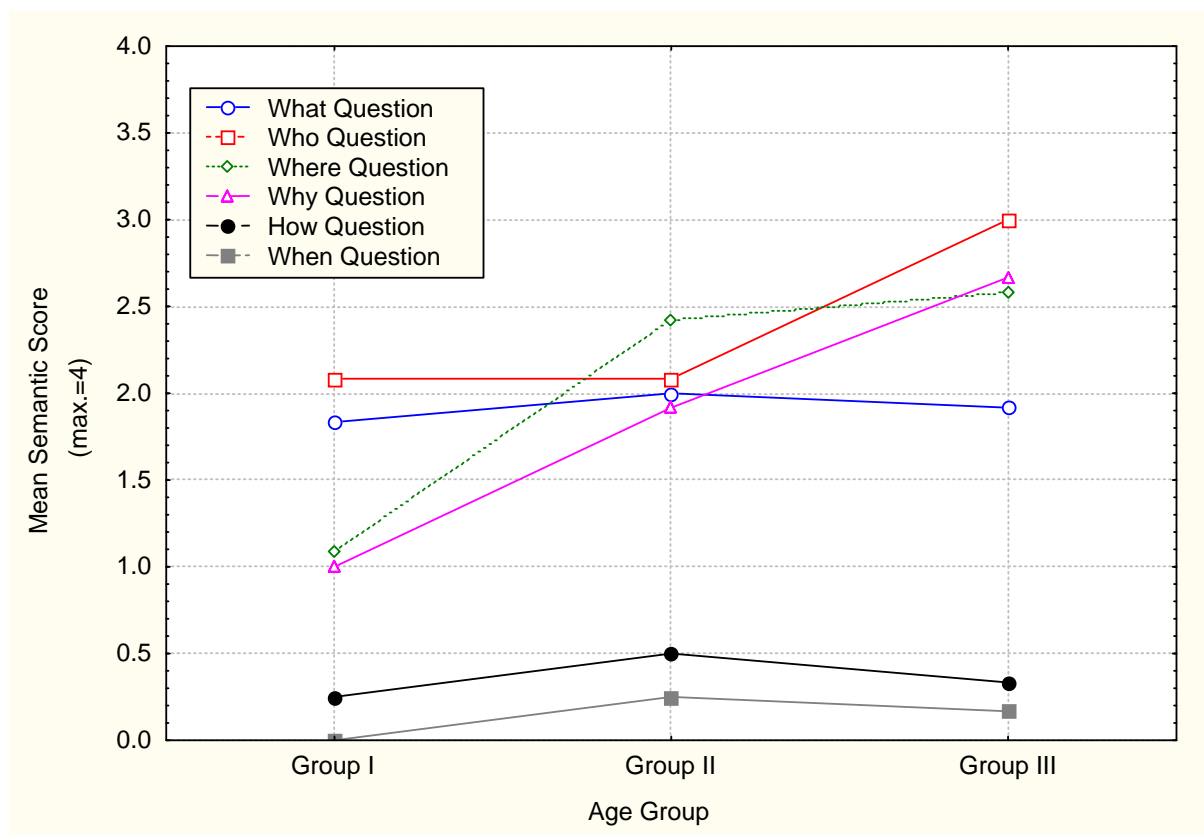Rabbit is eating big carrot sometimes.

E24 *Gau2zai2 jau6 zan6 si4 ngaau5 jan4 wo4.*

Dog   have CL time bite person SFP

Dog is biting people sometimes.

Appendix B

Illustration of interaction effects of age group by question type on semantic scores

Appendix C

Types, number and (percentage out of total number) of semantic error in each of the age groups

Types	Number (Percentage out of total number of semantic error)			Total
	Group I	Group II	Group III	
"Why" + verbal prompt	108	122	90	320
	(20%)	(22%)	(17%)	(59%)
Repetition of verbal prompt	35	28	14	77
	(6%)	(5%)	(3%)	(14%)
Other comments about the picture	21	4	23	48
	(4%)	(1%)	(4%)	(9%)
Substitution by early developing questions	25	9	12	46
	(4%)	(2%)	(2%)	(8%)
Intonation question / Yes-no question	*12*	*3*	*5*	*20*
	(2%)	*(1%)*	*(1%)*	*(4%)*
Wh-question	*13*	*6*	*7*	*26*
(earlier developing than targeted type)	*(2%)*	*(1%)*	*(1%)*	*(4%)*
Guess the missing piece of information	9	7	5	21
	(2%)	(1%)	(1%)	(4%)

What question – who question inversion	1	5	9	15
	(<1%)	(1%)	(2%)	(3%)
Substitution of what by who at subject position	*1*	*5*	*8*	*14*
	(<1%)	*(1%)*	*(1%)*	*(3%)*
Substitution of who by what at object position	*0*	*0*	*1*	*1*
	(0%)	*(0%)*	*(<1%0*	*(<1%)*
Substitution by Which question	4	1	4	9
	(1%)	(<1%)	(1%)	(2%)
Use more than two question words	1	5	3	9
	(<1%)	(1%)	(1%)	(2%)

Appendix D

Types, number and percentage (out of total number) of syntactic error in each of the age groups

Types	Number (Percentage out of total number of semantic errors)			Total
	Group I	Group II	Group III	
Substitution by identification questions	19	7	8	34
	(40%)	(15%)	(17%)	(72%)
Subject-object inversion	5	0	3	8
	(11%)	(0%)	(6%)	(17%)
Substitution of who-object by who-subject question	*4*	*0*	*2*	*6*
	(9%)	*(0%)*	*(4%)*	*(13%)*
Substitution of what-subject by what-object question	*1*	*0*	*1*	*2*
	(2%)	*(0%)*	*(2%)*	*(4%)*
Non-adult forms	1	1	2	4
	(2%)	(2%)	(4%)	(9%)
Main verb missing (single wh-word question)	1	0	0	1
	(2%)	(0%)	(0%)	(2%)