

Children's Knowledge of Quantifier Raising: Evidence from Scope Construal of Negative Sentences Containing a Quantified Noun Phrase

Akiko Terunuma

1. Introduction

In the theory of generative grammar (Chomsky (1995)), it is assumed that the computational system of human language (CS) maps the Numeration, which is a set of lexical items selected from the lexicon, onto two interface levels, PF and LF. In the process of derivation from the Numeration to LF, syntactic structures are recursively constructed. At some point of the derivation, the operation Spell-Out strips information relevant only to sound off the structure already constructed. The information stripped off is mapped onto a PF representation. The remaining structure, which is relevant to meaning, is mapped onto an LF representation. The subsystem of the CS in which the computation proceeds from the Numeration to the Spell-Out is called the overt component. The subsystem of the CS from the Spell-Out to LF is called the covert component. Quantifier Raising (QR) is a covert operation that moves a quantified noun phrase (QNP) to a non-argument position such as a TP-adjoined position. It has been claimed that QR is responsible for the interpretation of QNPs (May (1985), Aoun and Li (1989, 1993), Fox (1995, 2000), Beghelli and Stowell (1997), Reinhart (2006)).

From the perspective of language acquisition, a question arises as to whether children have knowledge of the covert operation QR. Previous

studies that address this question have demonstrated that evidence for children's knowledge of QR comes from English-speaking children's interpretation of sentences with antecedent-contained deletion (ACD) (Lidz et al. (2004), Kiguchi and Thornton (2004), Syrett and Lidz (2005, 2009)). This paper shows that another piece of evidence for children's knowledge of QR comes from Japanese-speaking children's scope construal of negative sentences containing a QNP such as (1).¹

- (1) Gakusei-ga hon-o zenbu yoma-nakat-ta.
 student-Nom book-Acc all read-Neg-Past
 'The student didn't read all the books.'

The organization of this paper is as follows: Section 2 reviews previous studies that address the question of whether children have knowledge of QR. Section 3 considers scope construal of negative sentences containing a QNP such as (1) above in adult Japanese. Section 4 shows how Japanese-speaking children interpret sentences like (1), drawing on Terunuma's (2008, 2010) experimental study. Based on the results of Terunuma's (2008, 2010) experiment, section 5 discusses children's knowledge of QR. Section 6 makes a summary.

2. Previous Studies

In previous experimental studies, it has been shown that English-speaking children's interpretation of sentences with ACD provides a piece of evidence for children's knowledge of QR (Lidz et al. (2004), Kiguchi and Thornton (2004), Syrett and Lidz (2005, 2009)). In particular,

¹ In this paper, the following abbreviations are used: Nom = nominative, Acc = accusative, TTop = thematic topic particle, CTop = contrastive topic particle, Past = past tense morpheme, Neg = negative morpheme, SFP = sentence-final particle.

Syrett and Lidz (2005) found in their experiment that 4-year-old English-speaking children can interpret the ACD sentence in (2) as in (3).

- (2) Miss Piggy wanted to drive every car that Kermit did.
- (3) Miss Piggy wanted to drive every car that Kermit wanted to drive.

Under the assumption that the interpretation in (3) is obtained through the procedure shown in (4), where the QNP *every car that Kermit did* is raised to a position higher than the matrix VP by QR, the finding of Syrett and Lidz (2005) demonstrates that children have knowledge of QR.

- (4) a. Miss Piggy wanted to drive every car that Kermit did [_{VP} e]
- b. QR:
 [every car that Kermit did [_{VP} e]] Miss Piggy wanted to drive t
- c. ellipsis resolution:
 [every car that Kermit did [_{VP} want to drive t]] Miss Piggy
 wanted to drive t

Lidz et al. (2004) claim that evidence for children's knowledge of QR is also found in the results of their experiment that investigated English-speaking children's bound variable reading of pronouns. What Lidz et al. (2004) found through their experiment is that in the sentence in (5), 4-year-old English-speaking children can interpret the pronoun *she* as a variable bound by the QNP *every dancer*.

- (5) Kermit kissed every dancer before she went on stage.

Assuming that the bound variable reading of the pronoun in (5) is obtained when the QNP *every dancer* undergoes QR as in (6), Lidz et al. (2004) take

the results of their experiment as indicating that children have knowledge of QR.

(6) [every dancer] Kermit kissed t before she went on stage

However, the results of Lidz et al.'s (2004) experiment do not necessarily show that QR is part of child grammar. The bound variable reading of the pronoun in (5) above is obtainable without recourse to QR. The QNP *every dancer* in (5) is raised to its Case position, namely the Spec position of matrix vP, for Case checking by A-movement, as shown in (7).

(7) Kermit [_{VP} [every dancer] [_{VP} kissed t before she went on stage]]

After the A-movement to its Case position, the QNP *every dancer* is in a position from which it can bind the pronoun *she*. Thus, we cannot conclusively say that children's bound variable reading of the pronoun in (5) provides evidence for their knowledge of QR.

In what follows, I will show that a new piece of evidence for children's knowledge of QR comes from Japanese-speaking children's scope construal of negative sentences which contain a QNP with a universal quantifier in object position. I will first consider Japanese-speaking adults' scope construal of such sentences, and then turn to Japanese-speaking children's scope construal.

3. Adults' Scope Construal

In negative sentences containing a QNP, QNPs and negation scopally interact with each other. Consider the Japanese negative sentence in (8),

which contains a QNP with a universal quantifier in object position.²

- (8) Gakusei-ga hon-o zenbu yoma-naka-ta.
student-Nom book-Acc all read-Neg-Past
'The student didn't read all the books.'

(8) is ambiguous with respect to the relative scope of the QNP *hon-o zenbu* 'all the books' and negation. (9) and (10) are the paraphrases of the possible readings.

- (9) It is not the case that the student read all the books.
(10) The student read no books.

(9) is the interpretation in which negation takes scope over the universal QNP. (10) is the interpretation in which the universal QNP takes scope over negation.

The ambiguity of negative sentences containing a universal QNP in object position such as (8) above is attributed to two different LF representations. Negative sentences containing a QNP in object position are associated with two representations at LF. In one representation, the QNP is in a position in which it c-commands negation. In the other representation, it is in a position in which it is c-commanded by negation. To put it differently, two potential scope positions are provided at LF for QNPs. We assume that one of the two scope positions for object QNPs is the head position of the A-chain created by A-movement for Case checking, and that the other is the head position of an A'-chain created by QR. The head position of the A-chain

² In (8) in the text, the universal quantifier *zenbu* 'all' is in the position just after the Case particle attached to the noun it modifies. Following Watanabe (2006, 2008), we assume that scope-bearing elements in such a position are within nominal projection.

for object QNPs, namely Spec vP, is lower than NegP, where negation is interpreted. When object QNPs are interpreted at the head position of the A-chain, they take narrow scope with respect to negation. When object QNPs are raised to a TP-adjoined position by QR, they take wide scope with respect to negation.

Let us now take a closer look at two possible LF representations for Japanese negative sentences containing a QNP in object position such as (8) above. Suppose that the object QNP is interpreted at the head position of the A-chain, namely that its copy in the tail position is deleted at LF. Then, the sentences have the LF representation in (11).

(11) [TP [NegP [vP object QNP [vP ~~object QNP~~]] Neg]]

(11) yields the narrow scope reading of the QNP because the interpreted copy of the QNP is c-commanded by negation.

As can be seen in (11) above, the wide scope reading of the object QNP cannot be obtained through its A-chain. In order to achieve wider scope, the object QNP undergoes QR, which yields the LF representation in (12).

(12) [TP object QNP [TP [NegP [vP ~~object QNP~~
[vP ~~object QNP~~]] Neg]]]

(12) gives rise to the wide scope reading of the QNP because the interpreted copy of the QNP c-commands negation.³

³ In our analysis, QNPs undergo QR to obtain the scope relative to negation that is not available through A-chains. The application of QR is subject to an economy principle (Fox (1995, 2000), Reinhart (2006)).

4. Children's Scope Construal

We now turn to Terunuma's (2008, 2010) study on children's scope construal of negative sentences containing a QNP. Conducting an experiment, Terunuma (2008, 2010) investigated how Japanese-speaking children interpret negative sentences containing a universal QNP in object position. The experimental method used was the truth value judgment task methodology (Crain and Thornton (1998)). In the experiment, negative sentences containing a universal QNP in object position were presented with two types of context stories. One type of story depicted the context where the narrow scope reading of QNPs is true ($\neg Q$ context). The other type depicted the context where the wide scope reading of QNPs is true ($Q\neg$ context).⁴ (13) and (14) illustrate the test items in $\neg Q$ contexts and in $Q\neg$ contexts.

⁴ The narrow scope reading of universal QNPs is entailed by the wide scope reading of universal QNPs. That is, the set of $\neg Q$ contexts for negative sentences containing a universal QNP includes the set of $Q\neg$ contexts. In some $\neg Q$ contexts, not only the narrow scope reading but also the wide scope reading of the universal QNP is true. In this paper, however, the term $\neg Q$ contexts is used to refer to contexts where only the narrow scope reading of the QNP is true.

(13) A test item in the \neg Q context

Context story:

O-hiru-gohan-no yooi-ga deki-mashita. Minnie-no mae-ni-wa banana to ringo-ga ari-masu. [There are three bananas and three apples in front of Minnie Mouse.] Minnie-wa mazu "Banana-o tabe-yoo kana," to omoi-mashita ga, amari suki-de-wa nakat-ta node yame-mashita. "Ringo-wa doo shi-yoo kana?" Minnie-wa kangae-mashita. Soshite, ik-ko-me to ni-ko-me-no ringo-o tabe-mashita. Nokori-no ringo-mo tabe-yoo ka to omoi-mashita ga, yappari tomodachi-ni age-yoo to omoi, taberu-no-o yame-mashita.

'Lunch was ready. There were bananas and apples in front of Minnie Mouse. [There are three bananas and three apples in front of Minnie Mouse.] Minnie Mouse first considered eating the bananas, but decided against it because she did not like bananas very much. "What about the apples?" she thought. Then, she ate the first and second apples. She also considered eating the other apple, but decided not to eat it so that she could give it to her friend.'

Test sentence:

Minnie-wa	ringo-o	zenbu	tabe-nakat-ta	yo.
Minnie-TTop	apple-Acc	all	eat-Neg-Past	SFP

'Minnie didn't eat all the apples.'

(14) A test item in the Q \neg -context

Context story:

Tora-wa mori-no naka-de ringo to ninjin-o mitsuke-mashita. [There are three apples and three carrots.] *Tora-wa saisho-ni ringo-o tabe-yoo to omoi, ik-ko-me to ni-ko-me-no ringo-o tabe-mashita. Nokori-no ringo-wa ato-de taberu tame-ni nokoshi-mashita. "Ninjin-mo tabe-yoo kana," to omoi-mashita ga, ninjin-wa amari suki-dewa nakat-ta node taberu-no-o yame-mashita.*

'A tiger found apples and carrots in a forest. [There are three apples and three carrots.] The tiger first considered eating the apples, and ate the first and second apples. He left the other apple uneaten so that he could eat it later. He also considered eating the carrots, but decided not to eat them because he did not like carrots very much.'

Test sentence:

Tora-wa	ninjin-o	zenbu	tabe-nakat-ta	yo.
tiger-TTop	carrot-Acc	all	eat-Neg-Past	SFP

'The tiger didn't eat all the carrots.'

The task of children was to judge whether the test sentences were acceptable as descriptions of what had happened in the context stories. The experiment included two trials each of types (13) and (14). Thirty Japanese-speaking children (3;10.22–5;3.9) were tested on these trials.⁵

⁵ In addition to experimental items to investigate children's interpretation of negative sentences containing a universal QNP in object position, Terunuma's (2008, 2010) experiment included the following items: items to investigate children's interpretation of negative sentences containing a numeral QNP in object position, items to investigate children's interpretation of negative sentences where the universal QNP in object position is marked by the contrastive topic particle *wa* 'CTop,' items to investigate whether children have a basic understanding of relevant scope-bearing elements, and filler items. For details of the materials and procedure of the experiment, see Terunuma (2010).

The results of Terunuma's (2008, 2010) experiment show that Japanese-speaking children tend to consider negative sentences containing a universal QNP in object position to be unacceptable in $\neg Q$ contexts but acceptable in $Q\neg$ contexts. Based on these findings, Terunuma (2008, 2010) claims that Japanese-speaking children have a preference for the wide scope reading of QNPs in negative sentences containing a QNP in object position.

5. New Evidence for Quantifier Raising in Child Grammar

Japanese-speaking children's scope construal of negative sentences containing a universal QNP in object position provides new evidence that children have knowledge of QR. As reviewed in the previous section, it has been found in Terunuma's (2008, 2010) experiment that 3- to 5-year-old Japanese-speaking children consider negative sentences containing a universal QNP in object position to be acceptable in $Q\neg$ contexts. This indicates that Japanese-speaking children can assign the wide scope reading of QNPs to the sentences in question. Recall from section 3 that in negative sentences containing a QNP in object position, the wide scope reading of QNPs is obtained when QNPs undergo QR. The results of Terunuma's (2008, 2010) experiment demonstrate that for the scope construal of negative sentences containing a universal QNP in object position, children consider the covert operation QR. This in turn shows that QR is part of child grammar.

6. Summary

This paper has considered children's knowledge of QR. Previous studies have provided evidence for children's knowledge of QR in light of 4-year-old English-speaking children's interpretation of ACD sentences. The present study has shown that further evidence for children's knowledge of QR comes from 3- to 5-year-old Japanese-speaking children's scope construal of negative sentences containing a QNP.

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