Topics in Child Japanese

Noriko Hattori[1], Seiki Ayano[1], Dylan Herrick[2], David Stringer[1],

and Koji Sugisaki[1]

[1]MIE UNIVERSITY and [2]POMONA COLLEGE

1. Introduction

One major line of acquisition research within the generative framework has been to demonstrate experimentally that children's linguistic knowledge is essentially the same as that of adults. This line of investigations has been quite successful with respect to the acquisition of syntactic knowledge: It has been understood at least since Otsu (1981) that children display early mastery of a complex array of facts pertaining to the core properties of syntax (see also Crain 1991 and Crain & Thornton 1998, among many others). This finding, combined with the observation that the relevant experience available to children is severely limited, constitutes evidence for the fundamental assumption in generative grammar that human beings are biologically endowed with innate linguistic knowledge (UG), which establishes boundary conditions on the space of possible human languages.

Recently, this line of research has been extended to the acquisition of semantics, and a growing number of studies address the question of whether the observation of early mastery also holds for various aspects of semantic knowledge. The major phenomena that are currently undergoing systematic investigation include (i) universal quantification (e.g. Philip 1995, Crain et al. 1996, Crain 2000, Geurts 2003) and (ii) scope interaction between quantifiers

and negation (e.g. Musolino et al 2000, Lidz & Musolino 2002, Gualmini 2005, Musolino &Lidz, in press). Interestingly, it has been reported that English-speaking children seem to have difficulty interpreting sentences with these expressions, at least in certain circumstances.[1] This finding raises an important question of whether such difficulty is observed in the acquisition of other languages as well.

In light of this background, this study focuses on children's acquisition of quantificational interactions in Japanese. More specifically, we investigate experimentally whether Japanese-speaking children can correctly comprehend scope interactions between negation and the universal quantifier followed by the topic marker *wa*. Our results suggest that the interpretive difference between children and adults widely observed in English is not so prevalent in Japanese. This finding would add a cross-linguistic perspective to recent investigations of children's comprehension of sentences containing quantifiers and negation, thereby refining our understanding of the acquisition of quantificational competence.

2. Quantifiers and Negation in Child English

In this section, we briefly overview some basic observations about the interpretation of negation and quantified NPs in adult and child English.

It is widely known that in many languages including English, universally-quantified NPs interact with negation to create scope ambiguity, as exemplified in (1).

(1)　Every student didn't sleep in that class.　　√ *every > not*, √ *not > every*

On one interpretation, the universally-quantified NP *every student* takes scope over the negation (*every > not*), and the sentence can be paraphrased as meaning that every student is such that he or she didn't sleep in that class; namely, none of them did. Musolino et al. (2000) call this an isomorphic interpretation, since in this case the scope relation between the universal quantifier and negation coincides with their surface position. Another possible interpretation of (1) is that not all of the students slept in that class. Here, the universally-quantified subject is interpreted within the scope of negation (*not > every*). Since the relative interpretation of *every student* and negation does not mirror their overt position, Musolino et al. (2000) use the term non-isomorphic interpretation for this reading.

In order to determine whether English-speaking children can access both of these interpretations, Musolino et al. (2000) conducted an experiment using the truth-value judgment task (Crain & Thornton 1998). The results obtained from 20 children ranging in age between 4;0 (years; months) and 7;3 (mean 5;11) showed that while adults can easily access the non-isomorphic interpretation of sentences like (1), children display a strong preference for the isomorphic interpretation. For example, in one of the experimental stories, three horses try to jump over a fence. Two of the horses successfully jump over the fence but the third one decides not to do so. At the end of the story, a puppet describes the situation as in (2).

(2)　Every horse didn't jump over the fence.

This statement is true on the non-isomorphic interpretation, since it is true that not every horse jumped over the fence. In contrast, the puppet's statement is

false on the isomorphic interpretation, since it is not true that none of the horses jumped over the fence. Musolino et al. (2000) found that children around the age of five accepted the puppet's statements on the non-isomorphic reading only 7.5 % of the time. These results led Musolino et al. to propose the descriptive generalization given in (3).

(3) *The Observation of Isomorphism* (Musolino et al. 2000:14):

Unlike adults, young children systematically interpret negation and quantified NPs on the basis of their position in overt syntax.[2]

Musolino et al. (2000) and Lidz & Musolino (2002) showed that the observation of isomorphism also holds for negative sentences containing other types of quantifiers, by testing children's comprehension of statements as in (4) and (5).

(4)   The detective didn't find two guys. $\sqrt{}$ *not > two*, $\sqrt{}$ *two > not*
(5)   The detective didn't find some guys.   **not > some*, $\sqrt{}$ *some > not*

The example in (4) is ambiguous. On one reading, the sentence can be paraphrased as 'It is not the case that the detective found two guys'. In this case, the quantified NP *two guys* is interpreted in the scope of negation (*not > two*), giving rise to an isomorphic interpretation. The other reading of (4) can be paraphrased as 'There are two guys that the detective didn't find'. Here, the quantified NP *two guys* takes scope over negation, giving rise to a non-isomorphic interpretation. The experiment with 24 English-speaking children (mean age 4;4) found that, when presented with sentences like (4), children accepted the non-isomorphic interpretation only 33% of the time, while

accepting the isomorphic interpretation 81% of the time.

In contrast to (2) and (4), the example in (5) is not ambiguous: It is generally assumed that (5) requires a wide-scope interpretation for the existentially-quantified NP *some guys*, and the sentence can only be paraphrased as 'There are some guys that the detective didn't find'. The main experimental finding was that 15 children ranging in age from 3;10 to 5;2 (mean 4;7) rejected this wide-scope reading 65% of the time, and incorrectly assigned the isomorphic interpretation which equates *some* with *any* (i.e. 'The detective didn't find any guys').

Even though the studies reviewed so far suggest that the observation of isomorphism is a pervasive phenomenon in child English, later investigations discovered that if the context is changed so as to make the non-isomorphic scope assignment more accessible, children accept the inverse-scope reading to a much larger extent. For example, Musolino & Lidz (in press) placed the test sentences after the affirmative statements which minimally differed from their negative counterparts only in the object NP, as exemplified in (7). Musolino & Lidz reasoned that this manipulation would set up a natural 'context of denial' and hence would satisfy the felicity conditions on the use of negative statements.

(6)   Every horse didn't jump over the fence.
(7)   Every horse jumped over the log but/and every horse didn't jump over the fence.

The results obtained from 20 children (mean age 5;4) showed that children's ability to access the non-isomorphic interpretation increased dramatically when the test sentences were preceded by affirmative statements: While children

almost never accepted the non-isomorphic reading of (2) (repeated here as (6); 15% acceptance), they accepted this interpretation around 60% of the time in the case of (7).

Gualmini (2005) also demonstrates that children are capable of accessing the non-isomorphic reading of (5) (repeated here as (8)) when the sentence is used to point out that an expectation went unfulfilled.

(8) The detective didn't find some guys.

According to Gualmini, children's difficulty stems from the felicity condition requiring that negative sentences should be used only as a denial of an expectation that is made salient.[3] In support of his claim, Gualmini conducted an experiment in which each story was matched with two test sentences, one of which was infelicitous in the context provided and the other of which was felicitous. For example, in one story Grover orders four pizzas from the Troll. The Troll is supposed to deliver all of them, but is driving too fast and loses two on the way. After the story, the puppet utters either (9a) or (9b). Note that only the latter is felicitous in this context, since while this sentence points out the discrepancy between what was expected to happen (the Troll would deliver all of the pizzas) and what actually happened, the example in (9a) does not do this.

(9) a. The Troll didn't miss some pizzas.

b. The Troll didn't deliver some pizzas.

The results showed that while 15 children (mean age 4;11) accepted sentences like (9a) only 50% of the time, a different group of 15 children (mean age 4;10) accepted sentences like (9b) 90 % of the time, again indicating a

dramatic increase in the acceptance of the non-isomorphic interpretation.

To summarize this section, we have seen that the isomorphism effect is a pervasive phenomenon in child English, which is observed with various types of quantificational sentences containing negation. We have also seen that English-speaking children can overcome such difficulty and become able to access the non-isomorphic, inverse scope interpretation when these sentences are accompanied by a context that satisfies the felicity conditions for the use of negative statements. In light of these previous findings, the present study addresses the following question: What happens when children are acquiring a language which behaves like English in that sentences like "Everyone didn't sleep" exhibit scope ambiguity, but is crucially different from English in that each interpretation is clearly marked by different prosodic patterns? Japanese is such a language, as we will briefly discuss in the next section.[4]
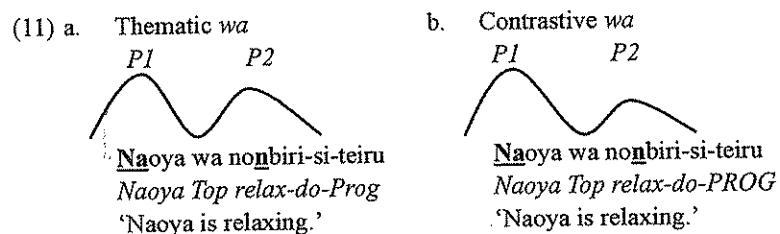
3. The Topic Marker *Wa* and Quantifer Scope in Japanese

It has been observed at least since Kuno (1973:38) that the topic marker *wa* in Japanese has two pragmatic functions, to mark a theme or two mark a contrasted element of a sentence, as illustrated in (10).

(10) a. Thematic *wa*: "Speaking of ..., Talking about ..."
John-wa   gakusei desu.
John-Top student is
'Speaking of John, he is a student.'

b. Contrastive *wa*: "X ... but ..., As for X ..."
Ame-wa   futte   imasu   ga, yuki-wa   futte   imas-en.
rain-Top falling is   but snow-Top falling is-Neg
'It is raining, but it is not snowing.'

By conducting an experiment with five adult native speakers of Japanese,

Nakanishi (in press) revealed that these two functions of *wa* are associated with different prosodic patterns. Her experiment measured the fundamental frequency (F_0), which is an acoustic correlate of the psycho-acoustic percept of the pitch of the voice. Nakanishi compared the value of the F_0 peak immediately before *wa* (P1) and immediately after *wa* (P2), and found the following patterns: When *wa* is thematic, P1 and P2 are about the same value; In contrast, when *wa* is contrastive, P2 is much lower than P1. These patters are schematized in (11).

(11) a. Thematic *wa*
         P1   *P2*

Naoya wa nonbiri-si-teiru
Naoya Top relax-do-Prog
'Naoya is relaxing.'

b. Contrastive *wa*
    P1   *P2*

Naoya wa nonbiri-si-teiru
Naoya Top relax-do-PROG
'Naoya is relaxing.'

Turning to quantificational sentences, Nakanishi (in press) observes that a Japanese sentence such as (12), which contains negation and a universal quantifier followed by *wa*, yields scope ambiguity: It can be paraphrased either as 'No one slept' (isomorphic interpretation) or as 'It is not the case that everyone slept' (non-isomorphic interpretation).

(12) Minna-wa   ne-nakat-ta.   √ *every > not*, √ *not > every*
     Everyone-Top sleep-Neg-Past

However, based on an experiment with four adult native speakers, Nakanishi discovered that there is a correlation between each scope interpretation and different prosodic patterns of *wa*: The prosodic pattern of thematic *wa* corresponds to the isomorphic (*every > not*) reading, whereas the prosodic pattern of contrastive *wa* corresponds to the non-isomorphic (*not > every*) pattern of contrastive *wa* corresponds to the non-isomorphic (*not > every*)

reading. Thus, there is a strict mapping between the two prosodic patterns of *wa* illustrated in (11) and the two scope readings of (12).

(13) *Correlation between Prosody and Scope Interpretations in Japanese* (Nakanishi, in press):
   a. Prosodic pattern of thematic *wa* → isomorphic interpretation
                                            (*every > not*)
   b. Prosodic pattern of contrastive *wa* → non-isomorphic interpretation
                                            (*not > every*)

Nakanishi (in press) provides an account of (13), building on Büring's (1997) Alternative Semantics Approach. We are not going to review her analysis here, since it takes us too far afield. Instead, we now turn to child Japanese, to address the following developmental question: Does the observation of isomorphism also hold for Japanese-speaking children, or are they able to access non-isomorphic interpretation by making use of the prosodic information?[5]

4. Experiment

4.1. Subjects and Method

In order to determine whether the isomorphism effect can be observed even in a language in which distinct scope readings are accompanied by different prosodic patterns, we conducted an experiment with Japanese-speaking children. The subjects were 22 children, ranging in age from 4;2 to 5;11 (5 four-year-olds and 17 five-year-olds, mean age 5;5). The task was a version of the truth-value judgment task (Crain & Thornton 1998). In this task, each child was told a story, which was accompanied by a series of pictures presented on a laptop computer. At the end of each story, a puppet described verbally what he thought had happened in the story. The task for the child was to judge whether the puppet's

description was true or false, by feeding him either a nice strawberry or a horrible green pepper.

The experiment consisted of six stories, four of which contained the test sentences and two of which contained fillers. The four test sentences are listed in (14).

(14) *Test sentences*:
  a. Minna-wa   ne-nakat-ta-yo.
     everyone-Top   sleep-Neg-Past-Excl
  b. Minna-wa   utawa-nakat-ta-yo.
     everyone-Top   sing-Neg-Past-Excl
  c. Minna-wa   hasira-nakat-ta-yo.
     everyone-Top   run-Neg-Past-Excl
  d. Minna-wa   oyoga-nakat-ta-yo.
   *everyone-Top   swim-Neg-Past-Excl*

Among these four, two of them were assigned the prosodic pattern of thematic *wa* and hence carried the isomorphic interpretation (*every > not*), and the other two were assigned the prosodic pattern of contrastive *wa* and hence carried the non-isomorphic interpretation (*not > every*). This assignment was done in a pseudo-random way.[6] A sample story and the pictures for this story are provided in (15) and in (16).

(15) *Sample story*:
  Today is Sports Day. A squirrel, a rat and a rabbit are going to have a race.
  The squirrel said, "I want to run, but my leg hurts, so I'm not going to run."
  The rat said, "I really want to run, but I have a cold today, so I'm not going to run, either."
  The rabbit said, "Then I will show you how fast I can run. Let's go!"

  Test Sentence: Today is Sports Day, but
                     minna-wa   hashira-nakat-ta-yo.
                     everyone-Top   run-Neg-Past-Excl

(16) *Pictures for the Story in (15)*:
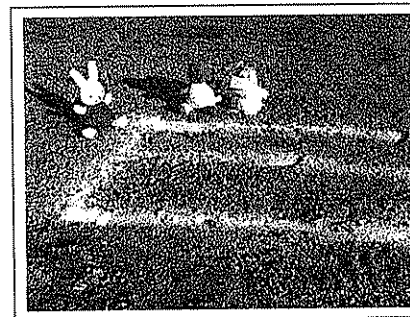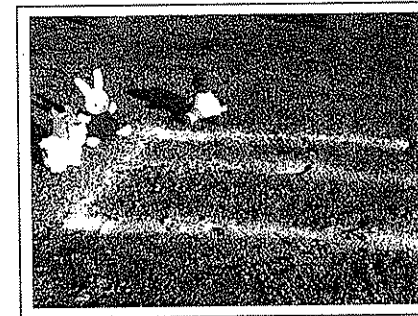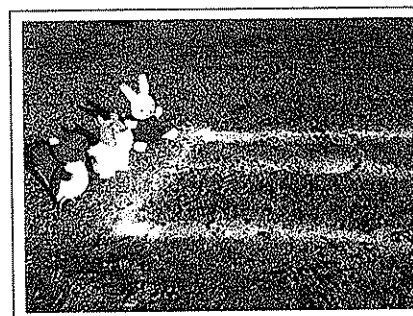
In this story, the test sentence in (15) should be false when it is accompanied by the prosodic pattern of thematic *wa*, since this prosodic pattern leads to the isomorphic interpretation in which the universal quantifier takes scope over the negation (i.e. 'No one ran'). In contrast, the same sentence should be true when it is accompanied by the intonational pattern of contrastive *wa*, since this pattern corresponds to the non-isomorphic interpretation in which the universally-quantified NP takes narrow scope with respect to negation (i.e. 'Not everyone ran'). Thus, given this experimental design, if the isomorphism effect applies in the acquisition of Japanese, children should reject the test sentences most of the time no matter which prosodic pattern of *wa* the sentence carries.

4.2. Results

The results are summarized in (17) and in (18). Overall, Japanese-speaking children correctly rejected the test sentences with thematic-*wa* intonation 86.4% of the time, and correctly accepted the test sentences with contrastive-*wa* intonation 65.9% of the time.

(17) *Overall Results*:

	# of Correct Answers	% of Correct Answers
Sentences with Thematic-*wa* Intonation	38/44	86.4%
Sentences with Contrastive-*wa* Intonation	29/44	65.9%

We found five children who consistently assigned the isomorphic interpretation irrespective of the prosodic pattern. If this response pattern is discounted, the results are as follows:

(18) *Modified Results*:

	# of Correct Answers	% of Correct Answers
Sentences with Thematic-*wa* Intonation	28/34	82.4%
Sentences with Contrastive-*wa* Intonation	29/34	85.3%

4.3. Discussion

As reviewed in Section 2, Musolino et al. (2000) found that English-speaking children around the age of five accepted the non-isomorphic reading of negative sentences such as (19) only 7.5% of the time. In our own experiment with Japanese-speaking children, when a sentence such as (20) was accompanied by the prosodic pattern of contrastive *wa*, five-year-olds correctly

assigned the non-isomorphic interpretation 65.9% of the time.

(19) Every horse didn't jump over the fence.
(20) Minna-wa   ne-nak-atta-yo.
     everyone-Top   sleep-Neg-Past-Excl

This sharp contrast suggests that the isomorphism effect widely observed in the acquisition of English is not prevalent in the acquisition of Japanese, which expresses different scope interpretations by different prosodic patterns. This finding in turn demonstrates that, in addition to the contextual manipulations to satisfy the felicity conditions for negative statements (Gualmini 2005, Musolino & Lidz, in press), prosodic information also helps children overcome the isomorphism effect and makes the inverse-scope interpretation more accessible.

At the same time, we found a small number of children who never accepted the non-isomorphic reading irrespective of the intonational pattern of the test sentences. The responses of this group of Japanese-speaking children are, in fact, consistent with the observation of isomorphism. Then, an important question arises as to whether this is a 'real' phenomenon in child Japanese, and if so, what the exact source of difficulty is for these children. We speculate that this pattern of responses stems not from the lack of ability to access the inverse-scope interpretation but from the failure to use prosodic cues. At present, however, we must leave further investigation of these issues for future research.

5.   Conclusion

In this study, we investigated experimentally whether Japanese-speaking children are able to correctly comprehend scope interactions between negation and the universal quantifier followed by the topic marker *wa*. By so doing, we addressed the question of whether the isomorphism effect pervasive in child

English is also observed in the acquisition of Japanese, in which distinct scope interpretations correspond to different intonational patterns. The results revealed that the isomorphism effect is not prevalent in child Japanese, which in turn suggests that in addition to contextual manipulations, prosodic information constitutes another factor that mitigates the isomorphism effect. These findings add a cross-linguistic perspective to recent investigations on children's comprehension of quantificational sentences, and hence point us toward further refinement in our understanding of the acquisition of semantic knowledge.

Notes:

[1] For the acquisition of universal quantifiers in Japanese, see Philip (1995: Chapter 4.7), Sugisaki & Isobe (2000), and Gouro et al. (2001).

[2] For evidence that the isomorphism effect is a consequence of hierarchical structure (c-command) rather than linear order, see Lidz & Musolino (2002).

[3] See also Hulsey et al. (2004) for detailed discussion.

[4] There is a possibility that English might be the same as Japanese in this regard. Musolino & Lidz (in press) note that "[i]t is sometimes claimed in the linguistics literature (e.g. references cited in Horn 1989) that (although, crucially, never demonstrated experimentally [footnote omitted]) that 'non' and 'not all' readings may be associated (at least in English) with different intonational contours."

[5] For another experiment investigating quantifier-negation interactions in child Japanese, see Terunuma (2001).

[6] In one version of the story, the sentences in (14a,c) were assigned the prosodic pattern of thematic *wa* and the sentence in (14b,d) were assigned the prosodic pattern of contrastive *wa*. In the other version of the story, the assignment was vice versa.

References

Büring, Daniel. 1997. The great scope inversion conspiracy. *Linguistics and Philosophy* 20:175-194.

Crain, Stephen. 1991. Language acquisition in the absence of experience. *Behavioral and Brain Sciences* 14:597-650.

Crain, Stephen. 2000. Sense and sense ability in child language. In *Proceedings of the 24th annual Boston University Conference on Language Development*, eds. S. Catherine Howell, Sarah A. Fish and Thea Keith-Lucas, 22-44. Somerville, Massachusetts: Cascadilla Press.

Crain, Stephen, and Rosalind Thornton. 1998. *Investigations in Universal Grammar: A Guide to Experiments on the Acquisition of Syntax and Semantics*. Cambridge, Massachusetts: MIT Press.

Crain, Stephen, Rosalind Thornton, Carole Boster, Laura Conway, Diane Lillo-Martin, and Elaine Woodams. 1996. Quantification without qualification. *Language Acquisition* 5:83-153.

Geurts, Bart. 2003. Quantifying kids. *Language Acquisition* 11:197-218.

Gouro, Takuya, Hanae Norita, Motoki Nakajima, and Ken-ichi Ariji. 2001. Children's interpretation of universal quantifier and pragmatic interference. In *Proceedings of the Second Tokyo Conference on Psycholinguistics*, ed. Yukio Otsu, 61-78. Tokyo: Hituzi Syobo.

Gualmini, Andrea. 2005. *The Ups and Downs of Child Language*. New York: Routledge.

Horn, Laurence R. 1989. *A Natural History of Negation*. Chicago: University of Chicago Press.

Hulsey, Sarah, Valentine Hacquard, Danny Fox, and Andrea Gualmini. 2004. The question-answer requirement and scope assignment. In *MIT Working Papers in Linguistics 48: Plato's Problems*, eds. Aniko Csirmaz, Andrea Gualmini and Andrew Nevins, 71-90: MITWPL.

Kuno, Susumu. 1973. *The Structure of the Japanese Language*. Cambridge, Massachusetts: MIT Press.

Lidz, Jeffrey, and Julien Musolino. 2002. Children's command of quantification. *Cognition* 84:113-154.

Musolino, Julien, Stephen Crain, and Rosalind Thornton. 2000. Navigating negative quantificational space. *Linguistics* 38:1-32.

Musolino, Julien, and Jeffrey Lidz. In press. Why children aren't universally successful with quantification. *Linguistics*.

Nakanishi, Kimiko. In press. Prosody and scope interpretations of the topic marker wa in Japanese. In *Topic and Focus: Cross-linguistic Perspectives on Intonation and Meaning*, eds. C.-M. Lee, M. Gordon and D. Büring. Dordrecht: Kluwer.

Otsu, Yukio. 1981. *Universal Grammar and Syntactic Development in Children: Toward a Theory of Syntactic Development*. Doctoral dissertation, MIT, Cambridge, Massachusetts.

Phillip, William. 1995. *Event Quantification in the Acquisition of Universal Quantification*. Doctoral dissertation, University of Massachusetts, Amherst.

Sugisaki, Koji, and Miwa Isobe. 2001. Quantification without qualification without plausible dissent. In *The Proceedings of SULA: The Semantics of Under-Represented Languages in the Americas*, eds. Ji-Yung Kim and Adam Werle, 97-100. Amherst: GLSA.

Terunuma, Akiko. 2001. A note on the acquisition of quantifier-neg interaction. In *Linguistic Research*, 97-122. Tokyo: The University of Tokyo English Linguistics Association.

(sugisaki@human.mie-u.ac.jp)