Children’s Non-isomorphic Interpretation in Japanese Conditionals

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1. Introduction

It has been cross-linguistically reported that children have difficulty accessing inverse scope interpretations in sentences containing a quantified NP and sentential negation (Musolino 1998, Musolino, Crain and Thornton 2000, Lidz and Musolino 2002, a.o.). In Japanese, Japanese-speaking children seem to be able to interpret a universally quantified subject under sentential negation, according to Sugawara and Wexler (2014). However, the result of their experiment is still unconvincing, since they did not conduct any experiments with Japanese-speaking adults. Thus, it is unclear whether or not the children’s performance in Sugawara and Wexler (2014) was truly adult-like. In this paper, we demonstrate that Japanese children at age 5 as well as Japanese adults can clearly access not > all interpretations in Japanese conditional sentences containing a universally quantified subject and sentential negation.

The organization of this paper is as follows. In section 2, we will briefly look at some previous studies that focus on the acquisition of scope interpretations in English, Kannada, and Japanese. In section 3, we will point out some remaining issues based on Sugawara and Wexler (2014). In section 4, in order to address the remaining issues, we will show our experiments and discuss the results. In section 5, we will conclude this study.

2. Previous studies

According to Musolino (1998), English-speaking children strongly tend to access the surface scope interpretation (every > not) in sentences like (1). The sentence given in (1) was given under the following situation. There are three horses. Two of them managed to jump over the fence, but the other did not.

(1) Every horse didn’t jump over the fence. (every > not, not > every)

English-speaking adults correctly accepted the sentence given in (1), and the correct acceptance rate was 100% of the time. This means that all of the adult
participants could interpret the universal quantifier under sentential negation \((\text{not} > \text{every})\). In contrast, almost all the children rejected sentences like (1). The rejection rate was 92% of the time. This result shows that children have difficulty interpreting the quantified NP under the sentential negation in (1). Concerning the children’s non-adult-like performance, there were (at least) two possibilities. One was that children relied on linear order. In other words, children interpreted the universal quantifier over the sentential negation since the universal quantifier precedes the negation in (1). The second possibility was that children’s interpretations were based on structural relations, that is, they used the surface c-command relation between the universal quantifier and the sentential negation when they interpreted scope-bearing elements.

To address this issue, Lidz and Musolino (2002) conducted an experiment with Kannada adults and children. Kannada is an SOV language spoken in India. Lidz and Musolino investigated adults’ and children’s scope interpretations for the numeral quantifier \(\text{eradu} \) (two) in the object position and the sentential negation. A sample stimulus sentence is given in (2).

(2) Anoop eradu kaaru toley-al-illa.
    Anoop two cars wash-INF-NEG.
    ‘Anoop didn’t wash two cars.’ (not > two, two > not)

As shown above, this sentence is ambiguous. According to Lidz and Musolino (2002), the numeral quantifier precedes the sentential negation, but the sentential negation is structurally higher than the numeral quantifier. Predictions are as follows. If children always access scope interpretations by linear precedence of the quantifier and negation, they should interpret \(\text{two} \) over the sentential negation in this sentence. However, if children assign scope interpretations by structural relations, namely, c-command relations, they should tend to interpret \(\text{two} \) under the sentential negation.

The adult participants could interpret the numeral quantifier under the sentential negation 85.4% of the time, which coincides with the c-command relations. In addition, they could also interpret the quantified NP over the sentential negation 87.5% of the time. This means that the adult participants could access both of the interpretations. In contrast, the children could interpret the numeral quantifier under the negation 75% of the time, but they had difficulty accessing the wide scope interpretations of the numeral quantifier. The acceptance rate was only 22.9% of the time.

To summarize, in addition to Musolino (1998), Lidz and Musolino (2002) also observed that children have difficulty accessing inverse scope interpretations, and they concluded that children’s scope assignment is based on c-command relations.

As these previous studies have shown, it has been cross-linguistically observed that children strongly persist with interpretations that correspond to surface structural positions. In the literature, this is called the ‘observation of isomorphism’, as Musolino, Crain, and Thornton (2000) defined in (3).
Unlike adults, young children systematically interpret negation and quantified NPs on the basis of their position in overt syntax.

Next, let us briefly take a look at previous studies on scope assignment in Japanese. Miyagawa (2001, 2010) reported that SOV sentences that contain a universally quantified subject and sentential negation are not ambiguous. The universally quantified subject takes scope over the sentential negation in a sentence such as (4).

   all-NOM that exam-ACC take-NEG-PAST  
   ‘All did not take that test.’ (all > not, *not > all)

In addition, Miyagawa claimed that in scrambled OSV sentences, sentential negation can take scope over the universally quantified subject. Hence, the sentence in (5) is ambiguous.

(5) Sono tesuto-o_i zen’in-ga ti uke-nak-atta.  
    that exam-ACC all-NOM take-NEG-PAST  
    ‘That test, all didn’t take.’ (all > not, not > all)

Then, how do Japanese-speaking children interpret these kinds of sentences? To address this question, Sugawara and Wexler (2014) conducted an experiment for investigating five-year-old children’s interpretations in canonical SOV sentences and scrambled OSV sentences. First, let us see the case of SOV sentences. They use stimulus sentences such as (6) and recall that this sentence has only the all > not reading because of the canonical word order.

(6) Risusan minna-ga donguri-o  
    squirrel everyone-NOM chestnuts-ACC  
    hirow-anak-atta-yo.  
    pick.up-NEG-PAST-DECL  
    ‘Every squirrel didn’t pick up chestnuts.’ (all > not, *not > all)

The result is as follows. The wrong acceptance rate of not > all readings was only 5% of the time. This result suggests that Japanese children correctly disallow the not > all interpretation, and that they access all > not readings in SOV sentences, according to Sugawara and Wexler (2014).

Let us move on to the result of the OSV sentences. Sugawara and Wexler (2014) used the stimulus sentences shown in (7).
(7) Ninjin-oi     usagisan  minna-ga        t i
    carrot-ACC  rabbit    everyone-NOM
    hirow-anak-atta-yo.
pick.up-NEG-PAST-DECL
‘Carrots, every rabbit didn’t pick up.’ (all > not, not > all)

This sentence is ambiguous since the word order is scrambled. In contrast to the
result of (6), the correct acceptance rate of the not > all readings was 21% of the
time. Based on these results, Sugawara and Wexler claimed that Japanese
children at around age 5 do not allow not > all readings in SOV sentences, but
they can allow it in the OSV sentences.

3. Research Questions

As we have already seen, Japanese children seem to interpret a quantified
subject under sentential negation in Japanese OSV sentences, according to
Sugawara and Wexler (2014). However, this is not convincing since there are
some remaining issues, such as whether Japanese adults also allow the wide
scope interpretation of the sentential negation in (7) at the same rate. If Japanese
adults clearly accessed the wide scope interpretation of the sentential negation in
(7) at a high rate, the results of Sugawara and Wexler (2014) would be
compatible with the observation of isomorphism. This is because the correct
acceptance rate of OSV sentences was only 21% of the time, and this result was
rephrased so that the children interpreted the universal quantifier over the
sentential negation 79% of the time.

Furthermore, there is a possibility that Japanese adults may also prefer the
narrow scope interpretation of the sentential negation in the stimulus sentences
used by Sugawara and Wexler (2014). However, to test the observation of
isomorphism, we should use a construction in which adults clearly interpret a
quantifier under sentential negation, following the previous studies. Let us
review children’s acceptance rates of the inverse scope interpretations in the
previous studies.

Table 1. The contrast between adults’ and children’s acceptance rate in
previous studies

<table>
<thead>
<tr>
<th></th>
<th>Adults</th>
<th>Children</th>
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<tbody>
<tr>
<td>Musolino (1998)</td>
<td>100%</td>
<td>8%</td>
</tr>
<tr>
<td>Lidz and Musolino (2002)</td>
<td>87.5%</td>
<td>22.9%</td>
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</table>

In Musolino (1998), English adults interpreted the quantifier under the sentential
negation 100% of the time, but roughly speaking, English children did not.
Additionally, Lidz and Musolino (2002) shows that adults’ acceptance rate of
the wide scope interpretation of the negation was around 87% of the time, while
children’s acceptance rate was around 23% of the time. In short, both of the
studies showed a clear difference between adults’ performance and children’s performance.

To examine whether Japanese-speaking children also show the same type of difficulty reported in the literature, that is, the observation of isomorphism, further investigation is required. First, we need to establish that Japanese adults clearly access wide scope interpretation of sentential negation in sentences containing a quantified NP and sentential negation. Then, we need to examine whether Japanese children show adult-like performance. What kinds of sentences are suitable?

As shown in (4), Japanese canonical word order sentences containing a quantified subject and sentential negation are not ambiguous in simple declaratives.

    all-NOM that exam-ACC take-NEG-PAST
    ‘All did not take that test.’ (all > not, *not > all)

However, according to Saito (2009), such sentences embedded in conditional clauses become ambiguous, as shown in (9).

(9) Zen’in-ga sono tesuto-o uke-na-katta-ra,
    all-NOM that test-ACC take-NEG-PAST-if
    raigetu mata tesuto-o su-ru.
    next month again test-ACC do-PRES
    ‘If all do not take the exam, (we will) have another exam next month.’
    (all > not, not > all)

Hence, the following questions arise.

(10) a. Do Japanese adults clearly interpret a quantifier under sentential negation in conditional sentences?
    b. If so, can Japanese children also access it?

To answer these questions, we conducted experiments with Japanese adults and children.

4. Experiments
4.1. Target group

To address the issues shown above, we conducted a target experiment with Japanese adults first. The organization of our experiment consists of three practices, three targets, and one filler. In this experiment, we investigated whether Japanese adults clearly interpret a quantified subject under sentential negation in conditional sentences. The participants were five Japanese-speaking adults.
Let us see a sample story. A frog, a squirrel, and a bear practice jumping down from a high place onto the ground, and they demonstrate this action to a participant. Mickey Mouse is their teacher. A sample picture of this scene is given below.

Figure 1. the beginning of the sample story

Next, an experimenter gives a stimulus sentence to a participant. The sample stimulus sentence is given in (11), which is also a conditional sentence, and thus, this sentence is also ambiguous.

(11) Mosi zen’in-ga toba-nak-atta-ra, Mickey-ni if everyone-NOM jump-NEG-PAST-if Mickey-DAT piiman-o age-te-ne. green pepper-ACC give-IMP-MOOD Sore igai-no toki-wa, keeki-o age-te-ne. that except-GEN case-TOP cake-ACC give-IMP-MOOD ‘If all (the animals) don’t jump down, please give Mickey the green pepper. Otherwise, please give him the cake.’ (all > not, not > all)

The frog and the squirrel successfully jumped down. However, the bear also tried to jump down, but he failed because he was scared. The final outcome is given below.

Figure 2. the final outcome of the sample story
Once again, the experimenter gives the stimulus sentence to the participant as a reminder. Then, the experimenter asks the participant to pass the green pepper or the cake to Mickey.

The predictions for this group are as follows. Under this situation, if the participants correctly interpret the universal quantifier under the sentential negation in (11), they should give Mickey the green pepper. In contrast, if the participants interpret the universal quantifier over the sentential negation in the stimulus sentence, the conditional clause means ‘if nobody could jump down…’. If so, they should give Mickey the cake because the two animals managed to jump down even when one character failed to jump down.

Let us see the result of the target adult group. The adult participants gave Mickey the green pepper 100% of the time. Therefore, this result means that Japanese adults could clearly interpret the universally quantified subject under the sentential negation in Japanese conditional sentences. Now we are ready to investigate how Japanese-speaking children interpret this stimulus sentence. The participants were 10 Japanese-speaking children, ranging from 4;10 to 5;9, and their mean age was 5;3. The story and stimulus sentences are identical to the one that were given to the adult group.

The result of the children was also almost the same as that of adults. They passed the green pepper to Mickey 96% of the time. This result seems to indicate that children correctly interpreted the universally quantified subject under sentential negation like adults. However, there is a possibility that, unlike adults, children always interpret quantified subjects under sentential negation in conditional sentences. Even if they have such non-adult-like knowledge, it is also possible to pass the green pepper. To examine this possibility, we conducted another experiment with other adults and children as a control group.

4.2. Control group 1

First, let us see the stimulus sentences in this control group. We used an existential quantifier dareka (someone), which is a positive polarity item (PPI) in Japanese. Therefore, it is not interpreted under the scope of the sentential negation, as shown in (12).

(12) Dareka-ga ko-nak-atta.
    someone-NOM come-NEG-PAST
    ‘Someone didn’t come.’ (some > not, *not > some)

However, we assume that the scope interaction between dareka (someone) in the subject position and sentential negation becomes ambiguous in Japanese conditionals, as shown in (13)¹.

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¹ Szabolcsi (2004) also reported that someone (PPI) can be interpreted under the sentential negation in conditional sentences.

(i) If we don’t call someone, we are doomed. (*not > some)
We asked 5 Japanese-speaking adults whether the wide scope interpretation of the sentential negation is possible in this sentence. Our finding is that all of them could allow a wide scope reading of the sentential negation in (13). Thus, we assume that *dareka* (*someone*) can be interpreted under sentential negation although it is a PPI, and that both the wide and narrow scope readings of the sentential negation are possible in this sentence.

In the control group, we investigate whether the participants can interpret *dareka* over the sentential negation in conditional sentences. The participants were 5 Japanese-speaking adults and 10 Japanese-speaking children ranging from 5;0 to 5;4, and their mean age was 5;1. The sample stimulus sentence is given in (14). As we said before, this sentence is also ambiguous since the sentence is conditional.

Let us see the predictions for the control group. If the participants interpret *dareka* over the sentential negation in sentence (14) under the situation given above, they should choose the green pepper. In contrast, if they interpret *dareka* under the negation in sentence (14), that is, if they interpret the test item as ‘it is not the case that someone jumped down…’, then they should give the cake, since the two animals manage to jump down.

The result was as follows. The adult participants passed the green pepper 100% of the time. In addition, the children also gave the green pepper to Mickey 90% of the time. Therefore, the children correctly interpreted *dareka* over the sentential negation. This means that Japanese children can interpret the quantified subject over the sentential negation in Japanese conditional sentences as correctly as adults can.
4.3. Control group 2

The experiments above showed that Japanese children show adult-like performance in interpreting scopally ambiguous sentences in conditionals. In other words, it seems that they can interpret a quantified subject under/over sentential negation. However, there is another possibility that children always focused on a character that had failed to jump, and hence, they gave the green pepper to Mickey, since the green pepper is a typical symbol of failure. In other words, there is a possibility that the children ignored the target sentence (or the conditional clause) and gave the green pepper to Mickey since the character that had failed to jump was salient. To examine this possibility, we conducted another experiment with 10 children aged from 4;10 to 5;9 (mean = 5;2). The stimulus sentence used in this experiment is given in (15).

(15) Mosi dareka-ga ton-da-ra, Mickey-ni keeki-o age-te-ne. cake-ACC give-IMP-MOOD Sore igai-no toki-wa piiman-o that except-GEN case-TOP green pepper-ACC age-te-ne. give-IMP-MOOD ‘If someone jumps down, please give Mickey the cake. Otherwise, please give him the green pepper.’

Note that this sentence does not contain sentential negation. Additionally, this sentence was given to participants under the same situation; the frog and the squirrel managed to jump down, but the bear failed to jump down. Suppose that children ignore the target sentence (or the conditional clause) and always gave the green pepper since the bear failed (and it was salient). Then, it is predicted that children should also give the green pepper in this case. However, the participants correctly gave the cake to Mickey 100% of the time. Thus, this result confirmed that children did not ignore the conditional clause. Rather, it seems that the participants paid attention to the conditional clause, and they chose the item to give to Mickey.

Before concluding this paper, we will summarize the results of the experiments.

Table 2. Summary of the experiments

<table>
<thead>
<tr>
<th>Target (not &gt; all)</th>
<th>Control 1 (some &gt; not)</th>
<th>Control 2 (item)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Children</td>
<td>96%</td>
<td>90%</td>
</tr>
</tbody>
</table>
First, in the target group, Japanese adults gave Mickey the green pepper 100% of the time, and Japanese children did so 96% of the time. This result means that Japanese adults clearly allowed the wide scope interpretation of sentential negation in Japanese conditional sentences, and Japanese children also allowed it. Next, in the first control group, Japanese adults chose the green pepper 100% of the time, and children did so 90% of the time. This result shows that the participants could assign the wide scope interpretation of the quantified subject as well, indicating that the participants could access both the wide scope interpretation and the narrow scope interpretation of the quantified subject in Japanese conditionals. Additionally, the result of the second control group indicates that the children did not ignore the stimulus sentences, and thus, they interpreted stimulus sentences based on the given situation.

5. Conclusion

As we pointed out, Sugawara and Wexler (2014) conducted their experiments only with children. Therefore, there was a possibility that even Japanese adults cannot easily access the wide scope interpretation of the sentential negation in their OSV stimulus sentences. In addition, there was another possibility that Japanese adults highly access the wide scope interpretation of the sentential negation in their target items. In this case, the result in their experiment seems to be compatible with the observation of isomorphism, as reported in previous studies (Musolino 1998, Lidz and Musolino 2002). Therefore, it was not clear whether Japanese children also show difficulty in interpreting scopally ambiguous sentences (the isomorphic effect).

However, the current study demonstrates that Japanese-speaking children as well as adults clearly accessed the not > all interpretations in Japanese conditional sentences. Additionally, we showed that Japanese children accessed not only the narrow scope interpretation of negation but also the wide scope interpretation of negation. Our results indicate that children do not show the isomorphic effect at least in interpreting conditional sentences containing the universally quantified subject and the sentential negation.

Some studies showed the roots of the isomorphic effect in children. According to Gualmini, Hulsey, Hacquard, and Fox (2008), children’s persistence in surface scope interpretations can be accounted for by a single pragmatic factor; Question-Answer-Requirement (QAR). QAR says that the interpretation chosen by children must be a good answer to the salient question available in the contextual setting of an experiment, and they can easily access inverse scope interpretations only if QAR is satisfied. Importantly, QAR is defined with respect to declaratives. However, the test sentences in our experiment are not declaratives but imperatives. Thus, QAR is not directly

2 We will leave the reason that the not > all interpretations are possible in conditional sentences for our future research.
applicable to this experiment due to the type of test sentences. The current study provides new evidence that children can access inverse scope interpretations without meeting QAR (see di Bacco, Tieu, Moscati, Folli, Sevdali, and Romali (to appear)).

References


