

---

---

## DISSERTATION ABSTRACT

---

---

### **The Acquisition of Negative Sentences Containing a Quantified Noun Phrase: Relative Scope and Implicatures in Child Grammar**

Akiko Terunuma  
Daito Bunka University

terunuma@ic.daito.ac.jp

*Ph.D. Received: University of Tokyo, 2010*

In language acquisition research within the generative framework, the acquisition of semantic and pragmatic knowledge has recently attracted much attention as well as the acquisition of syntactic knowledge. One major topic of such research is interpretation of negative sentences containing a quantified noun phrase (QNP). In the previous literature on the acquisition of negative sentences containing a QNP, two interpretive properties of the sentences have been examined. One is scope construal pertaining to the relative scope of a QNP and negation. The other is literal/non-literal interpretation bearing on the range of contexts where the sentences are acceptable on a particular scope reading. It has been observed in previous experimental studies in languages such as English and Kannada that children are different from adults both in scope construal and in literal/non-literal interpretation (Musolino (1998, 2006), Lidz and Musolino (2002), Musolino and Lidz (2002), Hulsey et al. (2004)).

This dissertation examines how and why children differ from adults in the interpretation of negative sentences containing a QNP, taking into consideration new findings from child Japanese obtained by conducting three experiments and a corpus analysis. Particular focus is placed on negative sentences that contain a QNP with a universal quantifier or a numeral. The results of the three experiments and the corpus analysis show that children are the same as adults in syntactic, semantic and pragmatic knowledge related to scope construal and literal/non-literal interpretation of the sentences in question, but that they fail to put their knowledge to use in some cases for a processing reason. Below, I first give an outline of syntactic operations and implicatures relevant to scope construal and literal/non-literal interpretation of negative sentences containing a QNP in adult grammar, and then turn to the acquisition of the two interpretive properties.

Based on the observations of adult interpretation of English and Japanese negative sentences containing a universal QNP or a numeral QNP, I assume that the relative scope of a QNP and negation is construed in the following manner in adult grammar: Through operations such as A-movement, QR and copy deletion, negative sentences containing a universal QNP or a numeral QNP have two LF representations. One corresponds to the wide scope reading of QNPs. The other corresponds to the narrow scope reading of QNPs. When both of the two LF representations are mapped onto a well-formed meaning representation, sentences become ambiguous with respect to the relative scope of a QNP and negation. (1) and (2) are Japanese examples of ambiguous sentences.

- (1) Minnie-wa ringo-o zenbu tabe-nakat-ta.  
Minnie-TTop apple-Acc all eat-Neg-Past  
'Minnie didn't eat all the apples.'
- (2) Mickey-wa suika-o ni-ko tabe-nakat-ta.  
Mickey-TTop watermelon-Acc two-CL eat-Neg-Past  
'Mickey didn't eat two slices of watermelon.'

When only one of the two LF representations is mapped onto a well-formed meaning representation, sentences are unambiguous. One factor bearing on the ambiguity resolution is Contrastive Implicatures (CIs) induced by prosodical or morphological marking such as B accents in English and the contrastive topic particle *wa* ‘CTop’ in Japanese. In English negative sentences where the high pitch of a B accent falls on the universal quantifier within a QNP and in Japanese negative sentences where contrastive *wa* ‘CTop’ immediately follows the universal quantifier within a QNP, the wide scope reading of universal QNPs is not available. The reason for this is that in such sentences, the wide scope reading of QNPs and CIs which are computed on that reading contradict each other and hence the meaning representation which includes them is ill-formed. (3) illustrates Japanese sentences that are disambiguated by CIs.

- (3) Mickey-wa ringo-o zenbu-wa tabe-nakat-ta.  
 Mickey-TTop apple-Acc all-CTop eat-Neg-Past  
 ‘It is not the case that Mickey ate all the apples.’

(3) only has the narrow scope reading of the QNP.

As for literal/non-literal interpretation, Scalar Implicatures (SIs) play an important role. Adult speakers generally do not interpret negative sentences containing a universal QNP literally when the sentences have the narrow scope reading of QNPs. For example, the sentence in (3) above, which unambiguously has the narrow scope reading of the QNP, is literally true in both of the following contexts: (a) the context where the narrow scope reading of the QNP is true (e.g. Mickey ate two out of three apples) and (b) the context where the unavailable wide scope reading of the QNP is true (e.g. Mickey ate none of the three apples). The sentence in (3) should thus be acceptable in both contexts if it is interpreted literally. However, Japanese-speaking adults do not accept the sentence in the context (b). The factor in the non-literal interpretation of negative sentences containing a universal QNP is SIs. When the sentences in question have the narrow scope reading of QNPs, SIs are induced by universal quantifiers. These SIs are incompatible with contexts like (b).

Turning to the acquisition of the interpretation of negative sentences containing a QNP, three questions arise: (i) Do children differ from adults in the scope construal of negative sentences containing a QNP with no particular prosodical/morphological marking (unmarked sentences), and if they do, how and why?, (ii) Are children sensitive to the effect of CIs on the scope construal of negative sentences containing a QNP, and if they are not, why not?, and (iii) Are children sensitive to the effect of SIs on the interpretation of negative sentences containing a QNP, and if they are not, why not?

In the previous literature on the question in (i), it has been observed that children differ from adults in the scope construal of unmarked sentences. In particular, Musolino (2006) claims that children show a preference for the interpretation in which the relative scope of a QNP and negation corresponds to their overt c-command relation. Musolino’s (2006) claim is based on the results of Lidz and Musolino’s (2002) experiment with Kannada negative sentences containing a numeral QNP. However, the results of Experiment 1 conducted in the present study demonstrate that the factor in children’s interpretive preference is not overt c-command but linear order. Experiment 1 investigates, using the truth value judgment task methodology, whether 3- to 5-year-old Japanese-speaking children accept unmarked negative sentences containing a universal QNP or a numeral QNP in object position such as (1) and (2) above in contexts where the narrow scope reading of QNPs is true ( $\neg Q$  contexts) and in contexts where the wide scope reading of QNPs is true ( $Q\neg$  contexts). The results of Experiment 1 with sentences like (2), together with those of Terunuma’s (2004b,e) experiment, suggest that children interpret numeral QNPs as being referential, and that children’s responses to negative sentences containing a numeral QNP are not a consequence of their scope construal of the sentences. Given this referentiality analysis, we cannot conclude from the results of Lidz and Musolino’s (2002) experiment that children’s preference for a particular scope reading is based on overt c-command. The results of Experiment 1 with sentences like (1) rather show that children have a preference for the interpretation in which the relative scope of a QNP and negation corresponds to their linear order.

Although the results of Experiment 1 provide evidence for children's preference for the scope reading consistent with linear order, previous studies have observed that English-speaking children can access the scope reading that is not consistent with linear order under certain circumstances (Musolino and Lidz (2006), Hulsey et al. (2004)). As shown below, Japanese-speaking children can also assign the scope reading that is not consistent with linear order to *wa*-marked sentences like (3) above. On the basis of these findings, the present study attributes children's preference for the scope reading consistent with linear order to their insufficient processing ability. In online comprehension, children first access the scope reading that is consistent with linear order because such a reading is easier to process than the scope reading that is not consistent with linear order. They fail to revise the initial parse due to their limited computational resources. Accordingly, they cannot access the scope reading that is not consistent with linear order, although they are adult-like in the grammatical operations they have at their disposal for the scope construal of unmarked sentences.

In order to address the question in (ii), Experiment 1 of the present study also investigates Japanese-speaking children's interpretation of sentences like (3) above. The results demonstrate that 3- to 5-year-old children, unlike adults, accept sentences like (3) not only in  $\neg Q$  contexts but also in  $Q\neg$  contexts. According to Kobayashi (1992), the same non-adult-like responses are observed even among 7-year-old Japanese-speaking children. For these non-adult-like responses of children (the acceptance of sentences like (3) in  $Q\neg$  contexts), two accounts are conceivable: the CI-based account suggested by Kobayashi (1992) and the SI-based account. On the CI-based account, it is assumed that children lack the knowledge of CIs and hence assign the wide scope reading of QNPs to sentences like (3). On the SI-based account, it is assumed that although children are sensitive to the effect of CIs on the scope construal of sentences like (3), they fail to compute SIs and hence interpret the sentences literally. In order to examine which account is preferable, I conducted an experiment (Experiment 2) and a corpus analysis. The results of Experiment 2 and the corpus analysis, in addition to those of Experiment 1, provide a ground for the SI-based account. In Experiment 2, by using the truth value judgment task methodology, it is investigated whether 4- or 5-year-old Japanese-speaking children can compute CIs in negative sentences with contrastive *wa* 'CTop' that do not contain QNPs. In the corpus analysis, it is examined whether contrastive *wa* 'CTop' is attested in the spontaneous speech of Japanese-speaking children under 4 years of age. It is found that 4- or 5-year-olds can compute CIs in negative sentences that do not contain QNPs, and that even 2- or 3-year-olds correctly use contrastive *wa* 'CTop' in their spontaneous speech. Furthermore, the difference between children's responses to sentences like (3) and their responses to sentences like (1) above observed in Experiment 1 can be explained when we assume that children compute CIs in sentences like (3). Taken together, these findings provide evidence against the CI-based account and lend support to the SI-based account. This shows that children have knowledge of CIs and are sensitive to the effect of CIs on the scope construal of negative sentences containing a QNP.

Concerning the question in (iii), the results of Experiment 1, Experiment 2 and the corpus analysis in the present study show that 3- to 5-year-old children fail to compute SIs induced by universal quantifiers in negative sentences. The same conclusion has been reached by Musolino and Lidz's (2002) study on English negative sentences containing *every*. One conceivable reason for children's failure to compute SIs is the limitation of children's processing ability, as claimed in Chierchia et al.'s (2001) study on the acquisition of SIs induced by *or*. In the computation of SIs, two (or more) propositions must be compared in terms of informational strength. Because it is difficult for children to retain two (or more) propositions in working memory for comparison, they fail to compute SIs unless the propositions to be compared are explicitly given. In order to examine whether this processing account is tenable for children's failure to compute SIs induced by universal quantifiers, Experiment 3 was conducted in the present study. Experiment 3 investigates, using the felicity judgment task methodology, whether 4- or 5-year-old Japanese-speaking children can compute SIs in sentences like (3) above when such sentences are presented together with sentences that are compared with them in the computation of SIs. The results of Experiment 3 suggest that the limitation of processing ability is one possible reason for children's failure to compute SIs induced by universal quantifiers in negative sentences, although factors such as experimental design and the linguistic environment in which scalar terms occur are also responsible.

The overall findings of the present study show the following: children are adult-like in their grammatical knowledge responsible for constructing two LF representations for negative sentences containing a QNP and mapping them onto meaning representations that include semantic interpretation such as the scope reading and pragmatic interpretation such as CIs and SIs. However, children differ from adults in that they are not always able to put their grammatical knowledge to use. One reason for children's failure to implement their knowledge is their limited processing ability.

## References

- Chierchia, Gennaro, Stephen Crain, Maria Teresa Guasti, Andrea Gualmini and Luisa Meroni (2001) "The Acquisition of Disjunction: Evidence for a Grammatical View of Scalar Implicatures," *Boston University Conference on Language Development* 25, 157–168.
- Hulsey, Sarah, Valentine Hacquard, Danny Fox and Andrea Gualmini (2004) "The Question-Answer Requirement and Scope Assignment," *MIT Working Papers in Linguistics* 48, 71–90.
- Kobayashi, Tomoko (1992) "Acquisition of the Relative Scope of Neg and Quantifiers in Japanese Children," *Sophia Linguistica* 31, 29–47, Sophia University.
- Lidz, Jeffrey and Julien Musolino (2002) "Children's Command of Quantification," *Cognition* 84, 113–154.
- Musolino, Julien (1998) *Universal Grammar and the Acquisition of Semantic Knowledge: An Experimental Investigation into the Acquisition of Quantifier-Negation Interaction in English*, Doctoral dissertation, University of Maryland.
- Musolino, Julien (2006) "Structure and Meaning in the Acquisition of Scope," *Semantics in Acquisition*, ed. by Veerle Van Geenhoven, 115–140, Springer, Dordrecht.
- Musolino, Julien and Jeffrey Lidz (2002) "Preschool Logic: Truth and Felicity in the Acquisition of Quantification," *Boston University Conference on Language Development* 26, 406–416.
- Musolino, Julien and Jeffrey Lidz (2006) "Why Children Aren't Universally Successful with Quantification," *Linguistics* 44, 817–852.
- Terunuma, Akiko (2004b) "Suuryooshi o Fukumu Hiteibun no Kaishaku no Shuutoku ni Tsuite," Paper presented at the 21st Conference of the Cognitive Science Society of Japan, Nihon Kagaku Miraikan, July, 2004.
- Terunuma, Akiko (2004e) "An Experimental Study on the Relative Scope of Numerals and Neg in Child Japanese," *Linguistic Research 20: Working Papers in English Linguistics*, 173–179, The University of Tokyo English Linguistics Association, Tokyo.