Chinese-Speaking Children's Production of *Wh*-Questions

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This paper deals with the acquisition of monoclausal *wh*-questions in Mandarin Chinese. Several experiments on the acquisition of *wh*-questions in Cantonese, English, Korean, and Japanese have been reported; however, the studies have yielded different results. In addition, no study of this issue in Mandarin Chinese-has been conducted. Hence, an experiment has been designed to test for the pure syntactic effects of a possible subject/object asymmetry in the relative difficulty of *wh*-questions in Mandarin Chinese. This experiment focuses on simple *wh*-questions which are subject *wh*-questions (e.g., Who is kicking John?) and object *wh*-questions (e.g., Who is John kicking?), and the crucial issue is whether subject *wh*-questions are easier to acquire than object *wh*-questions in Mandarin Chinese and how important is the role of age in the acquisition of *wh*-questions. The results show that subject *wh*-questions are much easier for Chinese-speaking children than object *wh*-questions and younger and older children do not behave differently.

Key words: *wh*-question, subject and object asymmetry, language acquisition

1. Introduction

This paper examines the development of monoclausal *wh*-questions in Mandarin-speaking children, focusing on simple *wh*-questions. While other researchers have investigated the acquisition of *wh*-questions in other languages such as English, Cantonese, Korean, and Japanese (Ervin-Tripp 1970; Cairns & Hsu 1978; Tyack &Ingram 1977; Sama 1991;Wilhelm & Hanna 1992; Cheung & Lee 1993; Kim 1995; Stromswold 1995; Yoshinaga 1996), no prior research has been done in this area with speakers of Mandarin Chinese. The present study aimed to fill this gap.

Monoclausal *wh*-questions include subejct *wh*-questions and object *wh*-questions. Example sentences for both patterns are as follows:

Subject *wh*-question
(1) Shui zai   ti   Xiaoming.
    Who Prog kick   Xiaoming
    'Who is kicking Xiaoming?'

Object *wh*-question

(2) Xiaoming zai   ti   shui.

   Xiaoming Prog kick who

   'Who is Xiaoming kicking?'

As shown in (1) and (2), subject *wh*-questions refer to *wh*-questions in which the *wh*-words are subjects while object *wh*-questions are those in which *wh*-words function as direct objects. In monoclausal subject and object *wh*-questions of Mandarin Chinese, *wh*-words appear in sentence-initial as in (1) and sentence-final as in (2) positions respectively.

Mandarin Chinese is regarded as a language without *wh*-movement in syntax; therefore it does not demonstrate subject and object asymmetry (Huang 1982, 1987). What is subject and object asymmetry? If we want to extract a *wh*-phrase from a clause, the permissibility of the extraction often depends on whether the *wh*-phrase occurs in the subject or object position. Cases like (3) elucidate this point.

(3a) $[_{CP}$ What$_i$ do $[_{IP}$ you think $[_{cp}$ **COMP** e$_i$ that] $[_{IP}$ Jane left e$_i$ on the table]]]

(3b) *$[_{CP}$ Who$_i$ do $[_{IP}$ you think $[_{cp}$ COMP e$_i$ that] $[_{IP}$ e$_i$ left the bag on the table]]

In (3a), the *wh*-word *what* has moved out of an object position while in (3b) the *wh*-word *who* has originated from a subject position. *Wh*-movement from a subject position is generally ungrammatical while a similar movement from an object position is grammatical since empty categories in an object position are lexically and hence properly governed by their verbs, which accords with the Empty Category Principle (ECP) (Chomsky 1981). A simplified version of ECP is presented in (4) with relevant notations in (5) and (6).

(4) The Empty Category Principle (ECP)

   A non-pronominal empty category must be properly governed.

(5) Proper Government

X properly governs Y if X governs Y and

   a.   X is a lexical category (lexical government) or

   b.   X is coindexed with Y (antecedent government)

(6) Government

X governs Y if every maximal projection [other than IP] dominating X also dominates Y and vice versa,

<div align="right">(Chomsky 1981, Lasnik and Saito 1984)</div>

In (3a), the trace of *what* is lexically and properly governed by the verb *left, which* satisfies the ECP.

By contrast, there is no lexical proper governor for a subject empty category and thus it can only be properly governed through a configurational relationship with an antecedent within COMP. If the antecedent is not in the required structural position with respect to the empty category or if there is no antecedent, the subject empty category cannot be properly governed. This is exactly what (3b) manifests since the trace of *who* is not lexically governed and the antecedent of *who* cannot properly govern the trace left behind because this would form an instance of the *that-t* effect. The That-Trace Filter has been proposed by Chomsky and Lasnik (1977) and restated as in the following:

(7) That-Trace Filter

$*[_{S'}$ that $[_{NP}$ e$]_{NP}$ …$]_{Si}$, unless **Si** (or its trace) is in the context $[_{NP}$ NP
___ …$]_{NP}$

<div align="right">(Riemsdijk and Williams 1986:163)</div>

Therefore, the subject cannot be separated from its immediate antecedent by an overt complementizer or ungrammaticality results. Hence, the subject/object asymmetry occurs.

In Mandarin Chinese *wh*-words do not move in syntax but move at Logical

Form and both subject and object positions are lexically governed (Huang 1982, 1987) for Infl, being a lexical category instead of a functional category in Chinese, properly governs the subject. In addition, the two types of *wh*-questions have the effect of forming islands, but islands formed in LF will not block Move α in syntax which is the consequence of rule ordering and bounding theory. Therefore, there should be no asymmetry between subject and object *wh*-questions in Mandarin Chinese.

What is the implication of moving *wh*-words without overt *wh*-movment in language acquisition? We will try to resolve the mystery by conducting an experiment which is a partial replication and modification of Yoshinaga's experiment in 1996.

2. Theoretical background

Whether subject *wh*-questions are easier to acquire than object *wh*-questions has long been a hotly debated issue, which is closely related with the syntactic effects of a possible subject/object asymmetry. Two competing accounts are taken into consideration: one put forward by Stromswold (1995) and the other by O'Grady (1997). Both try to account for English acquisition and each predicts a different preference. We will illustrate both in the following section.

2.1 Stromswold (1995)

Stromswold's approach is based on the principles-and parameters (P&P) framework; therefore, the *wh*-word is inserted in the position where it could be assigned case and is then moved to the sentence-initial position. According to Stromswold (1995), antecedent-government imposes much more of a processing load than the lexical government which is more local, more direct, and less

complicated.   Therefore, the object *wh*-question should be acquired earlier than the subject *wh*-question because object *wh*-questions are easier than subject *wh*-questions.   This prediction has been borne out in her study of spontaneous speech.

Nevertheless, the prediction of Stromswold seems to contradict what Huang proposed for Mandarin Chinese since both subject and object positions are assumed to be lexically governed in Mandarin Chinese (e.g., Huang 1982; Huang 1987), which predicts no asymmetry between the two types of *wh*-questions.   More details will be discussed in the results and discussion sections.

2.2 O'Grady (1997)

O'Grady (1997) claims that object *wh*-questions are more complex computationally than subject *wh*-questions because the former involves longer 'distance' between the *wh*-word and the associated gap than the latter does.   There are two different views regarding the subject *wh*-questions: (1) the *wh*-phrase stays in-situ, hence there is no gap; (2) the *wh*-phrase undergoes *wh*-movement and moves to the sentence-initial position.   We will look at the movement analysis only because in Mandarin Chinese the *wh*-phrase moves in LF (Huang 1982, 1987).   For the movement analysis, the relationships between the *wh*-word and the associated gap in the subject *wh*-question extends over only the IP boundary; however, in the object *wh*-question, it has to extend over both the IP boundary and the VP boundary. Sentences (8) and (9) are presented as follows to illustrate the phenomena.
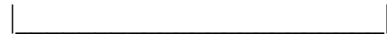
Subject *wh*-question
(8) [$_{CP}$ Who$_i$ [$_{IP}$ e$_i$ is kicking John]]?
          |_____|
          antecedent-government

Object *wh*-question

(9) [$_{CP}$ Who is [$_{IP}$ John [$_{VP}$ kicking e$_i$]]?

|_____|

lexical government

The distance between the *wh*-word and the associated gap has been characterized as computational complexity by O'Grady (1997:349).

(10) Computational complexity

X is cumulatively more complex than Y if X involves everything that Y does plus something else.

Hence, for a subject *wh*-question, the computational complexity rating for a subject is one because it crosses one IP boundary which intervens between the *wh*-phrase and the associated gap as shown in (8). With respect to object *wh*-questions, the rating would be two since there are two maximal projections crossed—VP and IP, as illustrated in (9). It is quite obvious that object *wh*-questions are computationally more complex than subject *wh*-questions. Therefore, the prediction for the acquisition order would be that subject *wh*-questions would be easier than object *wh*-questions based on the weak version of the Developmental Law, as presented in (11):

(11) The Developmental Law (weak version)

If X is cumulatively more complex than Y, X cannot emerge before Y (all other things being equal).

(O'Grady 1997:353)

If object *wh*-questions are cumulatively more complex than subject *wh*-questions, then object *wh*-questions will not emerge before subject *wh*-questions.

O'Grady (1997) does not make reference to *wh*-questions in languages that do not have overt *wh*-movements, such as Mandarin Chinese, Korean, and Japanese,

because his book is about English.   However, if we assume Huang's proposal that the *wh*-phrase in Mandarin Chinese moves at LF, then object *wh*-questions should be acquired later than subject *wh*-questions.

3. Literature review

A number of researchers have investigated the acquisition of questions, with a focus on subject and object *wh*-questions in monoclausal sentences.   Specific languages investigated include English, Korean, Cantonese and Japanese.   We will review previous research in this section.   Regarding studies of English acquisition, studies of Ervin-Tripp (1970), Cairns &Hsu (1978), Tyack & Ingram (1977), Sarma (1991), Wilhelm & Hanna (1992), and Stromswold (1995) are addressed.   Then, we will discuss studies of Cantonese by Cheung & Lee (1993), of Korean by Kim (1995), and of Japanese by Yoshinaga (1996).

3.1 Ervin-Tripp (1970)

Ervin-Tripp (1970) examined how children respond to various types of *wh*-questions, including subject *who*-questions and object *who*-questions.   Subjects included twenty-four children, ranging in age from 2;6 to 3;1 at the beginning, of the study and this study ended when the children grew to age 3;3 to 4;2.   Longitudinal data were gathered through monthly interviews.   During each session the children were shown a picture book and asked 30 questions about the book.   Examples of subject and object *who*-questions are presented in (12):

(12) i. Subject *wh*-question
    a. Who is feeding him?
    b. Who is petting him?
  ii. Object *wh*-question
    a. Who is he feeding?
    b. Who is he petting?

The results showed that more children acquired subject *who*-questions at an earlier age than object *who*-questions. However, Ervin-Tripp (1970) noted that individual differences did exist among the children since about 25% of the children interpreted subject *wh*-question as if they were object *wh*-questions at around 3;1, but this phenomenon disappeared by 3;9. Moreover, the children always responded appropriately to object *wh*-questions by 3;0. Hence, Ervin-Tripp, concluded that most of the children acquired both types of *who*-questions before 3;1, so object *who*-questions should not be regarded as a late acquisition. Therefore, the syntactic distinction between subject and object *who*-questions was acquired early, but temporarily confounded by a processing strategy before age four.

The results seemed to contradict the proposals of both Stomswold and O'Grady. However, as O'Grady (1997) pointed out, Ervin-Tripp's study contains a potentially serious flaw. Questions such as *Who is feeding him?* or *Who is he feeding?* were asked and the inclusion of the pronominal case (*him* vs. *he*) might provide children a secondary clue about the syntactic function of the *wh*-word.

3.2 Carins and Hsu (1978)

Cairns and Hsu (1978) also investigated children's responses to various types of *wh*-questions, including subject *who*-questions and object *who*-questions (with *do* and the progressive aspect respectively). However, this study was different from that of Ervin-Tripp's since it adopted the cross-sectional method. Subjects were fifty children between the ages of 3;0 and 5;6, divided equally into five age groups. Five videotaped episodes were shown, and each episode described the life of a family in pantomime. Children were asked 6 different *wh*-questions after each episode, so there were 30 questions for each child. An example of the test sentences follows:

(13) i. Subject *who*-questions

Who woke up the boy?

ii. Object *who*-questions (with progressive)

Who was the boy hitting?

iii. Object *who*-questions (with do)

Who did the girl dress?

The results indicated that children had relative difficulty in acquiring subject *who*-questions and object *who*-questions with *do*, and object *who*-questions with the progressive aspect were more difficult than the former two. Hence, the results of Carins and Hsu's study indicated that subject *who*-questions are either as difficult as or more difficult than object *who*-questions. This results partially echoed Ervin-Tripp's argument, that is, the syntactic distinction between subject and object *who*-questions was acquired relatively at the same time.

Nevertheless, there is an experimental flaw in Carins & Hsu's study (O'Grady 1997), that is, the auxiliary *do* appears only in non-subject questions. This phenomenon might provide children with another clue for the interpretation of those patterns. Hence, the validity of this experiment might be questionable.

3.3 Tyack and Ingram (1977)

Tyack and Ingram (1977) focused their study on children's comprehension of subject and object *wh*-questions. Subjects of this study were one hundred children with ages ranging from 3.0 to 5.5 years old and were equally divided into five groups with gender balanced. The materials used in this research were six photographed scenes. After being shown a series of photographs, the children were asked *wh*-questions about the event depicted in the scenes and answered the *wh*-question according to the scene. Each sentence type (i.e., subject *who*- and *what*-questions, and object *who*-and *what*-questions) had six tokens and only three

transitive verbs (*touch, ride,* and *help*) were used in this study. Example sentences are given as follows:

(14) i. Subject *who*-questions
   Who is touching/riding/helping the boy?
ii. Object *who*-questions
   Who is the boy touching/riding/helping?
iii. Subject *what*-question
   What is touching/riding/helping the boy?
iv. Object *what*-question
   What is the boy touching/riding/helping?

The results showed that in the case of *who*-questions, the mean correct response rate for the subject *wh*-questions was 80%, whereas the correct response rate was only 56% for the object *wh*-questions. This seems to indicate that subject *wh*-questions were easier than object *wh*-questions in the case of *who*-questions. Nevertheless, in the case of *what*-questions, the results were reversed. The mean correct response rate for the subject *what*-questions was only 35%, whereas the correct response rate for the object *what*-questions was 57%. This seems to show that object *wh*-questions were easier than subject *wh*-questions in the case of *what*-questions.

Therefore, the results elucidated that subject questions were easier than object question for *who*, but object questions were easier than subject questions for *what*. Tyack & Ingram assumed that this is because animate entities (i.e., *who*) are more likely to be associated with the subject position, whereas inanimate entities (i.e., *what*) are more likely to be associated with the object position, as originally proposed by Ervin-Tripp (1970). If this were the case, the animacy factor has interfered with the experimental results.

A closer look at the error data, however, might provide us alternative

explanations for the comprehension of those *wh*-quesitons. The most frequent error, according to Tyack & Ingram (1977:220-221), is 'the error in animacy', that is, animate *who* was misinterpreted as inanimate *what* or inanimate *what* as animate *who*. About 51.3% of the time on average, subject *what*-questions were interpreted as if they were subject *who*-questions. By contrast, object *what*-questions were treated as if they were object *who*-questions only 23% of the time on average. Likewise, object *who*-questions were misinterpreted as object *what*-questions 20% of the time on average. The lowest percentage was 9.7% and this was when children regarded subject *who*-questions as subject *what*-questions. We could infer from these numbers that the conversion rate for object *what*-questions and object *who*-questions was about the same in both directions but the animacy reversal rate was much higher for subject what-questions. In addition to the animacy effects, what might contribute to such an error pattern?

Another highly possible contributing factor to the animacy reversal might be due to the choice of verbs, that is, the error rate is correlated with the chosen verbs since only three verbs were adopted in this research. All the three verbs (*touch, ride, and help*) tend to have animate subjects. Yoshinaga (1996) also noted that these verbs have a strong tendency to take animate subjects and thus it might not be the case that subjects are more likely to be associated with animate entities. Conversely, not all of the verbs take animate objects. More specifically, the verb *touch* can take either animate or inanimate objects while the verb *help* is more likely to take an animate direct object. As to the verb *ride*, inanimate direct objects seem to appear more frequently. Sentences such as *What is the boy helping?* and *Who is the boy riding?* do not occur naturally, which might account for the conversion between object *what*-questions and object *who*-questions. The choice of verbs, rather than the animacy factor, seems to have more of an effect on the experimental

results.   The validity of this experiment seems to be questionable when there are so many factors that were not controlled.   Therefore, it would be difficult to talk about whose proposals have been supported.

3.4 Wilhelm &Hanna (1992)

Wilhelm & Hanna (1992) conducted a comprehension task and a production task to test whether subject *wh*-questions emerge earlier than object *wh*-questions. Eleven children (six boys and five girls), with ages ranging from 3;4 to 4;7, were divided into two groups : age 3 (3;4 to 3;6) and age 4 (4;1-4;7).   In the comprehension task, twelve pictures were presented to the children and the children were asked questions about what happened in the picture.   The verbs used in this test were carefully selected so that they did not exhibit an animacy bias; therefore, the subject entity and object entity were semantically reversible.   A sample of question patterns is illustrated in (15):

(15) i. Subject *who*-questions
        Who is kicking/biting the monkey?
    ii. Object *who*-questions
        Who is the monkey kicking/biting?
    iii. Subject *what*-questions
        What is hitting/pushing the car?
    iv. Object *what*-questions
        What is the car hitting/pushing?

There were three tokens for each type; in total, there were 12 questions.

In the comprehension task, the rate of correct responses for all question types and age groups was consistently high (combined results for both groups: *who*-subject 81.8%; *what*-subject 86.4%; *who*-object 90.9%; *what*-object 81.8%). However, the correct response rate for subject *what*-questions was slightly higher

than subject *who*-questions whereas the correct response rate for object *who*-questions was slightly higher than object *what*-questions. Based on Tyack & Ingram's animate-for-subject & inanimate-for-object account, these results seemed to contradict their prediction. Furthermore, the results for individual age groups showed that object questions were easier than subject questions for both age groups (age three: subject question→ 80%, object question→ 83.3%; age four group: subject question→ 86.7%, object question→ 88.9%). Unfortunately, Wilhelm and Hanna did not find any pattern in the errors the children made; therefore no further clues could be provided to help interpret the results.

Regarding the production task, the child would be shown a picture depicting an action involving two participants, one of whom was covered over. Then two experimenters would interact with the child and the sample dialogue would be as follows:

(16) Experimenter 1: Someone is pushing the monkey and I know who.
　　　Experimenter 2: Can you make up a sentence to find out who?

A series of models were carried out before they proceeded to the task.

The results of the production task indicated that subject *wh*-questions are easier than object *wh*-questions for both *who* and *what* questions although the scores are not very high for all sentence types (57.6% for *who*-subject; 39.4% for *what* subject; 33.3% for both *who*- and *what*-object). As shown from the percentages, subject questions were the easiest of all, which accords with the findings of the comprehension task in Tyack & Ingram's study. Nevertheless, there is one major difference between Wilhelm and Hanna's study and that of Tyack and Ingram. For the group of age three, object questions were easier than subject questions (43.3% and 40.0% correct respectively). This result was left unexplained.

Moreover, children's errors on the production task mostly involved animacy and Wilhem & Hanna (1992) noted that Tyack & Ingram's animate –for-subject and inanimate-for-object explanation can account for the misuse of *who* subjects for *what* subjects and the misuse of *what* objects for *who* objects. However, it does not provide any explanation for the misuse of *who* objects for *what* objects or the misuse of *what* subjects for *who* subjects. The second most common mistake was a syntactic error, in which children reversed subject and object questions and an object question was used instead of a subject question only 2.5% of the time whereas a subject question was used instead of an object question 17.5% of the time. A preference for subject questions seemed to be obvious.

In sum, this study showed a general tendency for subject *wh*-questions to be easier than object *wh*-questions in the production task while the reverse was true for the comprehension task. The contradictory results made interpretations of the results more difficult under the condition that no statistics had been done. Both Stromsworld and O'Grady's accounts are not applicable in this particular research. Since the study was quite small, we should be extra cautious to draw any inferences.

3.5 Sarma (1991)

Sarma (1991) used an elicited production task to study the acquisition of *wh*-questions in English with respect to subject-auxiliary inversion. This study consisted of sixteen children, divided into two age groups: Group I (2;9-3;4 with six members), and Group 2 (3;8-5;3 with ten members). One experimenter and a child played a 'guessing game' while the other experimenter played the role of a puppet named Mikey. The child had to ask the puppet experimenter a question about a story after the experimenter provided the child with instructions and 'games'. Some relevant target sentences from Sarma's study, with two tokens for each type,

are presented as follows.

(17) Who can lift the car?
   Who can Ernie carry?
   Who is the gorilla scaring?

Since subject-object asymmetry was not the focus of this study, he did not present the exact number of responses for subject and object *wh*-questions. However, there is one interesting phenomenon, that is, two children in Group II substituted target *who*-object questions with *who*-subject questions.

(18) i. Who is scaring the baby pigs?
      Target: Who is the gorilla scaring?
   ii. Who is carrying the teddy bear?
      Target: Who can Ernie carry?

The limited data probably could not reveal too much, but there might be a tendency for some children to acquire subject *wh*-questions more easily than object *wh*-questions.   Individual differences might account for such isolated cases.

Up to now, we have seen studies with different tasks leading to diverse results which cannot be interpreted by any existing theoretical frameworks.   If experimental methods could not provide us with clear-cut evidence, longitudinal natural data might be one way out.   Stromswold (1995) actually turned to this resource and revealed different findings which we will introduce in the following section.

3.6 Stromswold (1995)

Sromswold (1995) regards comprehension and production tasks as inappropriate for examining the issue of the order of acquisition of subject versus object *wh*-questions.   She indicated that we might underestimate children's

competence since children under the age of three may have already acquired the linguistic construction and the problem lies in the difficulty of the experiment. One possible supporting piece of evidence came from Wihlem and Hanna's research. In that study, there is a great difference between comprehension and production tasks in terms of correct response rate. For the comprehension task, the percentages for all sentence types are over 80% while in the production task, the scores are all below 60%. Although in their training period, almost all children proceeded well, it is still highly probable that children did not understand what "*Can you make up a sentence to find out who?*" meant. The relative difficulty would certainly influence the experimental results and thus led to incorrect assumptions.

Therefore, Stromswold (1995) used the CHILDES transcripts of twelve children to determine which *wh*-question (subject or object) was acquired first and examined *who* questions, *what* questions, and *which* questions. The age at which children asked their first subject questions in the transcripts ranged from 1;85 to 3;8.2, and the age at which children asked their first object questions ranged from 1;9.8 to 2;8.8. Generally speaking, three children acquired subject questions first while five children acquired object questions first. Interestingly, the remaining four children seemed to acquire both question types simultaneously. It seemed that there was no clear difference among which type of question was used first; however, for *what* and *which* questions, most of the children asked object *wh*-questions before they asked subject *wh*-questions. In terms of *what* questions, eight out of twelve children first used object questions while the rest of them used both subject and object questions simultaneously. As to *which* questions, five children asked object questions first while only one child used both subject and object questions at the same time. For the remaining six students, *which* questions did not appear in their transcribed data, which might suggest that this question type is the most difficult

one.

The relative frequency of subject and object *who*-questions and the relative frequency of subject and object *what*-questions by children and by adults were also examined. Stromswold (1995) adopted Tyack & Ingram's (1977) reasoning to account for the fact that adults and children ask more subject *who*-questions than object *who*-questions, and more object *what*-questions than subject *what*-questions. W*ho* rather than *what* is more likely to be used to ask about the identity of a subject since subjects tend to be animate whereas objects tend to be inanimate, thus *wha*t rather than *who* is more likely to be used to ask about the identity of an object.

Based on her analyses, Stromswold concluded that children acquire object *wh*-questions at the same age or earlier than subject *wh*-questions.   Therefore, the syntactic account which could best explain the result is Rizzi(1990)-Manzini (1992) Hypothesis that subject and object traces are governed in the same way and differently from adjunct traces.

3.7 Cheung & Lee (1993)

The study of Cheung & Lee (1993) tested the subject-object asymmetry in the relative difficulty of *wh*-questions.   The subjects were Cantonese children and a comprehension task had been applied.   Thirty children, between 2;6 to 5;0, were divided into 5 age groups with gender and number balanced: Group I, 2;6-3;0; Group II, 3;0-3;6; Group III, 3;6-4;0; Group IV, 4;0-4;6; Group V, 4;6-5;0.   The materials were twenty-four pictures (two as a set) and 12 audiotaped short stories. Transitive action verbs, intransitive action verbs, transitive stative verbs, and functional verbs were adopted in this study and each verb type had three tokens.   A researcher first presented a set of two pictures to a child and asked the child to identify the participants, locations and actions in the picture.   After that, the child

listened to a story with the researcher indicating relevant parts of the picture. *Wh*-questions, based on the story, were raised when the story ended. The picture was not shown to the child during the questioning.

Regarding *who* questions, subject questions were significantly more difficult than object questions (*who*-subject: 76%; *who*-object: 89%), (ANOVA, p< .05). If we examine more carefully different types of verbs, we discovered that *who*-objects were easier overall than *who*-subjects for both transitive action verbs (90% vs. 76%), and transitive stative verbs (93% vs. 83%) and the differences were all statistically significant. However, although the mean correct percentage for *who*-objects (80%) was slightly higher than for *who*-subjects (71%) in terms of function verbs (copula. existential, and locative verbs), it was not statistically significant.

As to *what* questions, there was no statistical significance between the subject pattern and object pattern although the subject pattern seems to be slightly easier than the object pattern (73% vs. 69%). The only exception was the result of function verbs; namely, *what*-object questions were significantly higher than *what*-subject questions (p< .01).

Based on their results, Cheung & Lee (1993) stated that in Cantonese, subjects acquired object *who*-questions before subject *who*-questions, and a similar tendency could also be observed in *what*-questions, which indicated an asymmetry between subject and object *wh*-questions in a language that does not involve *wh*-movement. Theoretically speaking, their results were regarded as compatible with Stromswold's proposal that object *wh*-questions should be acquired earlier than the subject *wh*-questions because object *wh*-questions are easier than subject *wh*-questions. Moreover, Cheung & Lee also rejected the hypothesis, originally proposed by Ervin-Tripp (1970), that subjects tended to be animate while objects tend to be inanimate because they assumed there were no differences between subject and

object questions for both who and what questions in their study.   Nevertheless, we have shown that there was no statistical significance between the subject questions and object questions for *what*-questions.   The conclusion, therefore, seemed to be questionable.

3.8 Kim (1995)

Based on Wilhelm and Hanna's (1992) study, Kim (1995) designed comprehension and production tasks and added imitation tasks with test sentences from the stimuli of the comprehension task and the target sentences in the production task.   The subjects in this study were Korean children between the ages of 2 and 8.   The number of subjects for the three tasks were different; sixty-nine children between the ages of 2 and 8 were divided into 7 groups for the comprehension task, forty-five children between the ages of 3 and 8 were divided into 6 groups for the production task, and fifty children between the ages of 3 and 8 were divided into 6 age groups for the imitation task.   Number and gender were almost balanced except for one group for the comprehension task but they were not balanced for the two other tasks.

Adopting Wilhelm and Hanna's (1992) experimental method, Kim (1995) also used verbs (*push*, *pinch*, *hit*, *pull*, and *bite*) that are semantically reversible.   A sample of test sentences (English version) served as stimuli for both the comprehension and imitation task as well as targets for the production task and they are presented as follows:

> (19) i. Subject who-questions
>   Who is pushing the monkey?
>   ii. Object who-questions
>   Who is the cow pushing?

Each pattern had five tokens so each task had 10 tokens in total.

The results of Kim's comprehension task showed that there was no asymmetry between the *who*-subject (84.1%) and *who*-object sentences (82%). Regarding the production task, *who*-subject questions (96.9%) were found to be much easier than *who*-object questions (74.2%). With respect to the imitation task, children were subdivided into two groups: one group receiving sentences with an adverb in the sentence initial position (ages 3, 7, 8) while the other group received sentences without adverbs (ages 4, 5, 6). The reason for the addition of adverbs was to avoid the saliency effect, that is, the sentence initial position tends to be more salient than the sentence final position. However, this control seemed to be dubious since in Korean who does appear in the sentence initial position. In addition, the method of division among age groups did not seem to have a solid foundation. The addition of adverbs only enhanced the difficulty of the imitation task because it is highly impossible for older children to perform worse than younger children, which was exactly the case in this study. The mean correct response rate for the adverb group was only 88.2% for *who*-subject questions while the mean correct response rate was 98.6% for the non-adverb group. Even worse, the mean correct response rate of *who*-object questions for the adverb group was only 65.5% while it was 90.7% for the non-adverb group. Although the overall results demonstrated that with or without adverbs the *who*-subject pattern was easier than the *who*-object pattern, the methodology of this study might need further scrutiny.

In sum, the comprehension task did not indicate any differences in the *who*-subject and *who*-object questions. Conversely, the production and imitation task all showed that the *who*-subject pattern is easier than the *who*-object pattern. Under the condition that the results were contradictory with each other and some experimental flaws might exist, the validity of the results seemed to be questionable.

3.9 Yoshinaga (1996)

Yoshinaga (1996) examined the development of *wh*-questions by English-speaking and Japanese-speaking children and focused on two types of *wh*-questions: simple and multiple *wh*-questions. For our purpose, we will only review the part of simple *wh*-questions from her study.

The simple *wh*-questions investigated in Yoshinaga's (1996) study were subject *wh*-questions and object *wh*-questions and she tried to test whether subject *wh*-questions are easier or more difficult than object *wh*-questions. Similar to Kim's (1995) study, the production task, designed by Yoshinaga (1996), also adopted the methodology in Wilhem and Hanna's (1992) study. Twenty-three English-speaking children with aged between 2;6 to 4;11 and thirty Japanese-speaking children aged between 2;4 to 5;0 were the subjects in this study. They were subdivided into two groups: age three and younger and age four and older with number and gender not balanced. Twenty-eight pictures in total, with four pictures for the training session, were used to elicit *which one*-, subject *who*- and object *what*-questions. There were six types of subject and object *wh*-questions with four tokens for each type. The animacy factor was controlled and semantically reversible verbs such as *push* and *pull* were used. A sample of target sentence patterns in English is illustrated in (20).

(20) i. Subject *wh*-questions
       Which one is pushing the cow?   (which AA)
       Which one is pushing the cow?   (which IA)
       Which one is pushing the truck?   (which AI)
       Which one is pushing the truck?   (which II)
       Who is pushing the cow?   (who AA)
       What is pushing the truck?   (what II)

    ii. Object *wh*-questions

       Which one is the cow pushing?   (which AA)

       Which one is the cow pushing?   (which AI)

       Which one is the truck pushing?   (which IA)

       Which one is the truck pushing?   (which II)

       What is the truck pushing?   (what II)

       Who is the cow pushing?   (who AA)

       (A refers to animate while I refers to inanimate)

The results showed that subject *wh*-questions (62.3%) were less difficult than object *wh*-questions (23.7%) for English-speaking children, but that there was no difference in their relative difficulty for Japanese-speaking children (26.3% for subject *wh*-questions and 31.3% for object *wh*-questions). Children, either in English or in Japanese, at different ages did not behave differently on different question patterns. Grammatical reversals were the most frequent error type for both English- and Japanese-speaking children. Children tended to substitute object *wh*-questions with subject *wh*-questions in English more frequently. By contrast, the Japanese-speaking children were inclined to respond with object *wh*-questions when subject *wh*-questions were the target sentences.

Yoshinaga (1996) accounted for the results by appealing to O'Grady's (1997) computational complexity proposal as we mentioned earlier. The results of the English-speaking children did not support Stromswold's hypothesis that object questions should be easier than subject questions. Therefore, Yoshinaga (1996) adopted O'Grady's account which predicted that in English subject questions should be acquired earlier and there would be no differences in the relative difficulty between subject and object questions in Japanese.

We have seen that even for languages with *wh*-words in situ, the experimental results were still different. For Korean, different experimental tasks yielded different results. With respect to Cantonese, the object questions were easier than

subject questions. As to Japanese, subject questions and objects questions were hypothesized to be acquired relatively at the same time. Since the results of the aforementioned studies were dissimilar, the researcher decided to investigate the acquisition of subject and object *wh*-qeustions for speakers of Mandarin Chinese.

4. Method

This research attempted to test for the pure syntactic effects of a possible subject/object asymmetry in the relative difficulty of *wh*-questions in Mandarin Chinese. The present study focused on simple *wh*-questions and the crucial issue was whether subject *wh*-questions are easier to acquire than object *wh*-questions in Mandarin Chinese and how important is the role of age in the acquisition of *wh*-questions. If Stomswold's proposal could be sustained, we could extend the hypothesis to Mandarin Chinese, that is, assuming LF movement in Mandarin Chinese with subject and object gaps lexically governed, there would be no subject/object asymmetry in Mandarin Chinese. However, if O'Grady's proposal was correct, we would have the same prediction since Chinese *wh*-questions could contain no gaps.

This research is a partial replication and modification of Yoshinaga's (1996) study; therefore, a production task was employed. Animacy bias was avoided and semantically reversible verbs (*push* and *pull*) were adopted as in Yoshinaga's (1996) study. However, we decreased the number of sentences because we understood that children have a limited attention span and we tried not to influence their regular school schedules.

4.1 Subjects

A total of eighty-five children from four kindergartens in Taipei and Hsinchu

counties participated in the present study. The number of children below age 4;06 were few—only twenty-two in total with ages ranging from 3;0 to 4;5, and would not be able to run statistics; hence, only children above 4;6 were included. For statistical reasons, some of the data were excluded. Therefore, data from only forty-two children were included in the current study. The children were divided into three age groups: age 4:6-4;12, age 5;0-5;6, and age 5;6-5;12. Each group included fourteen children and gender and number were balanced.

4.2 Materials

The materials used for the present study consisted of 16 pictures: 4 for the training session and 12 for the main tests. Two of the four pictures for the training session were used for eliciting *which one*-questions, one for subject *wh*-questions and one for object *wh*-questions. One of the remaining two pictures was used for subject *who*-questions, and the other for object *what*-questions. In total, there were 4 subject and object *which one*-questions and one subject and object *who*- and *what*-questions respectively. A list of the elicited target sentences is included in the appendix. Moreover, one puppet, a dog, was used to create a reasonable situation for the children to ask *wh*-questions.

4.3 Procedures

The experiment was conducted in Taipei County and Hsinchu County by the researcher. The production task of this study was based on the work of Wilhelm and Hanna (1992), whose methodology had also been adopted by Kim (1995) and Yoshinaga (1996). All participants were tested individually in a room separated from the classroom in four kindergartens so that they would not be distracted. There was a warm-up time between the researcher and the subjects so that children

would not feel embarrassed or shy in communicating with the experimenter. After the warm-up time, a picture would be presented to the child by the researcher. The picture would either depict an action that involved three participants such as two cows and one cat or two participants such as two pigs. The pictures with three participants were used to elicit the *which* questions, and part of the picture would be hidden from sight. If the picture included two participants, this was used to elicit *who* and *what* questions and one of the participants was covered by a piece of paper. Examples of some target sentences are shown as follows:

(21) i. Subject *who* question
       Who is pulling the car?
    ii. Object *what* question
       What is the car pulling?
    iii. Subject *which* question
       Which one is pushing the car?
    iv. Object *which* question
       Which one is the pig pushing?

A dog puppet was used to create a reasonable situation for the children to ask *wh*-questions. When a child was presented a picture, a cue such as "The cat is pulling someone. The doggie knows who. Could you ask him?" Then, the child has to ask the doggie a *wh*-question. A sample of interactions between the child and the researcher is shown in (22):

(22) A sample interaction
     Experimenter: A pig is pulling the car. The doggie knows which one.
                   Would you like to ask him?
     Child: Doggie, which one is pulling the car?

A child would be asked to model a sentence when s/he did not understand the task in the training session. For example, the experimenter would ask the child

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"Can you say 'Who is drawing a picture?'". However, in the main test session, errors were not corrected; and positive reinforcement was used (e.g. nodding, "good" or "That's right!" for all responses. All sessions were tape-recorded and the data were literally transcribed by the researcher.

4.4 Results and Discussion

The children's responses were categorized as either correct or incorrect. Perfect answers as well as sentences with noun deletion were counted as correct. Since Mandarin Chinese is a pro-drop language, the deletion of subject or object nouns is perfectly acceptable. Some of the children's answers that involved noun deletion are presented as follows:

(23) i. Subject deletion
Zai   tui   na   yi   zhe?
progressive push which one classifier
'Which one is the pig pushing?'
ii. Object deltion
Na   yi   zhe   zai   la?
which one classifier progressive   pull
'Which one is pulling the cow?'

Before the inferential statistics are discussed, the frequencies and percentages of correct responses for the different age groups are first analyzed descriptively to provide an overview.

Generally speaking, the scores for subject *wh*-questions were consistently higher than the scores for object *wh*-questions. A similar tendency was observed in the scores of correct responses by age groups. The percentages of correct responses by age group for both subject and object *wh*-questions are presented in Table 1.

Table 1. Frequencies of Correct Responses

Question type	Subject *wh*-questions	Object *wh*-questions
Overall	97.21%	59.93%
4;06-5;00	96.42%	59.52%
5;00-5;06	95.23%	59.52%
5;06-6;00	100%	60.76%

It is quite obvious that the percentages of subject wh-questions are much higher than object wh-questions for children across all age groups.

Then, paired T-tests were conducted across age groups to see if there were statistical significance and the results are displayed in Table 2:

Table 2. Paired Samples Test

Paired	Mean	Std. Deviation	t	df	Sig. (2-tailed)
SUBJECT-OBJECT	2.17	1.766	7.952	41	.000*
SUBJECT1-OBJECT1	2.07	1.730	4.479	13	.001*
SUBJECT2-OBJECT2	2.07	1.592	4.870	13	.000*
SUBJECT3-OBJECT3	2.36	2.061	4.280	13	.000*

p = .05
Note: SUBJECT1-OBJECT1 refers to Group 1. SUBJECT2-OBJECT2 refers to Group 2, and SUBJECT3-OBJECT3 refers to Group 3.

The p-values were all significant (Group I:.001; Group II .000; Group III .000; Across age groups: .000), which indicated that the subject *wh*-questions are much easier for Mandarin-speaking children than object *wh*-questions. Moreover, according to the results of the T-test, there was no significant effect or interaction involving age (comparison between group 1 and 2: df = 26, t = .18 < 1.706, p = .10. n.s.; comparison between group 2 and 3: df = 26, t = .192 < 1.706 p = .10 n.s.). Therefore, younger and older children did not behave differently.

We shall now look more closely at the errors found in the current study. As shown in Table 1, the mean correct percentage was not very high for object *wh*-questions. Mandarin-speaking children tended to substitute object

wh-questions with subject *wh*-questions, especially for *which*-one questions. For example, children would say *Na yi zhe zhu zai tui chezi? "Which pig was pushing the car?"* instead of the target sentence *Zhu zai tui na yi lian che? "Which car the pig was pushing?"* About 90% of the cases presented a grammatical reversal for object *wh*-questions and only a few cases were found for sbject *wh*-questions. Among the three types of *wh*-questions, *which-one* object questions (error rate: 49.66%) were more difficult than *who-* and *what*-object patterns (error rate: 21% for *who*-object and 16% for *what*-object). This result is similar to that found in Yoshinaga's (1996) study which reported that the correct response rates for *which-one* object questions in English were the lowest (which AA: 15.2%; which II 13%; which AI 20.7%; which IA 7%). However, in Japanese, such difficulty was not observed and no explanations were provided for this particular type of sentence pattern.

How can we interpret the results in the present study which are different from the previous research? Our results are different from that of Cheung and Lee's (1993) study because their results showed that object *wh*-questions were easier than subject *wh*-questions. Since Cantonese and Mandarin Chinese belong to the same language family, Sino-Tibetan, and they are closely related to each other, we might want to ask a question: "Why is there such a big difference? One possible contributing factor might be task difference, that is, their study only included a comprehension task while the present study only included a production task. From the perspective of psycholinguistics, a comprehension task in some sense is easier than a production task for participants sometimes could use body language such as pointing or nodding to give their answers without even saying a word. A production task includes all the processes involved in a comprehension task with the addition of output production which might need further mapping of all grammatical

levels such as morpho-syntatic, semantic, phonological, according to Levelt's (1989) production model. Errors thus frequently occur such as the tip of the tongue phenomenon or slip of the tongue since mistakes at any level might lead to incorrect production.

From the syntactic point of view, we might want to resort to the two hypotheses proposed by Stromswold (1995) and O'Grady (1997) respectively. We mentioned earlier that Cheung and Lee's (1993) study seems to agree with Stromswold's (1995) hypothesis that object *wh*-questions are easier than subject *wh*-questions. According to Stromswold (1995), lexical government is more local, more direct, and less complicated than antecedent-government. Hence, subject *wh*-questions which are antecedent-governed should be more difficult than object *wh*-questions which are lexically governed by the verb. However, we understand that Mandarin Chinese moves at the level of Logical Form instead of syntactic level. Under this condition, there would be no asymmetry between subject and object *wh*-questions according to Stromswold's hypothesis in that both subject and object positions are lexically governed in Mandarin Chinese (Huang 1982, 1987). Our results contradict with Stomswold's hypothesis and so did those of Cheung and Lee (1993) if we assume that in Cantonese, a type of Sinitic language (Voegelin & Voegelin 1977), the *wh*-phrase also moves at LF.

Although Stromswold's hypothesis does not match our results, the proposal of O'Grady's Developmental Law seems to provide a reasonable explanation. The weak version of the Developmental Law states that X cannot emerge before Y if X is cumulatively more complex than Y under the condition of all other things being equal. Based on this, O'Grady hypothesized that subject *wh*-questions will be either acquired earlier than object *wh*-questions or both constructions will emerge at the same time since object *wh*-questions are computationally more complex than

object *wh*-questions.   The results of the present study are consistent with O'Grady's proposal in that subject *wh*-questions were shown to be statistically significantly easier than object *wh*-questions for Mandarin-speaking children

According to Huang (1982, 1987), there is no overt *wh*-movement but *wh*-phrase moves at the level of LF.   Examples of Mandarin Chinese LF movement for subject and object *wh*-phrases follow:

(24) LF movement of subject *wh*-questions
[$_{CP}$ Shui$_t$ [$_{IP}$ e$_t$ [$_{VP}$ zai   la   che]]]?
        who   progressive   pull   car
'Who is pulling the car?'
(25) LF movement of object *wh*-questions
[$_{CP}$ Shui$_t$ [IP che [$_{VP}$ zai   la   e$_t$]]?
        whom   car   progressive   pull
'Whom the car is pulling?'

The computational complexity rating is one for subject *wh*-questions for the movement crosses one IP while that for object *wh*-questions is two since the movement crosses one IP and one VP.   This accounts for why subject *wh*-questions are easier than object *wh*-questions.

Yoshinaga (1996) also drew on O'Grday's analysis to interpret her experimental results.   Her results are also different from ours since she discovered that there is no asymmetry in the relative difficulty between subject and object *wh*-questions.   We might attribute the different results to the differences in two different case-marking systems.   There is no case-marking in Chinese but the nominative case-maker is *-ga* and the accusative case marker is *–o* in Japanese. The case-markings in Japanese obviously provide an important clue for the acquisition device.   According to Slobin (1985), if there is a straightforward relation between form and meaning and there is clearly discernible semantic

functions, the morphemes would be acquired earlier. The two case-markers in Japanese seem to match with these two conditions; therefore, it might be considered as one contributing factor since the subject and object *wh*-questions are acquired more or less at the same time.

Interestingly, the results for English-speaking children in Yoshinaga's (1996) study were quite similar to that of the present study, that is, subject *wh*-questions are easier than object *wh*-questions for both English- and Mandarin-speaking children. We have demonstrated in (8) and (9) that the computational complex rating for subject *wh*-questions in English is one and that for object *wh*-questions is two, which is the same as that for Mandarin subject and object *wh*-phrases in LF movement. It is tempting to conclude that the Developmental Law could in fact account for more data than Stromswold's proposal.

We will not discuss the Korean data in this article since there seems to be contradictory results among different tasks, which might result from methodological problems. In terms of Stromswold's transcript study, Yoshinaga (1996) has provided a possible explanation, that is, "A limitation of transcript studies in general is that the occurrence of certain structures depends heavily on the occurrence of real-world events that call for those structures." (Yoshinaga 1996: 117). It is highly possible the first use of subject and object *wh*-questions have been missed and incorrect assumptions thus follow. Similar reports have been found in the passive construction. Pinker, Lebeaux, & Frost (1987) showed that even three-year-old children could produce well-formed passive construction while Borer and Wexler (1987) reported that the emergence of the passive construction was quite late, around five years old. Therefore, spontaneous data might underestimate children's language competence.

5. Conclusion

This article explored the issue of subject/object asymmetry in language acquisiton and related theoretical issues. Two hypotheses were proposed: Stromswold's P & P (? Is this acceptance?) based approach and O'Grady's weak version of the Developmental Law. The two different proposals have different predictions. According to Stromswold, object *wh*-questions are hypothesized to be easier than subject *wh*-questions, while O'Grady suggested that object *wh*-questions would not be acquired earlier than subject *wh*-questions. Relevant literature has been reviewed to test the two hypotheses, and no conclusion has been drawn. The present study attempted to explore the issue by conducting an investigation on the relative difficulty of subject and object *wh*-questions. Our results seem to accord with O'Grady's account but unfortunately the conflicting results among different languages are still left unresolved. Moreover, it is quite unfortunate we could not include younger children due to an insufficient number of subjects and limited time for the research, which might indirectly influence our interpretations of the results. Further research that includes younger children or a diary study might also facilitate interpretations of different experimental results.

A great deal about the acquisition device is still unknown to us although during the last two decades, researchers have produced a large amount of data. Hopefully, with more advanced technology, we would be able to detect the subtle and delicate mechanisms involved in language acquisition just as we have located the gene for language—the seventh chromosome. Interdisciplinary work will be highly recommended so that theoretical foundations would be empirically sustained.

Appendix

1. 哪一個在踢小白兔？
2. 小熊在打哪一個？
3. 誰在畫圖？
4. 小英在讀什麼？
5. 哪一個在拉牛？　(AA)
6. 哪一個在推車？　(AI)
7. 哪一個在拉車？　(AI)
8. 哪一個在推豬？　(AA)
9. 車在拉哪一個？　(IA)
10. 牛在拉哪一個？　(AA)
11. 豬在推哪一個？　(AA)
12. 車在推哪一個？　(IA)
13. 什麼在拉船？　(II)
14. 誰在拉車？　(AI)
15. 車在拉什麼？　(IA)
16. 船在拉誰？　(IA)

　　(A = animate, I = inanimate)

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中文疑問詞疑問句的習得

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本文探討兒童如何習得中文單一子句疑問詞疑問句。雖然英文、日文、韓文、廣東話都有相關實驗的探討，但是卻沒有一致的結論。中文到目前爲止並無相關實驗的探討，所以我想嘗試探討這個問題，以彌補這方面的缺失。本篇文章先探討中文疑問詞疑問句中主詞和受詞的不對稱性問題，再設計一實驗，以檢測疑問詞疑問句中單純的主詞和受詞不對稱性對兒童習得此一句型難易度的影響。本實驗主要探討簡單疑問詞疑問句，包括主詞疑問句和受詞疑問句。關鍵性的問題是主詞疑問句是否比受詞疑問句較容易習得，而年齡又扮演什麼樣的角色。實驗結果顯示主詞疑問句比受詞疑問句較容易習得，而且不同年齡層的小孩所呈現的結果是相同的。

關鍵詞：疑問詞疑問句、主詞和受詞不對稱性、語言習得