

WORKING PAPERS

IN

LINGUISTICS

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Volume 37(3)

2006
(March)

DEPARTMENT OF LINGUISTICS
UNIVERSITY OF HAWAI'I AT MÂNOA
HONOLULU 96822

An Equal Opportunity/Affirmative Action Institution

DEPARTMENT OF LINGUISTICS FACULTY

2006

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ACQUISITION OF THE SCOPE INTERACTION BETWEEN NUMERAL QUANTIFIERS AND NEGATION IN KOREAN: A DESCRIPTIVE STUDY ON PRODUCTION AND COMPREHENSION*

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This study explores the scope interaction between numeral quantifiers and negation in Korean. Several studies have investigated children's interpretation of sentences containing numeral quantifiers and negation in languages other than Korean (Lidz and Musolino 2002, Su 2003, among others). In an attempt to fill a gap in the literature, this study investigates Korean-speaking children's production and comprehension of sentences containing numeral quantifiers and negation. Twenty-nine Korean-speaking children aged four to five and a control group of twenty-six native Korean speakers participated in the production experiment, which involved an elicited production task (Crain and Thornton 1998, McDaniel, McKee, and Cairns 1998). The results revealed that the children and the control group produced few negative sentences containing numerals, preferring instead to use the corresponding affirmative sentences. The same subjects along with additional fourteen adult controls participated in the comprehension experiment, which involved a Truth-Value Judgment Task (Crain and Thornton 1998). The results showed that both the children and the control group tended to give judgments that were consistent with the quantifier wide scope interpretation of the test sentence. However, the control group did select the negation wide scope interpretation more frequently than the children. I discuss several factors that might have contributed to these results, including pragmatic factors, processing, and distributional patterns of numeral quantifiers and negation in the input.

1. INTRODUCTION. It has been reported that in interpreting scopally ambiguous sentences containing a quantified NP and negation, children tend to have a strong preference for the interpretation which corresponds to the surface syntactic structural position of the two elements (Lidz and Musolino 2002, Musolino 1998, Musolino et al. 2000). This phenomenon, which is known as isomorphism, is demonstrated in the following scopally ambiguous sentence:

(1) Donald didn't find two friends (Lidz and Musolino 2002).

One of its two interpretations is 'it is not the case that Donald found two friends,' where negation takes a wide scope over a quantified NP. The other interpretation is 'there are two friends that Donald didn't find,' in which a quantifier takes a wide scope over negation. The former interpretation is called isomorphic in English, as it corresponds to the surface syntactic relations between the two elements.

This study explores how Korean-speaking children's scope judgments on sentences containing numeral quantifiers and negation compare to those of Korean-speaking adults, and examines whether Korean-speaking children show a preference for the isomorphic interpretation. In an attempt to better understand this phenomenon, this study investigates how Korean-speaking children and adults express negation wide scope meaning and quantifier wide scope meaning, which involve numeral quantifier and negation interaction.

Several studies have investigated children's interpretation of scopally ambiguous sentences that include a numerally quantified NP and negation (Lidz and Musolino 2002, Su 2003). Lidz and Musolino (2002) investigated how children and adult speakers of English and Kannada interpret scopally ambiguous sentences containing numerally quantified NPs and negation (e.g., Donald didn't

* I am sincerely grateful to Professor William O'Grady for his invaluable comments throughout this project. I also thank Professor Kamil Ud Deen for his comments and lending me his puppets. I would like to thank Ms Myung-Sook Paik and Ms Eun-Young Kwak for their help with recruiting the participants. Last but not least, I give my heartfelt thanks to all the participants.

find two friends). They recruited 24 children and 24 adults for each language group. Children's mean age in this study was 4; 4 for the English group and 4; 5 for the Kannada group.

Lidz and Musolino employed the Truth Value Judgment Task (Crain and Thornton 1998; TVJT) as an experimental methodology to test children's and adults' interpretation. The TVJT involved two contexts, and in each context, only one interpretation (either the negation wide scope or the quantifier wide scope interpretation) was correct. Independent of the language they spoke, four-year old children showed a preference for the isomorphic reading, while adults easily accessed either scope interpretation. Pointing out that English and Kannada have different word orders (SVO for English and SOV for Kannada) and the position of negation with respect to numerally quantified object NPs is the opposite in the languages, Lidz and Musolino proposed that children's preferred interpretations are constrained by the surface hierarchical relations between numerally quantified NPs and negation, not by their linear order.

Su (2003) conducted a similar line of investigation with Chinese-speaking children and adults on how they interpreted scopally ambiguous sentences such as the following:

- (2) Lanjingling meiyou zhuadao liang-zhi niao.
 Smurf did not catch two-CL bird.
 'The smurf didn't catch two birds.'

She conducted two experiments by using the TVJT as in Lidz and Musolino 2002. Experiment 1 tested whether Chinese-speaking children allow the negation wide scope reading for sentences like (2) through the recruitment of 25 children (mean age 4; 10) and a control group of 40 adults. Experiment 2 used 19 children (mean age 5; 1) and 29 adults to test whether the quantifier wide scope reading for the same type of sentences is available. Since Chinese has the same word order as English, Su predicted that Chinese-speaking children would show a preference for the negation wide scope reading if they used the same scope principle employed by English-speaking children. She found that children preferred the non-isomorphic quantifier wide scope reading (Two>Not), while adults exhibited the opposite preference (Not>Two). Based on her results, Su concluded that Chinese-speaking children do not seem to follow the surface hierarchical relations as a scope principle, unlike English or Kannada-speaking children.

Cross-linguistic comparisons of children's interpretations of scopally ambiguous sentences have provided us with puzzling results. However, it does appear that four-year old children's preference for scope interpretations are different from those of adults independent of the language spoken. An interesting question has to do with why differences between children's and adults' interpretations occur. Musolino and Lidz (2003) showed that English-speaking children's isomorphic interpretations reflect an exaggerated interpretive preference, which can be observed in adults, and that the very contextual factors that lead children to overcome their isomorphic preferences also have a similar effect on adults. Based on their findings, they proposed that children's isomorphic interpretations represent differences between children and adults in the operation of the parser during sentence processing rather than differences between children's emerging grammatical systems and those of adults. Furthermore, they suggested that what is difficult for adults to process might be even more difficult for children, and that children and adults might differ in their ability to override the difficulty to accept the non-isomorphic reading (Musolino and Lidz 2003:286–87).

Musolino and Lidz's 2003 study provides us with a plausible account for children's isomorphism phenomenon. In considering the cross-linguistic difference in children's preferences for scope interpretations found in Lidz and Musolino's (2002) study and Su's (2003) study, it makes sense to investigate this scope interaction by considering a language other than the ones used in the previous studies. By looking at scope interaction of numeral quantifiers and negation in Korean, this study tries to determine whether this isomorphism phenomenon is cross-linguistic or specific to English or Kannada.

Few studies have been conducted regarding the scope interaction between a numeral quantifier and negation in Korean, and children's acquisition of scope interaction between these two elements.

Song (1982) stated that the following sentence is ambiguous in Korean:

- (3) John-i sakwa-lul twu-kay an mek-ess-ta
 John-Nom apple-Ac two-CL NEG eat-Pst-Decl.
 ‘Two apples, John didn’t eat.’
 ‘It is not the case that John ate two apples.’

However, it is not clear whether the statement was made based on Song’s intuition or on experimental studies. In any case, experimental studies should be conducted in order to provide a better picture of scope interaction between a numeral quantifier and negation in Korean.

In Korean, there are four types of negation, including two “short-form” pre-verbal negators and two “long-form” post-verbal negators. The short-form negators *an* and *mos* occur immediately before verbs, which differ in that the former expresses denial while the latter expresses inability or impossibility. The long-form negators *-ci anh* and *-ci mos* occur after verbs, showing a similar contrast to the two types of short-form negation. The four types of negators are displayed in the following sentences:

- (4) Short-form negator *an*
 Dora-ka hakkyo-ey **an** ka-ss-ta.
 Dora-Nom school-to NEG go-Pst-Decl.
 ‘Dora didn’t go to school.’
- (5) Short-form negator *mos*
 Dora-ka hakkyo-ey **mos** ka-ss-ta.
 Dora-Nom school-to NEG go-Pst-Decl.
 ‘Dora couldn’t go to school.’
- (6) Long-form negator *ci anh*
 Dora-ka hakkyo-ey ka-**ci anh**-ass-ta.
 Dora-Nom school-to go- NEG -Pst-Decl.
 ‘Dora didn’t go to school.’
- (7) Long-form negator *ci mos*
 Dora-ka hakkyo-ey ka-**ci mos**-hay-ss-ta.
 Dora-Nom school-to go- NEG -do-Pst-Decl.
 ‘Dora couldn’t go to school.’

It has been observed that children acquire long-form negation much later than short-form negation (Kim 1997). Therefore, the focus of this study is on the short-form negator *an* with regard to scope interaction with numeral quantifiers.

This study investigates whether scope interaction between a numeral quantifier and short-form negation in Korean allows both quantifier wide scope meaning and negation wide scope meaning. It also explores how Korean-speaking children interpret sentences containing numerally quantified objects and short-form negation, especially compared to the interpretations of Korean-speaking adults.

As an attempt to provide a complete picture of scope interaction in Korean, this study also investigates Korean-speaking children’s production of numeral quantifiers and negation. Most studies have focused on comprehension of numeral quantifiers and negation, not on their production. This study focuses on how Korean-speaking children express negation wide scope meaning and quantifier wide scope meaning in propositions involving numeral quantifiers and negation interaction, compared to Korean-speaking adults.

2. RESEARCH QUESTIONS. This study explores the following research questions:

2.1 COMPREHENSION.

- (1) Are the negation wide scope reading and quantifier wide scope reading possible in Korean sentences containing numeral quantifiers and short-form negation?

- (2) How do the scope judgments of Korean-speaking children compare to those of Korean-speaking adults?

Do Korean-speaking children have a preference for the isomorphic reading (i.e., quantifier wide scope reading)?

2.2 PRODUCTION.

How do Korean-speaking children and adults express negation wide scope and quantifier wide scope when there is an interaction involving a numeral quantifier and negation?

3. EXPERIMENT 1: PRODUCTION.

3.1 METHODOLOGY.

Participants. The participants in this study included 29 children, recruited from a kindergarten in Korea, and a control group of 26 native Korean speakers. Among the kindergarten children there were 15 girls and 14 boys—nine four-year-olds and 20 five-year-olds (mean age 5; 2). The control group included 15 females and 11 males, ranging in age from 17 to 30 (mean age 21).

Procedure. An Elicited Production task (Crain and Thornton 1998; McDaniel, McKee, and Cairns 1998) was employed by means of a laptop computer, on which each participant was presented with illustrated stories for the negation wide scope context and the quantifier wide scope context via Microsoft Office PowerPoint slides. At the end of each story, an experimenter¹ asked one or two puppets to describe what happened in the story. Participants were then asked to identify any incorrect statements made by the puppet and provide a correction. An example for each context is as follows:

Quantifier wide scope context (English translation)

A lady comes to a fruit/vegetable market. There are four tomatoes and countless cherries on the table. The owner tells the lady that he has fresh tomatoes and cherries. The lady wants to buy three tomatoes, because she really likes them. She also wants to buy cherries to make cherry juice for her son's birthday party. But when she examines them, she realizes that three cherries are rotten. Therefore, she decides to buy only the rest of the cherries.

FIGURE 1. Quantifier wide scope context.



Target meaning: 'There are three cherries that the lady didn't buy.'

<Protocol>

Experimenter: This is a story about a lady buying fruit and vegetable in a market.
Let's ask Puppet what happened in the story.

¹ The experimenter in this study narrated each story presented on the screen and also acted as puppets.

Puppet: (filler)

Kekey-ey thomatho-ka ney-kay iss-ess-e.
Market-in tomato-Nom four-CL be-Pst-E².
'There were four tomatoes in the market.'

Experimenter: Is it true or not?

Child:

(If a child says 'no', the experimenter asks him/her to correct the statement.)

Experimenter: What else happened?

Puppet: (test trial)

Acwumeni-ka cheyli-lul motwu sa-ss-e.
Lady-Nom cherry-Ac all buy-Pst-E.
'The lady bought all of the cherries.'

Experimenter: Is it true or not?

(If a child says 'no', the experimenter asks him/her to correct the statement.)

Target answer: Acwumeni-ka cheyli-lul sey-kay an sa-ss-e.
Lady-Nom cherry-Ac three-CL NEG buy-Pst-E.
'The lady didn't buy three cherries.'
('There are three cherries that the lady didn't buy.')

Experimenter: What else happened?

Puppet: (filler)

Acwumeni-ka thomato-lul sey-kay sa-ss-e.
Lady-Nom tomato-Ac three- CL buy-Pst-E.
'The lady bought three tomatoes'

Experimenter: Is it true or not?

Child:

(If a child says 'no', the experimenter asks him/her to correct the statement.)

Negation wide scope context (English translation)

Goofy and Mickey play, drawing with crayons. Goofy draws two big stars and then draws a circle. He shows his drawing to Mickey. Mickey says, "I can draw much bigger stars than yours." He draws three big stars.

FIGURE 2. Negation wide scope context.



Target meaning: 'It is not the case that Mickey drew two stars.'

² E refers to an intimate speech level in Korean.

<Protocol>

Experimenter: This is a story about Goofy and Mickey drawing things. Puppet 1 describes what happened in the story and Puppet 2 says whether Puppet 1's statement is true or not. Sometimes, Puppet 2 speaks incorrectly. So listen carefully to what he says and if he says incorrectly, tell him the truth about the story.

Puppet 1: (filler)

Goofy-ka wen-ul kuli-ess-e.
Goofy-Nom circle-Ac. draw-Pst-E.
'Goofy drew a circle.'

Puppet 2: Ung, mac-a.

Yes, true-E.
'Yes, it is true.'

Puppet 1: (test trial)

Goofy-wa Mickey-ka pyel-ul twu-kay-ssik kuli-ess-e.
Goofy-and Mickey-Nom star-Ac two-CL-each draw-Pst-E.
'Goofy and Mickey drew two stars each.'

Puppet 2: Ung, mac-a.

Yes, true-E.
'Yes, it is true.'

Target answer: Aniya. Mickey-nun pyel-ul twu-kay an kuli-ess-e.
No. Mickey-TOP star-Ac two-CL NEG draw-Pst-E.
'No. Mickey didn't draw two stars.'

('It is not the case that Mickey drew two stars.')

Puppet 1: (filler)

Mickey-ka wen-ul kuli-ess-e.
Mickey-Nom circle-Ac draw-Pst-E.
'Mickey drew a circle.'

Puppet 2: Ung, mac-a.

Yes, true-E.
'Yes, it is true.'

As part of the experiment, each child was asked to name the objects shown on the screen before being told each story. This exercise helped ensure that the children had full comprehension of the words used in each story. Additionally, to check whether s/he was able to count up to 10, each child was given a set of stickers and asked to count the stickers aloud. Every child successfully completed these tasks. The whole experiment took approximately 30 minutes for the children to complete, while the control group took from 15 to 20 minutes.

Materials. For both contexts, negation wide scope and quantifier wide scope, three stories were included (See Appendix A for more details), with each story followed by two fillers and one test trial. Every participant participated in all the activities, while half of the participants were given the negation wide scope context first and the other half were given the quantifier wide scope context first.

Data coding. For the data coding requirements of the experiment, sentences containing any combination of a numeral quantifier and negation were considered target sentences. In this experiment, both short-form negation and long-form negation were counted as instances of negation.

- (8) Short-form negator *an*
 Dora-nun tongmwul suthikhe-lul sey-kay an pwuth-i-ess-e.
 Dora-TOP animal sticker -Ac three-CL Neg stick-Affix-Pst-E.
 ‘Dora didn’t put three animal stickers anywhere.’
- (9) Short-form negator *mos*
 Dora-nun tongmwul suthikhe-lul sey-kay mos pwuth-i-ess-e.
 Dora-TOP animal sticker -Ac three-CL Neg stick-Affix-Pst-E.
 ‘Dora couldn’t put three animal stickers anywhere.’
- (10) Long-form negator *-ci anh*
 Dora-nun tongmwul suthikhe-lul sey-kay pwuth-i-ci anh-ass-e.
 Dora-TOP animal sticker-Ac three-CL stick-Affix-NEG-Pst-E.
 ‘Dora didn’t put three animal stickers anywhere.’
- (11) Long-form negator *-ci mos*
 Dora-nun tongmwul suthikhe-lul sey-kay pwuth-i-ci mos-hay-ss-e.
 Dora-TOP animal sticker-Ac three-CL stick-Affix-NEG-do-Pst-E.
 ‘Dora couldn’t put three animal stickers anywhere.’

Furthermore, all responses that included both a numeral quantifier and a negator were counted regardless of the types of particles attached to the quantified NP, as in the following examples.

- (12) Use of an accusative case particle *-ul/lul*
 Sathang ney-kay-lul mos kacye ka-ss-e.
 Candy four-CL-Ac NEG take go-Pst-E.
 ‘Goofy couldn’t take four candies.’
 (‘There are four candies that he couldn’t take.’)
- (13) Use of the topic marker *-un/nun*
 Sathang ney-kay-nun neh-ci mos-hay-ss-e.
 Candy four-CL-TOP put-NEG-do-Pst-E.
 ‘As for four candies, Goofy couldn’t put them in his bag.’
- (14) Use of the delimiter particle *-man*
 Sathang ney-kay-man an neh-ess-e.
 Candy four-CL-delimiter NEG put-Pst-E.
 ‘Goofy didn’t put only four candies in his bag.’

3.2 RESULTS. Overall, participants produced few target sentences containing a numeral quantifier and negation. The frequencies of target sentences in the negation wide scope and quantifier wide scope contexts are displayed in Table 1. The control group used target sentences in the negation wide scope context and in the quantifier wide scope context 4 percent and 23 percent of the time, respectively. On the other hand, children produced target sentences in the negation wide scope context 5 percent of the time, compared to 22 percent of the time in the quantifier wide scope context. For both groups, target sentences were produced with more frequency in the quantifier wide scope context than in the negation wide scope context.

TABLE 1. Frequency of the target sentences.

	Negation wide scope	Quantifier wide scope
Frequency in the child group	5%(4 /87)	22% (19/87)
Frequency in the control group	4% (3/78)	23%(18/78)

The participants of both groups tended to create affirmative sentences with numeral quantifiers more often than negative sentences containing numeral quantifiers, as in examples (15) and (16) below.

(15) Negation wide scope context

Mickey-nun pyel-ul sey-kay kuli-ess-e.
Mickey-TOP star-Ac three-CL draw-Pst-E.

‘Mickey drew three stars.’ (This implies ‘it is not the case that Mickey drew two stars.’)

(16) Quantifier wide scope context

a. Ney-kay-man namki-ess-e.
Four-CL-only leave-Pst-E.

‘Goofy left only four candies behind.’

(This implies ‘there are only four candies that Goofy didn’t put in his bag.’)

b. Sey-kay-man ppayko ta sa-ss-e.
Three-CL-only except all buy-Pst-E.

‘The lady bought all of the cherries except for three.’

(This implies ‘there are three cherries that the lady didn’t buy.’)

As summarized in Table 2, in the control group, only one of the 26 participants used the target sentences in the negation wide scope context, while 12 participants used target sentences in the quantifier wide scope context. On the other hand, four out of the 29 children produced target sentences in the negation wide scope context, while 14 children used various combinations of numeral quantifiers and negation in the quantifier wide scope context.

TABLE 2. Number of participants who produced the target sentences.

	Negation wide scope	Quantifier wide scope
Number of Children	4/29	14/29
Number of Participants (control group)	1/26	12/26

The results further revealed that children used only short-form negators *an* and *mos* in combination with numeral quantifiers in the two contexts. Some sample responses in the negation wide scope context are as follows:

(17) Mickey-ka pyel-ul sey-kay kuli-ese **twu-kay-lul an** kuli-ess-e.
Mickey-Nom star-Ac three-CL draw-because two-CL-Ac NEG draw-Pst-E.
‘Because Mickey drew three stars, he didn’t draw two stars.’

(18) Mickey-nun **twu-kay-lul an** kuli-ess-ko Mickey-nun sey-kay-lul kuli-ess-e
Mickey-TOP two-CL-Ac NEG draw-Pst-and Mickey-TOP three-CL-Ac draw-Pst-E
‘Mickey didn’t draw two stars and drew three stars.’

(19) **Sey-kay an** pwuth-i-ess-e
Three-CL NEG stick-Affix-Pst-E.
‘Piglet didn’t put three stickers on his notebook.’

Two out of the four children produced target sentences accompanied by relevant affirmative sentences, as in (17) and (18).

In the quantifier wide scope context, the children produced a variety of sentences containing numeral quantifiers and negation. Unlike the negation wide scope context, both of the short-form negators were used, seen in the following examples:

- (20) Short negator *an*
 Sathang-ul **ney-kay-lul** **an** neh-ess-e.
 Candy-Ac four-CL-Ac NEG put-Pst-E.
 ‘Goofy didn’t put four candies into his bag.’
- (21) Short negator *mos*
 Sathang **ney-kay-lul** **mos** kacye ka-ss-e.
 Candy four-CL-Ac NEG take go-Pst-E.
 ‘Goofy couldn’t take four candies.’

Among the 19 occurrences where the target sentences were used, *an* was selected in 18 cases and *mos* only once.

Also worthy of note is that six children used particles other than the accusative marker *-ul/lul* in target sentences. Rather, the particles they used included *-nun*, the topic/contrast marker, and *-man*, the limitation marker, as in the following examples:

- (22) **Sey-kay-nun** **an** sa-ss-e.
 Three-CL-TOP NEG buy-Pst-E.
 ‘As for three cherries, the lady didn’t buy them.’
- (23) **Sey-kay-man** **an** sa-ss-e.
 Three-CL-only NEG buy-Pst-E.
 ‘The lady didn’t buy only three cherries.’

It seems that the children were able to make the meaning of the target sentences clearer with the help of those markers, since they make the referent of the quantified NP to which they are attached salient in the context, thereby allowing the quantified NP to take scope over other elements.

Three children used a combination of numeral quantifiers and negation in complex sentences, as in (24) and (25).

- (24) **Sey-kay-nun** ssek-ese **an** sa-ss-e.
 Three-CL-TOP rotten-because NEG buy-Pst-E.
 ‘Because the three cherries were rotten, the lady didn’t buy them.’
- (25) **Sey-kay-nun** ssek-e-kaciko ku ken **an** sa-ss-e.
 Three-CL-TOP rotten-because the thing-TOP NEG buy-Pst-E.
 ‘Because the three cherries were rotten, the lady didn’t buy them.’

With the help of topic/contrast markers in complex sentences, the children seemed to put numerally quantified NPs in the wide scope position.

The results from the control group showed that long-form negators were used more frequently than short-form negators in target sentences. While it was not used for the negation wide scope meaning, the short-form negator *an* was used by the same speaker in three out of the 18 occurrences in the quantifier wide scope sense. As in the children’s responses, the data collected from the control group showed a variety of sentences containing numeral quantifiers and negation. Some sample responses are as follows:

- (26) Quantifier-classifier-topic marker and short-form negator *an*
Sey-kay-nun **an** pwuth-i-ess-e.
 Three-CL-TOP NEG stick-affix-Pst-E.
 ‘As for three stickers, Dora didn’t put them anywhere.’
- (27) Quantifier-classifier-accusative case marker and long-form negator *-ci anh*
 Dora-nun tongmwul suthikhe **sey-kay-lul** pwuth-i-**ci anh**-ass-e.
 Dora-TOP animal sticker three-CL-Ac stick-Affix-NEG-Pst-E.
 ‘Dora didn’t put three animal stickers anywhere.’

- (28) Quantifier-classifier-topic marker and long-form negator *-ci anh*
 Ssekun cheyli **sey-kay-nun** sa-**ci anh**-ass-e.
 Rotten cherry three-CL-TOP buy-NEG-Pst-E.
 ‘The lady didn’t buy the three cherries which were rotten.’
- (29) Quantifier-classifier-accusative case marker and long-form negator *-ci mos*
 Sathang-ul **ney-kay-l** chayngki-**ci mos**-hay-ss-e.
 Candy-Ac four-CL-Ac get-NEG –do-Pst-E.
 ‘Goofy couldn’t get four candies together.’
- (30) Quantifier-classifier-topic marker and long-form negator *-ci mos*
 Kongkan-i hyepsoha-(y)se **sey-kay-nun** pwuth-i-**ci mos**-hay-ss-e.
 Space-Nom small-because three-CL-TOP stick-Affix-NEG-do-Pst-E.
 ‘Because the space on the pencil case was small, Dora couldn’t put three animal stickers on it.’

In 14 out of the 18 target sentences in the quantifier wide scope context, the topic/contrast marker *-nun* was used instead of the accusative marker *-ul/lul*.

As in the children’s data, three participants in the control group produced numeral quantifiers and negation by using complex sentences such as the following:

- (31) **Sey-kay-nun** cali-ka eps-ese pwuth-i-**ci mos**-hay-ss-e.
 Three-CL-TOP room-Nom lack-because stick-Affix-NEG-do-Pst-E.
 ‘As for three animal stickers, because there is no room for them, Dora couldn’t put them on the pencil case.’
- (32) **Ney-kay-nun** kkampak ic-ko neh-**ci mos**-hay-ss-e.
 Four-CL-TOP completely forget-and put-NEG –do-Pst-E.
 ‘As for four candies, Goofy forgot about them completely and couldn’t put them into his bag.’

3.3 DISCUSSION. In the production experiment, children and the control group produced few negative sentences containing numerally quantified NPs (5% and 4% for the negation wide scope versus 22% and 23% for the quantifier wide scope). Rather than employing negative sentences to express the negation or quantifier wide scope related meaning, they preferred the corresponding affirmative sentences. Even though the overall frequency of the target sentences was low, both groups produced target sentences in the quantifier wide scope context more frequently than in the negation wide scope context.

The results of the production study confirmed that affirmative sentences are preferred to the corresponding negative sentences. Consistent with Horn’s (1989) observation that negatives are marked and relatively difficult to produce as well as to comprehend, the data revealed that participants tended to opt for a variety of affirmative patterns to express the negation wide scope or quantifier wide scope meaning. The data also showed that co-occurrence of negation and quantified NPs is rare. This low frequency of negative sentences containing quantified NPs seems to be cross-linguistic, as shown by Gennari and MacDonald’s (in press) production study findings. In their study, English-speaking adults were asked to read stories in the same format as the ones used in Lidz and Musolino’s 2002 study and then were asked to describe the gist of each story in one sentence. Gennari and MacDonald found that the participants preferred using positive sentences over negative sentences containing quantified NPs.

The fact that participants in both groups of the current study produced target sentences in the quantifier wide scope context with more frequency than the negation wide scope context could be explained in terms of Grice’s Cooperative Principle. One of the maxims associated with this principle is the “Quantity” maxim, which says that conversational participants are expected to make their contribution as informative as is required for the current purpose of the exchange (Grice 1989:26). Thus according to this maxim, expressing the negation wide scope meaning with the help of negative

sentences containing numerally quantified NPs is not as informative as expressing the meaning with the affirmative counterparts. For example, in the situation where Goofy and Mickey drew two and three stars, respectively, it is more informative to say ‘Mickey drew three stars’ than to say ‘Mickey didn’t draw two stars.’ The use of numeral quantifiers and negation seems to make sentences ambiguous or less informative, thereby violating the “Quantity” maxim.

The higher frequency of the corresponding affirmative sentences compared to negative sentences in the quantifier wide scope reading context is consistent with De Mey’s (1972) observation that “natural negation” only involves objects or elements a speaker or listener is attending to; see also Horn 1989. The data of the current study reveal that the participants tended to focus more on what a given character in each story did than on what s/he did not do. For example, in the scenario where Dora was putting all but three of the animal stickers on her pencil case, the participants seemed to be concerned more with what Dora put on the pencil case than with what she did not put on the case.

It is noteworthy that the use of Korean particles other than the accusative case marker was found frequently in the quantifier wide scope context. The elicitation protocol used in the context was that a character acted on all of the objects in the scene. For example, in the story in which a lady bought all of the cherries except for three rotten ones, the puppet’s statement used to elicit a target sentence is as follows:

- (33) Acwumeni-ka cheyli-lul motwu sa-ss-e.
 Lady-Nom cherry-Ac all buy-Pst-E.
 ‘The lady bought all of the cherries.’

In most of the cases, the participants’ responses included the topic/contrast marker, *-un/nun* instead of the accusative marker, *-ul/lul*, as shown in (34).

- (34) Acwumeni-ka cheyli sey-kay-nun an sa-ss-e.
 Lady-Nom cherry three-CL-TOP NEG buy-Pst-E.
 ‘As for three cherries, the lady didn’t buy them.’

The particle plays a role as a topic/contrast marker in Korean, which makes the referent of the NP to which it is attached contrast with the rest of the objects in the context. It seems that with the help of this topic/contrast marker, participants tried to emphasize that there were three cherries that the lady did not buy in contrast to the other cherries that she bought. It may be the case that the participants avoided making their statements ambiguous by using the topic/contrast marker instead of the accusative case marker.

4. EXPERIMENT 2: COMPREHENSION.

4.1 METHODOLOGY.

Participants. The same 29 children from the production experiment participated in the comprehension experiment. The control group consisted of the original 26 participants from the production experiment, plus an additional 14 subjects. The children participated in the two experiments with a time interval, while the control group took part in the experiments consecutively.

Procedure. The TVJT was used in order to test the children’s and the control group’s interpretation of the target sentences. Each participant was presented with illustrated stories for the negation wide scope and the quantifier wide scope contexts via Microsoft Office PowerPoint slides as in the elicited production task. At the end of each story, a puppet made a statement about what he thought happened in the story. The puppet’s statements were pre-recorded so as to reduce the possibility of variation in prosody as a confounding factor. Participants were then asked to determine whether the statement made by the puppet was right or wrong, and to justify their answers by explaining why they thought so. Each participant was tested individually.

Every participant was presented with all the test sentences in two contexts (i.e. negation wide scope and quantifier wide scope). While half of the participants were given test sentences in the

negation wide scope reading context first, the other half were given test sentences in the quantifier wide scope reading context first. For each group of participants, test sentences were presented in a randomized order, and the whole task took between 40 and 50 minutes for the children to complete, and approximately 30 minutes for the control group.

Materials. Two pretest sentences and relevant stories were included for practice, and for each context, five test sentences and six filler sentences were included, for a total of 24 sentences and relevant stories (see Table 3 and 4 for the test sentences in each context; see Appendix B for more details). Among the 10 test sentences, two sentences were adapted from Su 2003, and three from Lidz and Musolino 2002. In addition, two pretest stories and three sentences out of the twelve filler sentences were adapted from Su’s study, and one filler sentence was adapted from Lidz and Musolino’s study.

TABLE 3. Test sentences in the quantifier wide scope context.

Korean sentences	English translations
Acwumeni-ka kapang-ul twu-kay an sa-ss-e	‘The lady didn’t buy two handbags.’
Goofy-ka Pizza-lul twu-kay an mek-ess-e.	‘Goofy didn’t eat two slices of pizza.’
Dora-ka wuywu-lul twu-kay an neh-ess-e.	‘Dora didn’t put two pints of milk into the refrigerator.’
Namca ai-ka mal-ul twu-mali an tha-ss-e.	‘The boy didn’t ride two horses.’
Dora-ka cokay-lul twu-kay an cwu-wess-e.	‘Dora didn’t pick up two seashells.’

TABLE 4. Test sentences in the negation wide scope context.

Korean sentences	English translations
Yeca ai-ka kwaca-lul twukay an mek-ess-e.	‘The girl didn’t eat two cookies.’
Namca ai-ka kay-lul twu-mali an manci-ess-e.	‘The boy didn’t pet two dogs.’
Piglet-i chayk-ul twu-kwen an ilk-ess-e.	‘Piglet didn’t read two books’
Donald Duck -i phwungsen-ul twu-kay an thettuli-ess-e.	‘Donald Duck didn’t burst two balloons.’
Dora-ka wuywu-lul twu-kay an mas-yess-e.	‘Dora didn’t drink two pints of milk.’

Regarding the plots of the stories, both contexts were developed in the same way as the studies by Lidz and Musolino, and Su. In the negation wide scope context, the stories were constructed in such a way that a character acts on one of the two objects or animals, while nothing is done to the second, as exemplified in the following:

(English translation)

Donald Duck sees two balloons in Mickey’s room. The balloons look so great. He wants to ask Mickey to give him one of them. But Mickey is not at home, so he decides to wait. While he is waiting, he wants to touch them. He first touches a red balloon, but he burst the balloon by accident. So, he doesn’t touch the second balloon (see Figure 3).

Test sentence: Donald Duck -i phwungsen-ul twu-kay an thettuli-ess-e.
 Donald Duck-Nom balloon-Ac two-CL NEG burst-Pst-E.
 ‘Donald Duck didn’t burst two balloons.’
 Negation wide scope reading: ‘It is not the case that Donald Duck burst two balloons.’ (True)
 Quantifier wide scope reading: ‘There are two balloons that Donald Duck didn’t burst.’ (False)

FIGURE 3. Negation wide scope context.



Here, the negation wide scope reading is true, while the quantifier wide scope reading is false.

In contrast, in the stories for the quantifier wide scope context, a character performs an action on only two out of four objects or animals. In contrast to the negation wide scope context, the quantifier wide scope reading is true, while the negation wide scope reading is false. An example is given below.

(English translation)

Dora and Boots are playing on the beach. They see four seashells on the sand. Dora says that she wants to keep the seashells in her room. She first picks up two of them. She really likes them. She then tries to pick up the rest. But Boots says that they don’t look good. Dora decides not to pick them up (see Figure 4).

Test sentence: Dora-ka cokay-lul twu-kay an cwu-wess-e.
 Dora-Nom seashell-Ac two-CL NEG pick up-Pst-E.
 ‘Dora didn’t pick up two seashells.’
 Negation wide scope reading: ‘It is not the case that Dora picked up two seashells.’ (False)
 Quantifier wide scope reading: ‘There are two seashells that Dora didn’t pick up.’ (True)

FIGURE 4. Quantifier wide scope context.



All of the test sentences contained numerally quantified objects and the short-form negation *an*, with accusative markers *-ul/lul* on head nouns associated with the floated quantifiers, as in the following example:

(35) Noun-Accusative marker Quantifier-Classifier

Goofy-ka Pizza-lul twu-kay an mek-ess-e.
 Goofy-Nom Pizza-Ac two-CL NEG eat-Pst-E.
 ‘Goofy didn’t eat two slices of pizza.’

In Korean, accusative markers can occur in a variety of positions with respect to head nouns and floated quantifiers: after classifiers preceded by floated quantifiers, between head nouns and floated quantifiers, and after both head nouns and classifiers preceded by floated quantifiers. Additionally, the accusative markers can be omitted in colloquial speech. The following examples show the distributional pattern of the accusative markers *-ul/lul*.

(36) On the classifier

Goofy-ka Pizza twu-kay-**lul** an mek-ess-e.
 Goofy-Nom Pizza two-CL-Ac NEG eat-Pst-E.
 ‘Goofy didn’t eat two slices of pizza.’

(37) On the head noun

Goofy-ka Pizza-**lul** twu-kay an mek-ess-e.
 Goofy-Nom Pizza-Ac two-CL NEG eat-Pst-E.
 ‘Goofy didn’t eat two slices of pizza.’

(38) On both the head noun and the classifier

Goofy-ka Pizza-**lul** twu-kay-**lul** an mek-ess-e.
 Goofy-Nom Pizza-Ac two-CL-Ac NEG eat-Pst-E.
 ‘Goofy didn’t eat two slices of pizza.’

(39) No accusative marker

Goofy-ka Pizza twu-kay an mek-ess-e.
 Goofy-Nom Pizza two-CL NEG eat-Pst-E.
 ‘Goofy didn’t eat two slices of pizza.’

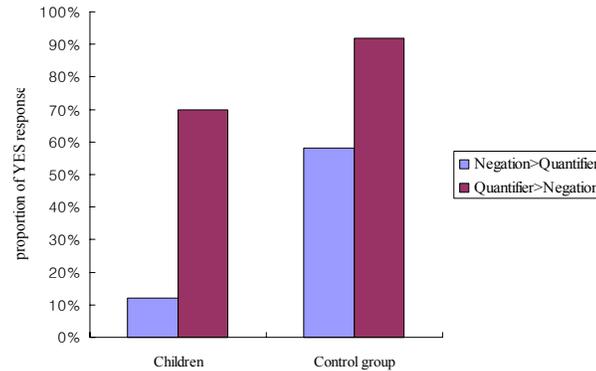
In this experiment, the position of an accusative marker in the test sentences (i.e., the pattern in (37)) was chosen based on a small-scale pilot study involving six native Korean speakers. In the study, nine test sentences were used for each context (i.e. negation wide scope and quantifier wide scope), exemplifying the following patterns: (1) sentences without an accusative marker, (2) sentences with accusative markers on head nouns, and (3) sentences with accusative markers on classifiers. Based on the preliminary results³ of the pilot study, the sentence type containing the accusative marker on the head noun was chosen for the current experiment, as it was regarded as the best candidate to provide both the negation wide scope and quantifier wide scope interpretations.

4.2 RESULTS. In the data analysis, the dependent variable was the proportion of “yes” responses to the puppet’s statements. For statistical analysis, T-test and repeated measures ANOVA were made at the significance level .05. The results revealed that both the quantifier wide scope reading and the negation wide scope reading are possible in Korean sentences containing a numeral quantifier and short-form negation *an*. The control group selected the quantifier wide scope interpretation 92 percent of the time and the negation wide scope interpretation 58 percent of the time. The difference between the two interpretations was statistically significant ($t(39) = 4.765, P < .05$). Children gave “yes” responses to test sentences in the quantifier wide scope context 70 percent of the time, and

³ In the negation wide scope context, the participants selected the target interpretation 56 percent of the time when presented with the sentences where the accusative marker occurs on the head noun, while accepting the target interpretation in the other sentence types less than 50 percent of the time. In the quantifier wide scope context, they selected the target interpretation 83 percent of the time in the sentences with the accusative marker on the head noun, while accepting the target interpretation in the sentence type containing the accusative marker on the classifier at a perfect rate of 100 percent and in the sentence type without the accusative marker at the rate of 67 percent.

“yes” responses to test sentences in the negation wide scope context 12 percent of the time. The difference in their performances between the two contexts was also statistically significant ($t(28) = 8.623, P < .05$). Figure 5 shows the proportion of “yes” responses to test sentences for the children and control group in both contexts.

FIGURE 5. Proportion of “yes” responses to test sentences.



The results of ANOVA revealed that there is a statistically significant difference between the negation wide scope and quantifier wide scope contexts ($F(1, 67) = 82.156, P < .05$), as well as between the children and control group ($F(1, 67) = 42.026, P < .05$). Moreover, there is a statistically significant interaction effect between contexts (negation wide scope and quantifier wide scope) and groups (children and the control group) ($F(1, 67) = 5.624, P < .05$). This indicates that regardless of group, the participants accepted the quantifier wide scope reading more frequently than the negation wide scope reading, and that regardless of the types of context, the control group accepted the target interpretations more frequently than did the children. The interaction effects reveal that the difference between the children’s acceptance rates of the negation wide scope reading and those of the control group was not caused by chance but was statistically significant.

As just noted, children showed a strong preference for the isomorphic reading (i.e., quantifier wide scope reading). The justifications that children provided in the negation wide scope context also showed this preference. When they were asked why they thought what the puppet said was wrong, most of them said a given character in the story acted on one of the two objects or animals. For example, in the story where Piglet read only one out of the two books, in response to the puppet saying “Piglet didn’t read two books,” children stated that the puppet’s statement was not true because Piglet had read one book. These responses suggest that they interpreted the statement in the quantifier wide scope sense. In other words, they interpreted it as ‘there are two books that Piglet did not read,’ thereby rejecting it on the grounds that Piglet read one book.

It is also worth noting that the frequency of children’s “yes” responses in the quantifier wide scope context was lower than that of the control group. Nine out of the 29 children gave “yes” responses only to one or two out of the five test sentences in this context. When asked why they thought the puppet’s statements were wrong, they said that a given character in the story acted on two out of the four objects or animals. For example, in the story about a lady buying two out of the four handbags, they said that the puppet’s statement (‘The lady didn’t buy two handbags’) was wrong because a lady bought two handbags. It seems that they paid more attention to what the character did than to what she did not do.

The control group also showed a preference for the isomorphic reading. In contrast to the children’s responses, however, they accepted the non-isomorphic, negation wide scope interpretation at the higher frequency rate- that is, 58 percent of the time. In fact, 20 out of the 40 participants in the control group accepted the negation wide scope interpretation at a rate higher than 80 percent, and five participants selected the interpretation 60 percent of the time.

Among the 20 participants who selected the target interpretation in the negation wide scope context, seven accepted both negation wide scope and quantifier wide scope interpretations 100 percent of the time. Two participants who accepted the negation wide scope interpretation all the time accepted the opposite interpretation 80 percent of the time. Eight participants who accepted the negation wide scope reading 80 percent of the time accepted the opposite reading at a rate equal to or higher than 80 percent of the time. Three out of the 20 participants accepted the quantifier wide scope reading equal to or lower than 60 percent of the time (see Table 5).

TABLE 5. Performance of the 20 participants, who accepted the target interpretation in the negation wide scope context.

Number of participants	Acceptance rate	
	Negation wide scope context	Quantifier wide scope context
Seven participants	100%	100%
Two participants	100%	80%
One participant	100%	60%
One participant	100%	40%
Six participants	80%	100%
Two participants	80%	80%
One participant	80%	20%

This result indicates that unlike children, approximately half of the control group could access both negation wide scope and quantifier wide scope interpretations quite successfully, providing strong evidence for that both interpretations are possible in Korean sentences containing numeral quantifiers and short-form negation.

4.3 DISCUSSION. In the comprehension experiment, both children and the control group displayed a preference for the isomorphic reading even though there was a difference in the acceptance rate of the non-isomorphic reading between the two groups. This result indirectly supports Musolino and Lidz's (2003) claim that children's preference for the isomorphic interpretation might reflect an exaggerated preference which can be observed in adults. It seems that the quantifier wide scope interpretation, which is isomorphic in Korean, is easier for both four- or five-year-olds and the control group to access than the opposite interpretation. This result corresponds to part of the results of Kurtzman and MacDonald's 1993 study. In their study on active scope ambiguous sentences containing *every*-phrases and *a*-phrases, they found that the interpretation in which leftward quantified phrases have wide scope was preferred, which is also predicted by most processing principles. For example, in the sentence *Every kid climbed a tree*, the preferred interpretation was that there may be more than one tree with different kids climbing each tree, in which the leftward phrase *every kid* has wide scope over *a tree*. On the other hand, in the sentence *A kid climbed every tree*, the preferred interpretation was that there is one particular kid who climbed all the trees. Kurtzman and MacDonald's study neither involved children nor dealt with scope interaction between numeral quantifiers and negation. However, their findings suggest that it is easier to process the interpretation in which leftward phrases have wide scope, as compared to processing the inverse scope interpretation.

Although the children and the control group showed a preference for the isomorphic reading, the control group selected the non-isomorphic interpretation more often than the children. As stated in the previous studies (Lidz and Musolino 2002, Musolino and Lidz 2003), there may be a difference in sentence processing abilities between children and the control group so that the control group could access the inverse scope with relatively greater ease. Trueswell et. al's 1999 study provides evidence for the difference in sentence processing abilities between children and adults. They found that children were not able to revise initial interpretations that they assigned to syntactically ambiguous sentences such as *Put the frog on the napkin in the box* as compared to adults. Even in the context where the NP-attachment of the prepositional phrase *on the napkin* as a modifier is expected, the children showed a strong preference toward the VP-attachment, which is regarded as syntactically less complex.

One finding of the current study was that three of the four children who produced target sentences in the negation wide scope context did not select the non-isomorphic negation wide scope interpretation in the comprehension study. This suggests that children at the age of four or five might know that two interpretations are possible, but that it might be harder for them to process the sentences with the target elements in the non-isomorphic order when they hear them. Anderson (2004) showed that it took longer for adults to assign the inverse scope interpretation than to assign the surface scope interpretation to ambiguous English sentences containing *a* and *every*, as in the following example.

- (40) An experienced climber scaled every cliff.
- a. Surface scope interpretation
There is one experienced climber who scaled all the cliffs.
 - b. Inverse scope interpretation
Every cliff was scaled by some possibly different climbers.

She also showed that this processing cost arose even when target sentences were provided with the inverse scope supporting contexts. This suggests that it is harder for adults to process the inverse scope interpretation than the surface scope interpretation of ambiguous sentences.

Along with insights from Trueswell et. al's (1999) study and Anderson's (2004) study, the findings of the current study make plausible the claim that differences in the acceptance rates of the non-isomorphic, inverse scope interpretation between children and the control group might be partly due to limitations on children's processing abilities. In order to test this claim, further studies should be conducted by measuring response times to test items that could facilitate the processing of the non-isomorphic interpretation.

In addition to processing-based accounts, another possible explanation of children's and adults' preference for the isomorphic interpretation has to do with felicity conditions for negative sentences. It has been observed that negative sentences tend to be processed more correctly or faster in felicitous contexts than in infelicitous contexts (De Villiers and Tager Flusberg 1975; Gualmini 2003; Wason 1965). In other words, the difficulty of negative sentences could be decreased when they are preceded by affirmative sentences representing contrastive information or when they are introduced in contexts where a listener's expectations are not fulfilled. In the stories for the negation wide scope contexts used in the current experiment, the felicity conditions for the negative sentences might not have been fully satisfied. For example, the negation wide scope reading of the sentence *Piglet did not read two books* would be more felicitous in contexts such as the following:

- (41) Sample context 1
Pooh and Piglet have two books apiece. Pooh reads the two books because they are so interesting. Piglet reads one of the two books first. When he is about to read the second book, he realizes that he borrowed the wrong book. So, he decides not to read it. He ends up reading one book.
Test sentence: Pooh read two books but Piglet did not read two books.

The presence of the corresponding affirmative sentence *Pooh read two books* that shows contrastive information might facilitate the acceptance of the reading ‘it is not the case that Piglet read two books.’

The negation wide scope reading of the sentence would be also felicitous when a listener’s expectations are not fulfilled, as in the following context:

(42) Sample context 2

The teacher told Piglet to read two books as homework. Piglet borrowed two books from a library. He reads one of the two books first. When he is about to read the second book, he realizes that he borrowed the wrong book. So, he decides not to read it. He ends up reading one book.

The context might lead listeners to build up the expectations that Piglet would read two books to complete his homework. When the ending of the story unfolds, however, the expectations are not fulfilled. Therefore, the reading ‘it is not the case that Piglet read two books’ would be felicitous. To provide evidence for the role of felicity conditions in the comprehension of negative sentences, future studies should be conducted with materials better designed to meet these conditions.

Another plausible factor in the discrepancy in acceptance rates between the isomorphic and non-isomorphic interpretations has to do with distributional patterns in the use of numeral quantifiers and short-form negation in the input. The participants in the current study might have activated the interpretations associated with the target elements which occur more frequently in their language experience. Gennari and MacDonald’s (in press) study revealed that child- and adult-directed utterances overwhelmingly use numeral quantifiers and negation in ways that are consistent with the isomorphic interpretation (i.e., negation wide scope meaning) in English. Their study suggested potential effects of distributional patterns of language use on children’s interpretation of ambiguous sentences containing numeral quantifiers and negation. The production experiments in the current study revealed a partial picture of how numeral quantifiers and negation are used, showing that the quantifier wide scope meaning is expressed more frequently than the negation wide scope meaning. However, more systematic analysis by means of naturalistic data collection or corpus analysis should be conducted for better understanding of the target elements.

From a cross-linguistic perspective, the findings of the current study suggest that with respect to numeral quantifiers and negation, isomorphism occurs in a language other than English or Kannada and that even adults may display a preference for the isomorphic reading under certain contexts.

5. GENERAL DISCUSSION. This study has attempted to describe the scope interaction between numeral quantifiers and negation in Korean and to investigate Korean-speaking children’s production and comprehension of numeral quantifiers and negation compared to those of Korean-speaking adults. The production experiments revealed that the frequency of numerally quantified negative sentences is very low in both children’s and adults’ utterances. The comprehension experiments support the conclusion that children and adults have a preference for the isomorphic interpretation of sentences containing numeral quantifiers and negation, although adults have access to the non-isomorphic interpretation more frequently than children.

As a possible explanation for the results of production experiments, I provided pragmatic accounts based on Grice’s Cooperative Principle. For the results of comprehension experiments, I provided a processing-based account and discussed factors pertaining to felicity conditions of negative statements as well as possible effects of the distributional patterns of use of numeral quantifiers and negation in child- or adult-directed utterances.

Unlike other studies focusing on children’s comprehension of numeral quantifiers and negation, this study has provided a pioneering sketch of how Korean-speaking children express negation wide scope meaning and quantifier wide scope meaning, which involve the two elements. Moreover, this study has shown a comprehensive picture of how the same individual expresses and comprehends the scope-related meanings involving the target elements. Based on this grounding work, further studies should make attempts to answer why differences in scope judgments between children and adults occur. Additionally, another attempt would be to investigate the same research questions by means

of methodologies other than the Elicited Production Task or TVJT so that we could examine the scope interaction phenomenon more closely by excluding possible confounding factors pertaining to any methodological flaws.

6. CONCLUDING REMARKS. The findings of the current study underline how mysterious the whole process of children’s acquisition of the interaction between numeral quantifiers and negation is in light of the fact that children have knowledge of the scopal facts, although the two elements are rarely used together in real life. Additionally, the results of the study show that there are several factors to consider in order to better understand the acquisition of scope interaction between the two elements. Further studies should be conducted with more fine-grained materials so as to provide answers to questions raised in the study.

APPENDIX A. SAMPLE ITEMS FOR THE PRODUCTION EXPERIMENT

I. Negation Wide Scope Context

<Context story > (English translation)

Piglet and Pooh play with a set of stickers. Pooh puts two stickers on a piggy bank. He then puts three stickers on his notebook. Following Pooh, Piglet puts four stickers on his notebook. (There is a pencil case in the scene)

< Protocol >

Experimenter: This is a story about Piglet and Pooh playing with stickers. Let’s ask Puppet 1 and Puppet2 what happened. Listen to what Puppets say and feel free to interrupt their conversation by correcting their statements which do not correspond to the story.

Puppet 1: Pooh-ka cekumthong-ey suthike-lul sey-kay pwuth-i-ess-e.
Pooh -Nom piggy bank-on sticker-Ac three- CL put-Affix-Pst-E
‘Pooh put three stickers on a piggy bank.’

Puppet 2: Piglet-un cekumthong-ey suthike-lul an pwuth-i-ess-e
Piglet-Nom piggy bank-on sticker NEG put-Affix-Pst-E.
‘Piglet didn’t put a sticker on a piggy bank.’

Puppet 1: Pooh-ka kongchayk-ey suthike-lul sey-kay pwuth-i-ess-e.
Pooh -Nom notebook-on sticker-Ac three- CL put-Affix-Pst-E
‘Pooh put three stickers on his notebook.’

☞ Puppet 2: Piglet-to kongchayk-ey suthike-lul sey-kay pwuth-i-ess-e.⁴
Piglet-too notebook-on sticker-Ac three-CL put-Affix-Pst-E
‘Piglet put three stickers on his notebook too.’

Puppet1: Pooh-ka philthong-ey suthike-lul an pwuth-i-ess-e.
Pooh-Nom pencil case-on sticker-Ac NEG put-Affix-Pst-E
‘Pooh didn’t put a sticker on a pencil case.’

Puppet2: Piglet-un phithong-ey suthike-lul pwuth-i-ess-e.
Piglet-TOP pencil case-on sticker-Ac put-Affix-Pst-E
‘Piglet put a sticker on a pencil case.’

⁴ ☞ represents a test trial.

II. Quantifier Wide Scope Context

<Context story > (English translation)

Goofy is going to go on a picnic with Mickey and Minnie today. Mickey will pick him up in five minutes. He looks at a bundle of banana, a bunch of candies and a box of chocolate on the table. He wants to take banana and candies for dessert because Mickey really likes them. Goofy puts a bundle of banana into his bag. When he is about to put a bunch of candies into his bag, he hears Mickey's car. He puts candies into his bag in a hurry and goes outside. (There are four candies and a box of chocolate which are left behind in the scene)

<Protocol>

Experimenter: This is a story about Goofy putting dessert into his backpack. Puppet 1 describes what happened in the story and Puppet 2 says whether Puppet 1's statement is true or not. Sometimes, Puppet 2 speaks incorrectly. So listen carefully to what he says and if he says incorrectly, tell him the truth about the story.

Puppet 1: Goofy-ka kapang-ey chokoleys-ul neh-ess-e.
 Goofy-Nom bag-into chocolate-Ac put-Pst-E.
 'Goofy put chocolate into his bag.'

Puppet 2: Ung, mac-a.
 Yes, true-E.
 'Yes, it is true.'

Puppet 1: Goofy-ka kapang-ey panana-lul motwu neh-ess-e.
 Goofy-Nom bag-into banana-Ac all put-Pst-E.
 'Goofy put all banana into his bag.'

Puppet 2: Ung, mac-a.
 Yes, true-E.
 'Yes, it is true.'

Puppet 1: Goofy-ka kapang-ey sathang-ul motwu neh-ess-e.
 Goofy-Nom bag-into candy-Ac all put-Pst-E.
 'Goofy put all of the candies into his bag.'

☞ Puppet 2: Ung, mac-a.
 Yes, true-E.
 'Yes, it is true.'

APPENDIX B. SAMPLE ITEMS FOR THE COMPREHENSION EXPERIMENT

I. Negation wide scope reading (not>two)

1. Filler item

<Context story > (English translation)

The girl is at the pet store. There are two cats and four goldfish. She decides to buy one cat because her baby sister likes a cat. She then looks at four goldfish in a glass bowl. She says that they are really cute and she wants to buy all of them. However, when the owner of the pet store tells her how much it costs to buy all the fish, she decides to buy only two goldfish. This is a story about the girl at the pet store and I know what happened, "The girl bought four goldfish."

Puppet : Yeca ai-ka mwulkoki-lul ney-mali sa-ss-e.
 Girl-Nom goldfish-Ac four-CL buy-Pst-E.
 ‘The girl bought four goldfish.’

2. Test item

<Context story > (English translation)

A boy goes to a pet store near his apartment. He finds two new dogs. He first approaches a white dog and pets it since it is very cute. He is very happy. He then walks to a brown dog to take a close look at it. But the dog smells so bad, so he decides not to pet it.

This is a story about a boy petting dogs, and I know what happened, “The boy didn’t pet two dogs.”

Puppet: Namca ai-ka kay-lul twu-mali an manci-ess-e.
 Boy-Nom dog-Ac two-CL NEG pet-Pst-E.
 ‘The boy didn’t pet two dogs.’

II. Quantifier wide-scope reading (two>not)

1. Filler item

<Context story > (English translation)

Tiger and Piglet go to the park. There are a swing and a slide. Tiger says that the slide looks like a lot of fun and he wants to ride it. Tiger goes up the stairs and comes down the slide. Tiger then tells Piglet to ride it. However, Piglet feels scared because the slide looks too steep. Piglet decides not to ride it but instead gets on a swing.

This is a story about Tiger and Piglet at the park, and I know what happened, “Piglet didn’t get on a swing.”

Puppet: Piglet-i kuney-lul an tha-ss-e.
 Piglet-Nom swing-Ac. NEG get on-Pst-E.
 ‘Piglet didn’t get on a swing’

2. Test item

<Context story > (English translation)

Dora bought a bottle of juice, two cobs of corn and four pints of milk. She puts them into a refrigerator in a kitchen. First, she puts a bottle of juice, two cobs of corn and two pints of milk. When she is about to put the other two pints of milk, her friend, Boots, enters the kitchen and asks her to help him with riding on his new bicycle. Dora and Boots go outside together.

This is a story about Dora putting groceries into a refrigerator and I know what happened, “Dora didn’t put two pints of milk into a refrigerator.”

Puppet: Dora-ka wuywu-lul twu-kay an neh-ess-e.
 Dora-Nom milk-Ac two-CL NEG put-Pst-E.
 ‘Dora didn’t put two pints of milk into a refrigerator’

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