Scope Relations of QP's and Scrambling in the Acquisition of Japanese[*]

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1. Introduction

In this paper, I investigate children's acquisition of scope relations of QP's in Japanese and point out its implications for the variation of scope relations of QP's and for whether A-chains are available at the early stages of child language acquisition. I will show that the acquisition of scope relations of QP's in Japanese does not obey the Subset Principle (Berwick 1985, Wexler and Manzini 1987) and suggest that the acquisition of scope relations of QP's is lexical. I will also show that clause-internal scrambling does not change the scope relation of QP's in early child Japanese, and speculate that A-chain formation in clause-internal scrambling undergoes maturation.

2. Scope Relations of QP's in English and Japanese and Issues in Language Acquisition

It has been pointed out in May (1977, 1985) and others that an English SVO sentence such as (1), with two quantifiers, is ambiguous. That is, either *someone* in the subject position or *everyone* in the object position can take the wide scope in (1).

(1) Someone loves everyone.
    a. "There is a person x, such that, for every person y, x loves y." ($\exists>\forall$)
       or
    b. "For every person y, there is a person x, such that x loves y." ($\forall>\exists$).

We assume that quantifiers undergo Quantifier Raising (QR) at LF to take scope. The scope relations in (1) are represented as in (1'), following May (1977).

(1') a. $[_{IP}$ someone$_1$ $[_{IP}$ everyone$_2$ $[_{IP}$ t_1 $[_{VP}$ loves $t_2]]]]$.   (linear scope)
    b. $[_{IP}$ everyone$_1$ $[_{IP}$ someone$_2$ $[_{IP}$ t_2 $[_{VP}$ loves $t_1]]]]$.   (inverse scope)

(1'a) corresponds to the meaning in (1a), and (1'b) corresponds to the meaning in (1b). Thus, the scope ambiguity of an English sentence (1) is captured by the configurations created by QR.

2.1 The Ban on Inverse Scope in Japanese

In contrast, a Japanese SOV sentence (2), with two quantifiers, is unambiguous with respect to the scope relation (Kuroda 1970, Kuno 1973, Hoji 1985).

(2) Dareka-ga   daremo-o   aisite iru.
    someone-Nom everyone-Acc love
    "Someone loves everyone"
    a.   "There is a person x, such that, for every person y, x loves y." ($\exists > \forall$)
         (linear scope)
    but NOT
    b.   "For every person y, there is a person x, such that x loves y."   (*$\forall > \exists$)
         (inverse scope)

This observation is accounted for by the so-called rigidity condition in Huang (1982), Hoji (1985), and Lasnik and Saito (1992). Here again, we assume that the quantifiers in (2) can undergo QR and that (2) could result in two LF representations, as shown in (2').

(2') a. $[_{\text{IP}}$ dareka$_1$ $[_{\text{IP}}$ daremo$_2$ $[_{\text{IP}}$ t_1 $[_{\text{VP}}$ t_2 aisite iru]]]].
    b. $[_{\text{IP}}$ daremo$_1$ $[_{\text{IP}}$ dareka$_2$ $[_{\text{IP}}$ t_2 $[_{\text{VP}}$ t_1 aisite iru]]]].

In addition, we assume that (2) is subject to the rigidity condition in (3).

(3) Suppose that Q_1 and Q_2 are operators (quantified NP or WH). Then, Q_1 cannot take wide scope over Q_2 if t_2 c-commands t_1 (where t_1 and t_2 are variables). (Lasnik and Saito 1992, Murasugi and Saito 1992)

(2b) is impossible due to the rigidity condition, and hence, (2a) is the only good LF representation of (2). We account for the unambiguity of (2) in this way. A more difficult question – why is (1) not subject to the rigidity condition? – is put aside here but we will come back to the point later.

As we have just seen, inverse scope is impossible in the example (2) in Japanese, unlike in the example (1) in English. How do Japanese-speaking children acquire this knowledge? On the one hand, it is unlikely that the knowledge is learned from experience only, since it is negative knowledge and negative evidence is not likely to be available, especially for abstract knowledge such as scope. On the other hand, the ban on inverse scope cannot be totally innate, since inverse scope is possible in languages such as English. A possible way out of this dilemma is to hypothesize that inverse scope is banned as an innately-determined default and that it becomes possible only when it is allowed in the target language. In order to examine the empirical validity of this hypothesis, it is instructive to observe Japanese-speaking children's knowledge of inverse scope. Thus, we can state our first issue in this paper as in (4).

(4) Do Japanese-speaking children know that inverse scope is impossible in (2) from early on? (i.e., from the earliest stage for which we can observe relevant properties?)

To my knowledge, this issue has not been addressed in L1 acquisition of Japanese, although Marsden (2003) reports some experimental observations regarding L2 acquisition of Japanese. I will later address this issue with empirical observations on child Japanese.

2.2 Scrambling and Scope Relations of QP's

In Japanese, there is another peculiar phenomenon in scopal relations. A Japanese scrambled OSV sentence with two quantifiers, such as (5), is ambiguous; either quantifier can take the wide scope in (5), as observed in Kuroda (1970) and Hoji (1985).

(5) Daremo-o$_i$ dareka-ga t_i aisite iru. ($\exists > \forall$, $\forall > \exists$))
   everyone-Acc someone-Nom   loves
   "Everyone, someone loves."
   a.   "There is a person x, such that, for every person y, x loves y."   ($\exists > \forall$)
   or
   b.   "For every person y, there is a person x, such that x loves y."   ($\forall > \exists$)

After undergoing QR, (5) would result in two representations, as in (5').

(5') a.   [dareka$_1$ [daremo$_2$ [t_1 [t_2 aisite iru]]]].
    b.   [daremo$_1$ [dareka$_2$ [t_2 [t_1 aisite iru]]]].

(5'a), which represents the meaning in (5a), is not a problem for the rigidity condition. But in (5'b), which represents the meaning in (5b), the trace of *daremo*, t_1, is asymmetrically c-commanded by the trace of *dareka*, t_2. Hence, (5'b) appears to be impossible due to the rigidity condition in (3), and if so, *daremo* should not be able to take the wide scope in (5). But in fact, the wide scope reading of *daremo* in (5) is very easily available.

Murasugi and Saito (1992) argue that (5) is not a problem for the rigidity condition in (3). They claim that only variables are subject to the rigidity condition, and account for the ambiguity in (5) by taking advantage of the well-established consensus that clause-internal scrambling can be A-movement, as well as A'-movement (Mahajan 1990, Saito 1992).

Let us here briefly take a look at the evidence that clause-internal scrambling can be A-movement. First, Yoshimura (1989, 1992) observes that clause-internal scrambling does not yield a weak crossover (WCO) violation in Japanese, as in (6b).

(6)   a.   ?*Soitu$_i$-no hahaoya-ga dare$_i$-o aisite iru no?
         the guy-Gen mother-Nom who-Acc love Q
         "His$_i$ mother loves who$_i$."

b.　?Dare$_i$-o soitu$_i$-no hahaoya-ga t_i aisite iru no?
　　　who-Acc the guy-Gen mother-Nom love Q
　　"Who$_i$, his$_i$ mother loves t_i."

(6a) is a case of standard WCO violation.　In (6b), where the object phrase is scrambled, no WCO violation is observed.　This indicates that clause-internal scrambling can be A-movement, because, as is well-known, A-movement remedies a WCO violation, as in (7).

(7)　Who$_i$ [t_i seems to his$_i$ mother [t_i to be intelligent]]?

Thus, Yoshimura (1992) argues that the lack of the WCO effect in (6b) shows that Japanese clause-internal scrambling can be A-movement.
　　Second, Saito (1992) points out that a reciprocal anaphor *otagai* 'each other' can be bound by a clause-internally scrambled phrase in Japanese, as in (8b).

(8)　a.　?*Otagai$_i$-no sensei-ga　karera$_i$-o　hihansita.
　　　　　each other Gen teacher-Nom they-Acc criticized
　　　　"Each other's$_i$ teachers criticized them$_i$."
　　b.　?Karera$_i$-o otagai$_i$-no sensei-ga　　t_i　hihansita.
　　　　　they-Acc each other-Gen teacher-Nom criticized
　　　　"Them$_i$, each other's$_i$ teachers criticized t_i."

According to Binding Condition A in Chomksy (1981), an anaphor must be locally bound by its antecedent in an A-position.　Then, the well-formedness of (8b) indicates that a phrase preposed by clause-internal scrambling is in an A-position. This means, again, that Japanese clause-internal scrambling can be A-movement.
　　In this way, it has been agreed that clause-internal scrambling can be A-movement in Japanese.　However, as shown in Saito (1992), there is other evidence showing that Japanese clause-internal scrambling can be A'-movement as well.　To be specific, the scrambled phrase in the following grammatical example should not be in an A-position, to avoid violation of Binding Condition C; rather, it must be in an A'-position.

(9)　Zibunzisin-o$_i$ Hanako-ga　t_i　hihansita.
　　self　　-Acc　　-Nom　　crititized
　　"Herself$_i$, Hanako criticized t_i."

Thus, clause-internal scrambling in Japanese is ambiguous between A-movement and A'-movement.
　　Given that Japanese clause-internal scrambling can be A-movement, its trace can be an NP-trace, and not necessarily a variable.　Keeping this in mind, let us get back to the scope ambiguity of a scrambled Japanese sentence, such as the example in (5).　Take a look at the LF representations of (5) after QR, namely (5'a) and (5'b).　Earlier, we wondered if (5'b) is impossible due to the rigidity condition (3), as the trace of *daremo*, t_1, is asymmetrically c-commanded by the trace of *dareka*, t_2, in (5'b).　Now, notice that t_1 in (5'b) is a trace of clause-internal scrambling, hence

it can be an NP-trace.   Then, (5'b) is not ruled out by the rigidity condition, as only variables are subject to the rigidity condition.   This is how Murasugi and Saito (1992) handle the ambiguity of (5) while explaining the unambiguity of (2) by the rigidity condition.

The discussion so far implies that the scope change of QP's should not occur when the trace left by scrambling is a variable, in other words, when scrambling is A'-movement.   The validity of this implication can be empirically examined with long-distance scrambling.   It is again quite well-established that Japanese long-distance scrambling is purely A'-movement (Saito 1992, cf. Yoshimura 1989, 1992).   Saito (1992) observes that a phrase preposed by long-distance scrambling cannot bind an anaphor *otagai* 'each other', as in (10).

(10) a.   *Masao-ga otagai$_i$-no sensei-ni [Hanako-ga karera$_i$-o hihansita to] itta.
            -Nom each other-Gen teacher-to –Nom they-Acc criticized that said
            "Masao said to each other$_i$'s teachers that Hanako criticized them$_i$"
      b.   *Karera$_i$-o [Masao-ga otagai$_i$-no sensei-ni [Hanako-ga t_i hihansita to] itta].
            they-Acc   -Nom each other-Gen teacher-to -Nom criticized that said
            "Them$_i$, Masao said to each other$_i$'s teachers that Hanako criticized t_i."

(10b) is as bad as (10a).   This indicates that the landing site of long-distance scrambling is an A'-position, unlike the case of clause-internal scrambling.

Given this, let us see if the scope relation of QP's changes by long-distance scrambling or not.   Tada (1993) observes that long-distance scrambling does not change the scope relation of QP's, while clause-internal scrambling does.   Thus, (11) and (12) are the same regarding scope relation; they both lack inverse scope.

(11) Dareka-ga [John-ga daremo-o aisite iru to] omotte iru. ($\exists>\forall$, *$\forall>\exists$)
      someone-Nom   -Nom everyone-Acc loves that   thinks
      "Someone thinks that John loves everyone."
(12) Daremo$_i$-o dareka-ga [John-ga t_i aisite iru to] omotte iru. ($\exists>\forall$, *$\forall>\exists$)
      everyone-Acc someone-Nom -Nom loves that   thinks
      "Everyone, someone thinks that John loves."

The lack of inverse scope in (12) follows from the rigidity condition because long-distance scrambling is A'-movement and hence the trace of long-distance scrambling is a variable.

In this way, whether scope relation changes by scrambling or not depends on whether the scrambling in question is A-movement or A'-movement.   We have seen that clause-internal scrambling, which can be A-movement, changes the scope relations of QP's, while long-distance scrambling, which is purely A'-movement, does not change scope relations.

Incidentally, there is a debate on whether A-chains are available in the early stages of child language acquisition.   Borer and Wexler (1987, 1992) and Babyonyshev et al. (2001) claim that there is an early stage in child language acquisition where A-chains are unavailable because of immaturity.   This is called the A-chain Maturation Hypothesis.   In this connection, it would be interesting to see if Japanese-speaking children are able to form an A-chain in clause-internal

scrambling. Thus, here we introduce our second issue of this paper.

(13) Do Japanese-speaking children change scope relations by clause-internal scrambling? In other words, do they know that either quantifier can take the wide scope in (5) while (2) is unambiguous?

If the answer for (13) is "yes" for a child, then clause-internal scrambling can be A-movement for the child. Thus, by observing whether Japanese-speaking children change scope relations by clause-internal scrambling, we can evaluate the A-chain Maturation Hypothesis.

We have so far raised two questions on the acquisition of scope relations by Japanese-speaking children. A comprehension experiment was carried out to find answers to these questions.

3. Experiment

In the experiment, 20 monolingual Japanese-speaking children children (age 4;1-6;5) in the Tokyo area were examined. Also, 10 adult Japanese non-linguists were tested as controls. The method of the experiment was in the format of the Truth-Value Judgment Task (Crain and Thornton 1998). An experimenter narrated a story while showing a series of pictures. At the end of each story, another experimenter, who was pretending to be a Pikachu puppet, gave a Japanese sentence to describe what was going on in the final picture. The child's task was to judge whether the puppet's description of the picture was right or wrong by either feeding a candy or giving a stone to the puppet. Each child was interviewed individually in a quiet room.

Before the main session, there was a pretest session which investigated the subject's knowledge of a Japanese universal quantifier. The stimulus sentence in the pretest session was (14).

(14) Dono neko mo hata-o motte iru.
Every cat   flag-Acc holding
"Every cat is holding a flag."

(14) was given for matching and mismatching pictures. In the matching picture, there are three cats and each cat is holding a flag. In the mismatching picture, there are three cats and three flags; the first cat is holding a flag, so is the second cat, but the third cat is not holding a flag and a flag is on the ground. The task was to accept the matching case and reject the mismatching case. None of the 10 adult controls had a problem in the pretest. 20 children passed this pretest and only two kids were excluded by failing in the pretest.

In each trial of the main session, a series of three pictures was shown to each child and a puppet described the final picture with a Japanese sentence. In the first picture for all trials, there are three cats and four kids; the faces of three of the kids are visible and their names are given in narration (e.g., Taro, Hanako, Jiro), while the face of the fourth kid is invisible and the experimenter says that his name is unknown.

In one scenario, the nameless child ends up catching all three cats (i.e., the $\exists>\forall$ situation). This can be described by either the canonical SOV sentence (15) or the scrambled OSV sentence (16).

(15) Dareka-ga dono neko mo tukamaeta. (Canonical SOV) ($\exists>\forall$, *$\forall>\exists$)
　　　someone-Nom every cat caught
　　　"Someone caught every cat."

(16) Dono neko mo$_i$ dareka-ga t_i tukamaeta. (Scrambled OSV) ($\exists>\forall$, $\forall>\exists$)
　　　every cat　someone-Nom　caught
　　　"Every cat, someone caught."

In the other scenario, each of the three kids with names ends up catching a cat (i.e., the $\forall>\exists$ situation). This can be described by (16) but not by (15). The child's task was to accept both (15) and (16) for the $\exists>\forall$ situation, and reject (15) but accept (16) for the $\forall>\exists$ situation.

The correct response rates of the main session are given in (17).

(17)

	A	B	C	D
Situation	$\exists>\forall$	$\exists>\forall$	$\forall>\exists$	$\forall>\exists$
Sentence	(15)	(16)	(15)	(16)
right answer	accept	accept	reject	accept
Children (4;1-6;5)	18/20 (90%)	15/20 (75%)	6/20 (30%)	14/20 (70%)
Adult Control	10/10 (100%)	10/10 (100%)	8/10 (80%)	10/10 (100%)

First, let us examine whether Japanese-speaking children know that inverse scope is impossible in a canonical SOV sentence like (15). To see this, take a look at column C in (17), which represents the correct response rate of rejecting (15) for the $\forall>\exists$ situation. Children's correct response rate is only 30%, as opposed to 80% for the adult controls (see Marsden (2003) for similar results on adult controls). This indicates that young Japanese-speaking children do not know that sentences with the canonical SOV order cannot have inverse scope. This applies even to the group of 6-year-olds (N=5), as their correct response rate for the case C in table (17) is only 2/5 (40%).

The second issue of this paper is to investigate whether young Japanese-speaking children change the scope relations of QP's in clause-internal scrambling. For this, take a look at column D in (17), which represents the correct response rate of accepting (16) for the $\forall>\exists$ situation. The children's correct response rate for D is 70%. This is quite high, especially if we consider that a scrambled OSV sentence is more difficult for young children than a canonical SOV sentence (Hayashibe 1975, cf. Otsu 1994). However, it is hasty to conclude from this data that Japanese children know that clause-internal scrambling changes scope relation. To be more precise, we need to examine whether a child who succeeds in rejecting (15) for the $\forall>\exists$ situation also succeeds in accepting (16) for the same situation.

The result of the subject-by-subject analysis for the cases C and D is as follows.

There are 6 kids who correctly rejected the sentence (15) for the $\forall > \exists$ situation. Out of the 6 kids, 5 kids rejected the sentence (16) for the $\forall > \exists$ situation (5/6=83%). This is in sharp contrast to the response pattern of the rest of the subjects. There are 14 kids who wrongly accepted sentence (15) for the $\forall > \exists$ situation. Out of the 14 kids, only 1 kid rejected sentence (16) for the $\forall > \exists$ situation (1/14=7%). Thus, almost all of the Japanese kids (18 out of 20) do not change the scope relations of QP's due to scrambling, unlike adults. That is, Japanese kids do not know the difference between (15) and (16) regarding scope relations.

Thus, we have got negative answers to the two questions raised in this paper. Below, we will attempt to discuss theoretical implications of these results.

4. Late Acquisition of the Ban on Inverse Scope

Let us first discuss the issue in (4). The issue is whether Japanese-speaking children know that inverse scope is impossible in a canonical SOV sentence like (2) from a very early stage of development. This issue has to do with the learnability of the ban on inverse scope. A language where a sentence equivalent to (2) allows inverse scope (i.e., adult English) is a superset of a language where a sentence equivalent to (2) disallows inverse scope. (i.e., adult Japanese). In other words, such two languages are in a subset relation. Therefore, if a child first assumes that inverse scope is possible, then the child cannot change the grammar and begin to disallow inverse scope later, as long as the child receives positive evidence only. To make such a change in the grammar, negative evidence would be necessary, but negative evidence is not likely to be available to children (Brown and Hanlon 1970, Marcus 1993).

A way to solve this learnability problem is to assume that children obey the Subset Principle proposed in Berwick (1985) and Wexler and Manzini (1987). The Subset Principle can be defined as in (18).

(18) In language acquisition, always choose a grammar which generates a language:
  (a) compatible with the input data; and
  (b) smallest among the languages compatible with the input data

(see Wexler and Manzini 1987)

According to the Subset Principle, the child chooses a grammar which bans the inverse scope unless the child receives positive evidence that the target language allows the inverse scope. Thus, the Subset Principle predicts that a child acquiring Japanese continuously disallows the inverse scope since adult Japanese disallows it.

However, we have observed that Japanese-speaking children wrongly allow the inverse scope in a canonical SOV sentence. Hence, our data go against the idea that children obey the Subset Principle in the acquisition of the ban on inverse scope.

Our observation on the wrong inverse scope in early child Japanese is rather compatible with a view that whether inverse scope is possible or not is determined by lexical factors. There are some observations which suggest that this lexical account is on the right track. For instance, when the quantifier in the object position is *all*, as in (19), it is pointed out that there is decrease in the availability of inverse scope (Ioup 1975, Marsden 2003).

(19)   Someone read all the books.
    a.   "There is x, such that, for all y, y a book, x read y."   (∃>∀)
    b.   ??/*"For all y, y a book, there is an x, such that x read y."   (??/*∀>∃)

According to this lexical view, our data in early child Japanese can be understood in the following way.   In canonical SVO or SOV sentences, some quantifiers allow the inverse scope in scope relations and others do not, and it appears that it takes quite a while for children to identify which lexical item belongs to which class.   Thus, I speculate that Japanese-speaking children's wrong assignment of inverse scope arises from delay in the identification of quantificational lexical items.   This implies that the difference regarding scope between an English example in (1) and its corresponding Japanese example (2) should also be traced to a difference in the lexical identity of quantifiers.   It also implies that Japanese universal quantifiers such as *daremo* or *dono N mo* are like English *every* in child Japanese, and they are like English *all* in adult Japanese.   The exact nature of the lexical status of each quantifier is a further issue and left open here.

5.   Scope Relations and the Acquisition of Scrambling

Let us next discuss the issue in (13).   The issue is whether Japanese-speaking children change the scope relations of QP's by clause-internal scrambling.   In section 3, it was pointed out that almost all of the Japanese children did not change the scope relations of QP's by clause-internal scrambling.   As discussed in section 2, clause-internal scrambling, which is ambiguous between A-movement and A'-movement, may change the scope relations of QP's, while long-distance scrambling, which is purely A'-movement, does not change scope relations. Therefore, our experimental observation suggests that clause-internal scrambling in early child Japanese is purely A'-movement, just like long-distance scrambling in adult Japanese.   In other words, clause-internal scrambling lacks the property of A-movement in early child Japanese, while it has properties of both A-movement and A'-movement in adult Japanese.   This is another instance where an A-chain is not available in early child language, and it might be interpreted as support for the A-chain Maturation Hypothesis.

However, the A-chain Maturation Hypothesis has been argued against in Fox and Grodzinsky (1998) and there are some pieces of evidence against A-chain Maturation in Japanese acquisition in Sano et al. (2001) and Okabe and Sano (2002). To take an example in child Japanese, Sano et al. (2001) report that children at the age of 4 and 5 are significantly better at full unaccusatives such as (20b) than at full passives such as (20a).

(20) a.   Buta-san-ga   zou-san ni tukamae-rare-ta.   [Full passive]
        pig   Nom   elephant by catch-Pass-Past
        "The pig was caught by the elephant."
    b.   Buta-san-ga   zou-san ni tukamat-ta.   [Full unaccusative]
        pig   Nom   elephant by catch(Unacc)-Past
        "The pig was caught by the elephant."

Both of them involve an A-chain between the subject position and the object position, as shown by the Q-float test.   Hence, the late development of Japanese full passives such as (20a) cannot be accounted for by the A-chain Maturation Hypothesis and it should rather be attributed to the late development of theta-transmission, as argued in Fox and Grodzinksy (1998).

Then, how can we capture the unavailability of an A-chain in clause-internal scrambling in early child Japanese, without having recourse to the A-chain Maturation Hypothesis?   If we have been right so far, at the early stage of language development, A-chains are available for passives and unaccusatives, but are unavailable for clause-internal scrambling.   Here, note that passives and unaccusatives are pure A-movement, while clause-internal scrambling is ambiguous between A-movement and A'-movement, as shown in Saito (1992).   Thus, I tentatively offer a hypothesis such as the following.

(21) Limited A-chain Maturation Hypothesis
    A-chain undergoes maturation in language development where a dependency is
     ambiguous between A'-chain and A-chain.

At this point, I don't have an idea about why A-chain maturation is limited in such a way.   If this speculation is valid, I hope to find a deeper explanation for it, but here I leave the matter open.

6.   Conclusion

I have done two things in this paper.   One is to show that Japanese-speaking children at first allow inverse scope in SOV sentences such as (2), unlike adults.   I attributed this to the delay in lexical identification of quantifiers.   The other is to observe that Japanese-speaking children at first do not change scope relations in scrambled OSV sentences such as (5), unlike adults.   I argued that this is because clause-internal scrambling can be only A'-movement for young children.   Whether these observations are valid or not remain to be confirmed by further investigation.

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