

An Experimental Study on the Relative Scope of Numerals and Neg in Child Japanese

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1. Introduction

Conducting experiments on English-speaking children between 3;10 and 7;3 of age, Musolino (1998) finds that child English is different from adult English in the interpretation of negative sentences containing quantifiers (universal quantifiers, existential quantifiers or numerals) in subject or object position. In child English, quantifiers in subject position, which overtly c-command and at the same time precede Neg, take wide scope with respect to Neg, while quantifiers in object position, which are overtly c-commanded and preceded by Neg, take narrow scope with respect to Neg. In adult English, on the other hand, it does not necessarily have to be so. Musolino (1998) generalizes (1) from the data from child English.

(1) Musolino's (1998) generalization

The relative scope of quantifiers and Neg is isomorphic to their overt c-command relation or their linear order in child language.

In consideration of new-found data as well obtained from experiments that investigates how Japanese-speaking children interpret negative sentences containing quantifiers (universal quantifiers or numerals) in object position, Terunuma (2001a, b) claims that the factor determining the relative scope of quantifiers and Neg in child language is not overt c-command but linear order.¹ Terunuma (2001a, b) modifies the generalization in (1) as (2).

(2) Terunuma's (2001a, b) generalization

The relative scope of quantifiers and Neg is isomorphic to their linear order in child language.

¹ The experiment conducted in Terunuma (2001a) is a pilot experiment for the one conducted in Terunuma (2001b).

The results of Terunuma's (2001a, b) experiments concerning the interpretation of Japanese negative sentences containing the universal quantifier *zenbu* 'all' in object position constitute one piece of evidence for this generalization. *Zenbu* 'all' in object position is overtly c-commanded by Neg but precedes Neg in the test sentence, and the younger half of the child subjects gave wide scope to *zenbu* 'all' in object position rather than Neg.

The results of Terunuma's (2001a, b) experiments concerning the interpretation of negative sentences containing numerals in object position such as (3) are also compatible with the generalization in (2). However, more justification is needed.

- (3) Mickey-wa banana-o ni-ko tora-nakat-ta yo.²
 Mickey-Top banana-Acc two-CL pick-Neg-Past SFP
 'Mickey Mouse didn't pick two bananas.'

In adult Japanese, the numeral *ni* 'two' in sentences like (3) can take both wide and narrow scope with respect to Neg (the two > Neg and the Neg > two interpretations respectively). Terunuma (2001a, b) investigates whether sentences like (3) are accepted by children and a control group of adults in two contexts: a context where only the two > Neg interpretation is true (the two > Neg context) and a context where only the Neg > two interpretation is true (the Neg > two context). The results of Terunuma's (2001b) experiment concerning sentences like (3) are shown in Table 1. The rows indicate the contexts against which the sentences are judged. The figures indicate the rate of acceptance.

Table 1: The results of Terunuma's (2001b) experiment concerning sentences like (3)

	two > Neg context	Neg > two context
children (3;10 – 4;7)	54.5%	40.9%
(4;8 – 5;3)	50%	68.2%
adults	98.1%	85.2%

Since *ni* 'two' precedes Neg in sentences like (3), the generalization in (2) amounts to saying that Japanese-speaking children initially assign sentences like (3) the two > Neg interpretation, but not the Neg > two interpretation. As Table 1 shows, younger children allow the Neg > two interpretation of sentences like (3) at a low rate (40.9%), which is in accord with (2). However, the rate at which the same children allow the two > Neg interpretation of the sentences is not as high as it should be (54.5%) if (2) is/were correct.

As Terunuma (2001b) notices, the reason for the unexpected low rate of children's

² In this paper, I will use the following notation: Top = topic, Acc = accusative, CL = classifier, Past = past tense morpheme, SFP = sentence-final particle.

acceptance of sentences like (3) in the two > Neg context could be that the context used in the experiment is confusing for children. For example, the two > Neg context paired with the sentence in (3) is (4).

- (4) In a woods, Mickey Mouse finds two carrots in the ground and four bananas on a tree. First he considers picking the carrots, and picks one of them. He leaves the other carrot. Next he considers picking the bananas. He picks two of the bananas, but leaves the remaining two.

In the context outlined in (4), (3) is true on the two > Neg interpretation since the number of bananas that Mickey Mouse didn't pick is two. The number of bananas that Mickey Mouse picked is also two, and this is the point that makes (3) false on the other interpretation, namely the Neg > two interpretation. However, the context in which two bananas were picked and two bananas were left seems to cause children confusion when they are required to judge the truth value of (3). Even children who can assign the two > Neg interpretation to sentences like (3) could reject the sentences in such contexts.

The aim of this paper is to show the results of an experiment that overcomes the above-mentioned problem of Terunuma's (2001a, b) experiments and to confirm the validity of the generalization in (2) in the case of sentences like (3). In the next section, I will describe the revised experiment and provide the results. In section 3, based on the results of the revised experiment, I will consider whether the generalization in (2) is valid.

2. The Experiment

2.1. The Design

In order to clarify whether Japanese-speaking children can assign the two > Neg interpretation to sentences like (3), an experiment was designed where sentences like (3) were presented in a less confusing two > Neg context. The experimental methodology is the same as that of Terunuma's (2001a, b) experiments, namely the truth value judgment task. The experiment includes control items and test items.

The control items are the same as those of Neg and *ni* 'two' in Terunuma's (2001a, b) experiments, and are used to investigate whether children correctly understand the meaning of Neg and *ni* 'two' respectively. Control sentences are paired with the context where they are true (the match context) and the context where they are false (the mismatch context). Children are regarded to pass the control tests when they reject control sentences in the mismatch context and accept them in the match context. See Terunuma (2001b) for details of these control items.

In the test items, sentences like (3) are used as test sentences. The test sentences are paired with two contexts: a context where the Neg > two interpretation is logically true but pragmatically false (the not-2-but-3 context) and a two > Neg context which is less confusing than that of Terunuma's (2001a, b) experiments (the revised two > Neg context). (5) and (6) exemplify the two kinds of test items respectively.

- (5) The test item of *ni* 'two' (the not-2-but-3 context)

Outline of the context story:

Mickey Mouse is asked to wash pandas and lions at a zoo. There are two pandas and three lions. First he considers washing the pandas. He washes one of them, but does not wash the other. Next he considers washing the lions, and washes the three lions.

Test sentence:

Mickey-wa raion-san-o ni-hiki arawa-nakat-ta yo.

Mickey-Top lion-Acc two-CL wash-Neg-Past SFP

'Mickey Mouse didn't wash two lions.'

- (6) The test item of *ni* 'two' (the revised two > Neg context)

Outline of the context story:

In a woods, Mickey Mouse finds two carrots in the ground and five bananas on a tree. First he considers picking the carrots, and picks one of them. He leaves the other carrot. Next he considers picking the bananas. He picks three of the bananas, but leaves the remaining two.

Test sentence:

Mickey-wa banana-o ni-ko tora-nakat-ta yo.

Mickey-Top banana-Acc two-CL pick-Neg-Past SFP

'Mickey Mouse didn't pick two bananas.'

The revised two > Neg context makes the two > Neg interpretation of the test sentence true and its Neg > two interpretation pragmatically false. When children reject the test sentence in the not-2-but-3 context and accept it in the revised two > Neg context, it is demonstrated that they assign the two > Neg interpretation to the test sentence.³

³ Crain and Thornton (1998) point out that the experiment with the truth value judgment task needs to satisfy the condition of plausible dissent/assent, which requires that, in the experimental context, the truth value of the target sentence be different in the actual outcome and in the possible outcome. In all the control and test items of the experiment conducted in this paper, this condition is satisfied. For example, the revised two > Neg context in (6) in the text has the possible and the actual outcomes in (i).

(i) Possible outcome: The number of bananas that Mickey Mouse picked is not two (but one).

Actual outcome: The number of bananas that Mickey Mouse picked is three. (There exist two bananas that Mickey Mouse didn't pick.)

The possible outcome is plausible since Mickey Mouse picked only one of the carrots and the same thing may happen to the bananas as well.

In the revised two > Neg context outlined in (6), Mickey Mouse picks three bananas and leaves two. Judging the truth value of the test sentence seems to be easier in contexts like this than in contexts like (4) where Mickey Mouse picks two bananas and leaves the other two.

2.2. The Procedure

The experiment includes two trials each for the control sentences of Neg and *ni* 'two' (one in the match context and one in the mismatch context) and four trials for test sentences (two in the not-2-but-3 context and two in the revised two > Neg context), interspersed with seven trials for filler sentences in order to prevent presenting similar sentences on end and to check whether children still concentrate on the task. The experiment was done in one session, which took about twenty minutes to complete. The rest of the procedure is the same as that of Terunuma's (2001a, b) experiments.

2.3. Subjects

Forty-one monolingual Japanese-speaking children ranging in age from 4;2.25 to 5;1.17 were tested. Eighteen Japanese-speaking adults were tested as well for comparison.

2.4. Results

Thirty-two children passed both the Neg control and the *ni* 'two' control tests. Among them, one child (4;7.24) accepted test sentences in the not-2-but-3 context on both of the two trials, and another child (5;1.17) did so too on one trial. The other thirty children rejected test sentences in the not-2-but-3 context on both of the two trials. Eighteen adults all passed both the Neg control and the *ni* 'two' control tests. Three adults accepted and the other fifteen adults rejected test sentences in the not-2-but-3 context on both of the two trials.

Table 2 shows how test sentences were judged in the revised two > Neg context by the thirty children and the fifteen adults who consistently rejected test sentences in the not-2-but-3 context. The figures indicate the rate of acceptance. Children are divided in half according to their age.

Under the experimental hypothesis that children assign only the Neg > two interpretation to the test sentence of *ni* 'two', children's interpretation of the test sentence in (6) is true in the possible outcome and pragmatically false in the actual outcome. Children's acceptance of the test sentence in contexts like (6) (and rejection of the test sentence in contexts like (5) in the text) disprove the experimental hypothesis, and suggest that the test sentence of *ni* 'two' has the two > Neg interpretation in child Japanese.

Table 2: The rate of acceptance for test sentences in the revised two > Neg context

	revised two > Neg context
children (4;2.25 – 4;6.25)	86.7%
(4;7.3 – 5;1.15)	83.3%
adults	90%

As Table 2 indicates, both the younger and the older half of the children, like adults, accepted test sentences in the revised two > Neg context.

3. Discussion

In Terunuma's (2001b) experiment, as shown in the first column of Table 1, children accepted the test sentence of *ni* 'two' in the two > Neg context at no more than the chance level. As shown in Table 2, however, children at around the same age accepted the test sentence at a high rate in the revised two > Neg context. The results of the revised experiment indicate that Japanese-speaking children at the age of 4 or 5 can assign the two > Neg interpretation to negative sentences containing *ni* 'two' in object position, and in addition that the chance level rates shown in the first column of Table 1 are experimental artifacts caused by confusing contexts.

As for the results of Terunuma's (2001b) experiment shown in the second column of Table 1, I take them up as they are. They indicate that Japanese-speaking children at around 4 years of age tend to disallow the Neg > two interpretation of the test sentence of *ni* 'two'. From the data in the second column of Table 1 and the results of the revised experiment in Table 2, it is concluded that Japanese-speaking children initially assign the two > Neg interpretation to negative sentences containing *ni* 'two' in object position. The generalization in (2) holds in the case of Japanese negative sentences containing numerals.

References

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