TESTING PREDICTIONS OF THE TWO-GRAMMAR HYPOTHESIS FOR KOREAN*

Erica J. Yoon, Eun Jin Choi, Omar Lahlou, Junko Shimoyama

College of San Mateo & McGill University

Abstract

We revisit Han, Lidz, and Musolino's (2007) claim that each Korean speaker exclusively acquires one of two available grammars, either the one generating only the Neg>Object QP (Quantificational Phrase) scope with V-raising or the one generating only the Object QP>Neg scope with I-lowering. The claim was based on the observation of bimodal distribution of speakers in acceptance of the Neg>Object QP reading. We performed new experiments with crucial modifications to the original study and observed some speakers' simultaneous access to both readings. These findings are inconsistent with predictions of the two-grammar model. We end the paper with implications of our results.

Keywords: *head movement, scope, negation, Korean*

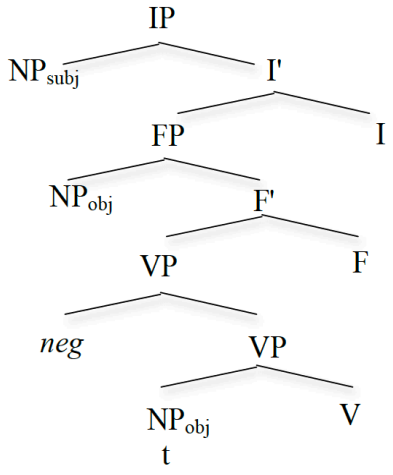
1. The Two-Grammar Hypothesis

Han, Lidz and Musolino (2007, HLM) set out to investigate the question of whether Korean has I-lowering or V-raising. In a head-final, agglutinative language like Korean and Japanese, the height of V and the functional heads above it is not easy to tell. To answer this question, HLM uses how object Quantificational Phrases (QPs) are interpreted with respect to negation.[1] HLM takes the scope reading Object QP > Neg as evidence for low negation derived by I-lowering, and the scope reading Neg > Object QP as evidence for high negation derived by V-raising. The trees in (1) below, with simplification, show only one of the two types of negation to be discussed shortly (HLM pp. 33-34). In (1a), I lowers to V and negation cliticizes to V,

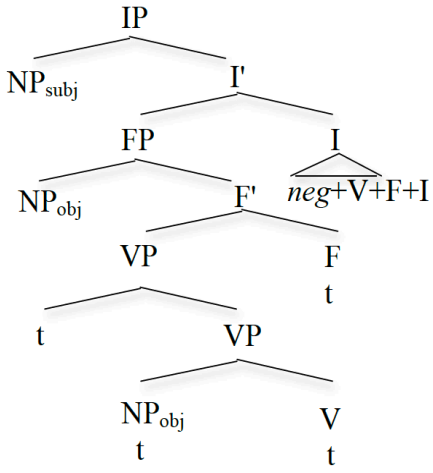
giving rise to low negation, while in (1b), negation cliticizes to V, V raises to I, giving rise to high negation. A crucial assumption that HLM makes is that the object QP position is fixed as shown in the trees. Reconstruction of QPs or negation therefore is not a possibility in their analysis (see, for example, Kim and Sells 2007 and Kim, A.-R. 2002). Zeijlstra (2022) and Kim (2017) have challenged the analysis of rightward, string-adjacent movement. Note also that if the universal QP that HLM relies on turns out to be a positive polarity item, then, the reading Neg > Object QP should not be available (Zeijlstra, 2022).

(1)

a.



b.



HLM reports on an experiment using a Truth Value Judgment task (Crain and Thornton 1998) where adult Korean speakers were presented with test sentences such as (2) and (3) and asked to judge whether they were true or false in given contexts. Both sentences have direct objects with quantifier *motun* 'every'. Sentence (2) contains so-called short form negation, which occurs preverbally, while sentence (3) contains so-called long form negation, which involves a -

ci suffixed main verb and *ha*-support. The two potential scope readings can be paraphrased as (4) and (5).

(2) Khwukhi Monsuthe-ka motun khwukhi-lul an mek-ess-ta. (short neg)
Cookie Monster-Nom every cookie-Acc Neg eat-Pst-Decl
'Cookie Monster did not eat every cookie.'

(3) Khwukhi Monsuthe-ka motun khwukhi-lul mek-ci ani ha-yess-ta. (long neg)
Cookie Monster-Nom every cookie-Acc eat-Ci Neg do-Pst-Decl
'Cookie Monster did not eat every cookie.' (HLM: 28)

(4) *every>not* reading (low neg): Cookie Monster ate no cookie.

(5) *not>every* reading (high neg): It is not the case that Cookie Monster ate every cookie.

Focusing for the moment on the results of HLM's experiment on the *not>every* reading, where participants were shown contexts that make only the *not>every* reading true, the acceptance rate was only 43%. Moreover, results on the *not>every* reading revealed a bimodal distribution of participants. Out of 40 participants tested on this condition, 12 participants (30%) consistently accepted test sentences in this reading, while 17 participants (42.5%) consistently rejected them (see HLM's Figure 4, p. 31).

Based on these results on the *not>every reading* (high negation), it is proposed by HLM that Korean has two grammars, one with high negation derived by V-raising, and the other with

low negation derived by I-lowering. According to their proposal, Korean speakers set parameters randomly either to V-raising or to I-lowering, as the language data that they are exposed to are assumed to be impoverished and therefore compatible with either parameter setting. Roughly 50% of the population thus ends up with V-raising, while the other 50% ends up with I-lowering.[2,3]

2. Unexpected Judgment Patterns and Entailment Relations

The two-grammar hypothesis generally predicts that approximately half of the Korean-speaking population would accept negative sentences with object QPs as true statements only in Neg>Object QP contexts (where only the Neg>Object QP reading is true), while the other half would accept such sentences as true only in Object QP>Neg contexts. With respect to the specific types of test sentences used in HLM's study, e.g., (2) and (3), while the first prediction was born out as we saw above, a seemingly unexpected acceptance pattern was obtained for the *every>not* reading. The participants who were tested on *the every>not* condition consistently (98%) accepted the test sentences (see HLM's Table 6 and Figure 3, p. 30), even though half of them are supposed to be speakers of the high negation grammar and are therefore expected to reject the sentences. In other words, the speakers of the high negation grammar, though their syntax presumably only generates the *not>every* reading, also accepted the test sentences in *every>not* contexts.

The explanation offered by HLM (footnote 19, pp. 32-33) of this seemingly unexpected acceptance pattern has to do with the entailment relation found in the two scope readings in (4) and (5). That *Cookie Monster ate no cookie* (*every>not*) in (4) entails that *it is not the case that Cookie Monster ate every cookie* (*not>every*) in (5). In other words, any situation that makes the

stronger every>not reading true also makes the *not>every* reading true. Thus, according to HLM, the speakers of the high negation grammar (though their syntax only generates *not>every*) also accept a statement in an *every>not* context (where the *every>not* reading is true), because the context is consistent with the weaker *not>every* reading that their syntax generates. If Cookie Monster ate no cookie, it is not incorrect, logically speaking, to describe the situation by saying that it is not the case that Cookie Monster ate every cookie. This gives rise to the situation where the test sentences are accepted close to 100% despite the two-grammar model. The claim is summarized in (6).

(6)

	i. Syntax of low neg grammar generates:	ii. Syntax of high neg grammar generates:
a. *every* > *not* reading	Yes	No but masked by entailment
b. *not* > *every* reading	No	Yes

3. Some Predictions Made by HLM's Analysis of the Unexpected Judgment Pattern

3.1. Removing Entailment

HLM's analysis of the unexpected judgment pattern sketched above makes several important predictions, one of which is that removing entailment should lead to a different judgment pattern.[4] In general, unexpected acceptance of test sentences in HLM's model of Korean grammar is predicted to arise for a non-syntactic reason, namely, due to two potential readings

that are related to each other by entailment. Thus, if we used sentences whose two potential scope readings are not related to each other by entailment, for instance sentences containing numeral quantifiers, it is predicted (i) that the acceptance rate of the Object QP>Neg reading would drop to approximately 50%; and moreover, (ii) that the 50% acceptance is attributable to half of the population consistently accepting the Object QP>Neg reading, while the other half consistently rejecting it.

For instance, the examples in (7) and (8) with numeral quantifiers are potentially ambiguous between the readings in (9) and (10). The two readings are not related by entailment as we can find scenarios where one reading is true while the other is false, and vice versa (*e.g.*, if Mina flips 3 out of 6 cups, reading (9) is true and reading (10) is false; if Mina flips 2 out of 4 cups, reading (10) is true and reading (9) is false). Section 4 outlines our experiment that is designed to test the prediction described above.

(7) Mina-ka sey-can-uy khep-ul an twicip-ess-ta. (short neg)
Mina-Nom 3-Cl-Gen cup-Acc Neg flip-Pst-Decl
'Mina did not flip three cups.'

(8) Mina-ka sey-can-uy khep-ul twicip-ci anh-ass-ta.[5] (long neg)
Mina-Nom 3-Cl-Gen cup-Acc flip-Ci Neg-Pst-Decl
'Mina did not flip three cups.'

(9) *3 > not* reading (low negation): There are 3 (or more) cups that Mina did not flip.

(10) *not > 3* reading (high negation): It is not the case that Mina flipped 3 (or more) cups.

3.2. Suppression of Scalar Implicature Computation

Before moving on, let us touch upon another prediction made in HLM's analysis of the unexpected judgment pattern, though we have not tested it. Recall that in HLM's analysis, if a speaker accepts the *not>every* reading, they also consistently accept test sentences in contexts where the *every>not* reading is true, though this reading is not generated by their syntax. The underlying assumption here, though not explicitly stated, is that the latter acceptance comes about because this population consistently suppresses the computation of the scalar implicature that a speaker uttering (5) 'It's not that CM ate every cookie' implicates that the stronger (or entailing) proposition (4) 'CM ate no cookie.' is false. The prediction then is that if this particular group of speakers are tested on scalar implicature computation in a similar experimental setting, they should show consistent suppression of scalar implicature computation.[6] This, however, seems to go against the general results found in the literature that adult speakers, as opposed to children, almost always compute scalar implicatures in experiments such as those reported in, for example, Musolino and Lidz (2002) for English and Papafragou and Musolino (2003) for Greek.

Furthermore, HLM's high negation grammar speakers have two very different routes to accepting statements in Truth Value Judgment tasks: (i) acceptances in *not>every* contexts are guaranteed by their unambiguous syntax, while (ii) acceptances in *every>not* contexts are based on entailment relations and not calculating scalar implicatures. It is predicted then that the nature of their acceptance of sentences (2)/(3) in *every>not* contexts would align with the nature of acceptance of an unambiguous high negation sentence such as 'It's not that Cookie Monster ate

every cookie' in *every>not* contexts by English speakers, or its Korean counterpart in (11) by any speaker of Korean.

(11) Khwukhi Monsuthe-ka motun khwukhi-lul mek-ci-nun anh-ass-ta.

Cookie Monster-Nom every cookie-Acc eat-Ci-Neun Neg-Pst-Decl

'It's not (the case) that Cookie Monster ate every cookie.'

4. Experimental Investigation

According to the two-grammar hypothesis, half of the Korean speakers have the I-lowering syntax, which only generates the Object QP>Neg reading, while the other half have the V-raising syntax, which only generates the Neg>Object QP reading. The results that apparently go against this hypothesis are claimed to be due to the choice of quantifier used, which masked the true picture. The goal of the current experiment is to test the prediction described in section 3.1 above, by using sentences such as (7) and (8) above that contain numeral quantifiers instead of universal quantifiers, thereby removing the entailment relation between the Object QP>Neg reading and the Neg>Object QP reading.

Before moving on, it should be mentioned that Han (2008) and Han, Storoshenko and Sakurai (2008) report on an experiment on Japanese where prenominal numeral quantifiers were used (in the form of 'Num-Cl-Gen NP-case'). For regular negation, results comparable to ours were obtained, and to those reported in HLM on Korean universal quantifiers. They propose that the high negation grammar speakers can get apparently low negation reading by a choice function strategy. This seems to be an *ad hoc* solution because the similar patterns with numerals and universals come out as an accident in the proposal that relies on a choice function strategy for numerals on the one hand, and on entailment relations for universals on the other hand. The

availability of the Q>Neg reading among the high negation grammar speakers attributed to a choice function strategy is not dependent on the availability of the Neg>Q reading (in the way that the Q>Neg reading was dependent on the Neg>Q reading in the case of universal quantifiers). This would make possible other types of analyses that are not built on the two-grammar hypothesis. For example, one might say that while the syntax produces Neg>Q for everyone, an existential quantifier over choice functions above negation is obligatory for some speakers (giving rise to the Q>Neg reading only), but optional for the others (giving rise to both readings). This is a somewhat unlikely story (where wide scope existential via a choice function strategy is forced), but it is only mentioned here to highlight the adhocness of the proposal.

4.1. Participants and Design

Participants were 24 (10 males, 14 females) adult monolingual Korean speakers (mean age: 23.9 years). The participants were given monetary reimbursements. The main factor in question was scope, which determines which scope reading is true in a given context: object QP taking scope over negation (Q>neg), versus negation over object QP (neg>Q). For example, for sentences (12) and (13), Q>neg meant a woman flipped three out of six cups, making the object QP>neg reading true and the neg> object QP reading false (see Appendix B for all the contexts).

(12) Yeca-ka sey-can-uy khep-ul an twicip-ess-ta. (short neg, prenom)
woman-Nom 3-Cl-Gen cup-Acc Neg flip-Pst-Decl
'The/a woman did not flip three cups.'

(13) Yeca-ka khep sey-can-ul twicip-ci anh-ass-ta. (long neg, postnom)

woman-Nom cup 3-Cl-Acc flip-Ci Neg-Pst-Decl

'The/a woman did not flip three cups.'

In HLM's experiment, each speaker was tested on only one type of reading, either *every>not* or *not>every*, over the whole testing session; hence the scope was a between-subjects factor.[7] In the current experiment, every speaker was tested on both types of reading (*i.e.*, scope was a within-subjects factor). If speakers indeed had exclusive access to one of the two readings, as HLM predicted, then each speaker would accept sentences in one of the two scope conditions, but reject sentences in the other condition. Each participant therefore went through 8 test trials, half of which presented Q>neg and the other half neg>Q, with the order of trials pseudorandomly counterbalanced.

There were additional factors that we examined to see whether they affect speakers' judgment. First, type of negation used in a sentence could be either *short neg* versus *long neg*. As previously mentioned, HLM did not find evidence that varying between the two negation types affects speakers' judgment.[8] The current experiment sought to verify this with the new design. Each participant was presented with four test trials with short negation and the other four with long negation, with the order of the trials pseudorandomly counterbalanced.

Second, the type of numeral quantifier (*quantifier* from here on) used in a sentence was also manipulated. HLM only used sentences that contained prenominal *motun* 'every', but in previous literature, there have been claims that different quantifier types in Korean and Japanese generate varied scope judgments (e.g., Kwak 2010; Ochi 2012). Hence, to check whether quantifier types affect scope judgment, the current experiment used sentences that contained prenominal versus postnominal quantifiers (as in (12) and (13)).[9] For example, the sentence 'The

girl didn't flip three cups' in Korean may contain either short or long negation, and either prenominal or postnominal quantifier (See Appendix A for examples). Each participant was presented with four test trials with prenominal quantifier and the other four with postnominal quantifier, with the order of the trials pseudorandomly counterbalanced.

4.2. Materials and Procedure

Each trial consisted of two types of video clips: situation and sentence clips. In a situation clip, an experimenter acted out a particular action involving a set of objects. Each situation clip depicted one of the two scope conditions. Thus, for each sentence like (12) or (13), there were two situation clips: one that showed Q>neg reading, and one that showed neg>Q reading. Each sentence clip showed a screenshot of the last scene in the preceding situation clip and a sentence caption at the bottom.[10] The sentence could contain either the short or long negation, and either the prenominal or postnominal quantifier. Then the participant would judge whether the sentence is true, based on the previously shown situation. Participants were introduced to the task with one practice trial. Each participant went through 8 test and 8 filler trials in a pseudorandom order, then indicated their acceptance ('yes') or rejection ('no') of a given sentence after each trial on an evaluation sheet. Each participant was tested alone with no interaction from the researcher during the experiment and was debriefed after each session.

4.3. Results and Discussion

Our dependent measure was the acceptance rates, calculated by dividing the number of "yes" responses by the total number of responses for each condition. A repeated measures

analysis of variance with 3 factors, scope (Q>neg vs. neg>Q), negation (*short neg* vs. *long neg*), and quantifier (*prenom* vs. *postnom*), yielded significant main effect of scope ($p < .01$): subjects accepted sentences in the Q>neg condition (M = 88%) significantly more than sentences in the neg>Q condition (M = 52%). There was no other main effect or interaction.

Recall the prediction based on HLM's claim: if the entailment relation between the two scope readings is removed, then the acceptance rate for the Q>neg condition is expected to drop to approximately 50%. However, comparison of the acceptance rates in the scope conditions of the current experiment (Figure 1) with the acceptance rates in HLM's study (see section 2) revealed that the acceptance rates were similar: our experiment yielded a high mean acceptance rate of over 80% for Q>neg, and a lower mean acceptance rate of near 50% for neg>Q. Hence, the acceptance rate for the Q>neg condition remained high despite the removal of entailment, which does not align with HLM's prediction.

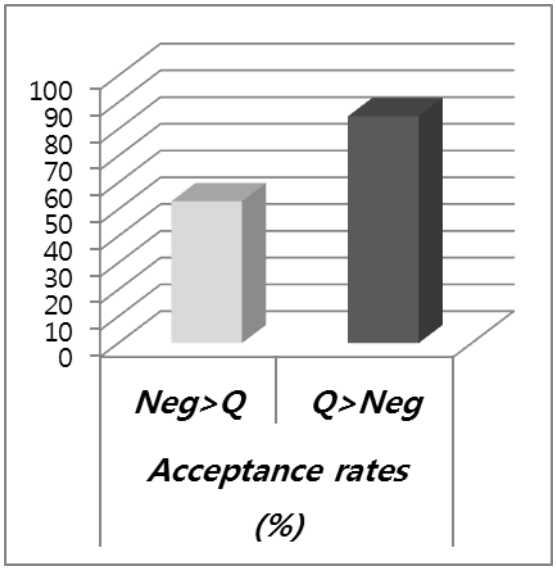


Figure 1: ***Acceptance rates (%) per scope readings***

Furthermore, the use of the within-subjects design for the scope factor allowed for analyses of responses of individual speakers to each of the two scope readings (Figure 2). In the two-grammar hypothesis, speakers are predicted to accept one of the readings consistently and reject the other reading consistently, as shown in gray in Figure 2 (even though we did not see direct evidence for this in HLM's study due to the entailment relation, in addition to the between-subjects design). However, the analyses revealed that most of the speakers who accepted neg>Q also accepted Q>neg, causing the high acceptance rate for Q>neg. Overall, more than 40% of the participants accepted each of the two readings 50% of the time or more, and 17% of all the participants accepted both readings 100% of the time. Thus, there are speakers whose grammar generates both scope readings (see below for a discussion of a different interpretation). HLM's claim that each Korean speaker exclusively has one of the two grammars generated by either V-raising or I-lowering should therefore be revisited.

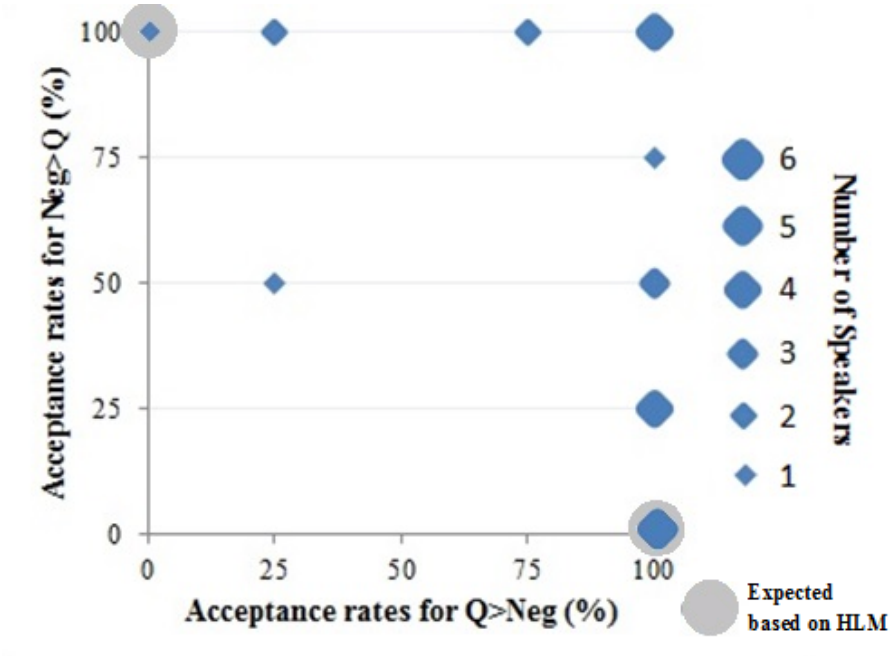


Figure 2: ***Acceptance rates for scope readings, Q > Neg on x-axis and Neg > Q on y-axis. Size of dots represent the number of participants that accepted the two readings at the given particular rate (e.g., rightmost bottom dot means they accepted the Q > neg reading at 100%, and Neg > Q reading at 0%, meaning they never accepted Q>Neg reading.***

As for the judgment pattern from the remaining population of speakers, interestingly, besides the speakers that accepted both readings relatively consistently (50% of the time or more), some other 42% of speakers primarily accepted only Q>neg reading and accepted neg>Q reading 25% of the time or less.[11] If we assume with HLM that the two readings indeed are derived from the syntactic processes of I-lowering and V-raising, then these results may suggest that the latter group of speakers have access to only the Q>neg reading through I-lowering. This might then suggest that the group of speakers who accepted both readings have the grammar that allows both I-lowering and V-raising and generates both scope readings. Another possibility is that there is some unknown factor that makes some speakers prefer the Q>neg reading over the neg>Q reading, while other speakers freely access the two readings equally. In the previous literature, some experiments hinted at the possibility that speakers have varied ability to use context to resolve ambiguity in scopally ambiguous sentences, as some speakers show bias for one scope reading over the other regardless of what the context suggests whereas other speakers use the context to access either of the two possible scope readings (Gibson et al., 2011). It is thus possible that the speakers who consistently accepted the Q>neg but rejected the neg>Q reading in the current experiment simply had a bias toward the Q>neg reading, and even though they could potentially access the neg>Q reading, this particular experimental context failed to reveal that.

Although there was no interaction between scope and negation type, that is, speakers were not more likely to accept Q>neg or neg>Q if the sentence used the long negation or short negation, the analyses of the current data revealed a possibility that the negation type may affect the speakers' judgment. When the scope and negation type for the first test trial were included in the analyses, we discovered that there was a significant interaction between scope across all trials and the negation type in the first test trial ($p = .23$), such that speakers who were presented with the short negation accepted Q>neg (95.3%) significantly more than neg>Q (33.9%) across all trials, while speakers who were presented with the long negation did not show significant difference between the means for acceptance rate for Q>neg (80.2%) and neg>Q (70.8%) across all trials.

This suggests that negation type might have a subtle priming effect, to be examined in future studies. It is worth mentioning here that in judgments reported in the previous studies summarized in HLM, if short and long negation showed any difference at all, it was that long negation made neg>Q easier to obtain than short negation. Furthermore, as pointed out to us by Shin-sook Kim (p.c.), we can bring out a difference between short and long negation in the following types of sentences where scope bearing elements such as *only* and *also* occur in the subject position. The wide scope negation reading is much harder with short negation than with long negation.

(14) a. Minse-man ku chayk-ul an ilk-ess-ta. (short neg)

Minseo-only that book-Acc Neg read-Pst-Decl

'Only Minseo didn't read that book.' (only > Neg)

b. Minse-to ku chayk-ul an ilk-ess-ta. (short neg)

Minseo-also that book-Acc Neg read-Pst-Decl

'Minseo also didn't read that book.' (also > Neg)

5. An alternative interpretation of the results and two follow-up studies

Han (2008) and Han, Storoshenko and Sakurai (2008) report on an experiment on Japanese where prenominal numeral quantifiers were used (in the form of 'Num-Cl-Gen NP-case'). For regular (short) negation, they obtained results comparable to ours on Korean numeral quantifiers, and to those reported in HLM on Korean universal quantifiers, seemingly going against HLM's two-grammar hypothesis once again. They propose that the high negation grammar speakers can get apparently low negation readings by a choice function strategy (see Fodor and Sag (1982), Reinhart (1997), Winter (1997), Kratzer (1998), Ruys and Winter (2011), Schwarz (2011)). This may seem like an ad-hoc solution, since we still do not have direct evidence for the two-grammar hypothesis, and therefore these results are also open to different interpretations that are not couched in terms of the two-grammar hypothesis. Nevertheless, if a choice function strategy was indeed available for Korean prenominal and postnominal numeral quantifiers of the type used in our experiment, our results would be compatible with the two-grammar hypothesis. We therefore carried out two follow-up studies using modified numerals such as *sey-kay isang* '3 (things) or more', which do not show exceptional wide scope behavior (Begheli 1995, Takahashi 2006), to see whether HLM's prediction holds up that speakers have exclusive access to only one of the two scope readings.[12]

5.1. Follow-up study 1

5.1.1. Participants and design

Participants were 49 (23 males, 26 females) adult Korean speakers (mean age: 31.5 years). The participants were recruited and participated in the experiment online, through a site that mainly targeted people who live or lived in Montreal, Canada. The majority of participants had fewer than 3 years of exposure to English (13 participants had 0-1 year of exposure, 5 had 1-2 years of exposure, 11 had 2-3 years of exposure, and 20 had more than 3 years of exposure). The participants were given monetary reimbursements.

For this follow-up study, we manipulated two main factors. First, identical to our previous experiment, we varied scope: object QP taking scope over negation (Q>neg), versus negation over object QP (neg>Q). Second, we also added the factor of quantifier type: standard numeral (e.g., 'three') vs. modified numeral (e.g., 'more than three'). We also varied the negation type (short vs. long), and only used prenominal quantifier (not postnominal) since we did not see an effect of the quantifier order type in the previous experiment.

5.1.2. Materials and Procedure

Each participant completed the study online. They went through two practice trials that were unambiguous, and then completed eight test trials. In each test trial, participants read a general description of the scenario at the top (*e.g.*, "The following are Jiho's papers. Look at what Jiho did.), a picture of objects (*e.g.*, three pieces of paper crumpled up and three pieces of paper intact), and the test sentence and a question asking whether the sentence is true (e.g., "Is the following sentence true? Jiho did not crumple up four or more pieces of paper."). Half of the test trials used "more than" quantifier and the other half used the regular numeral quantifier. Half

of the test trials used short negation and the other half used long negation. All of the test trials used a prenominal quantifier.

Figure 3: ***Image of sample test scenario shown to participants***

5.1.3. Results and discussion

Results from the follow-up study showed that, in contrast to our main study and to our surprise, no one was able to access both scope readings 100% of the time (see Fig. 4). The majority of the participants seemed to display an "exclusive" access to the Q>Neg or Neg>Q reading (blue color in Fig. 4) as Han et al. suggested, though there were still a few participants who accessed both readings at 50% rate or higher (green color in Fig. 4).

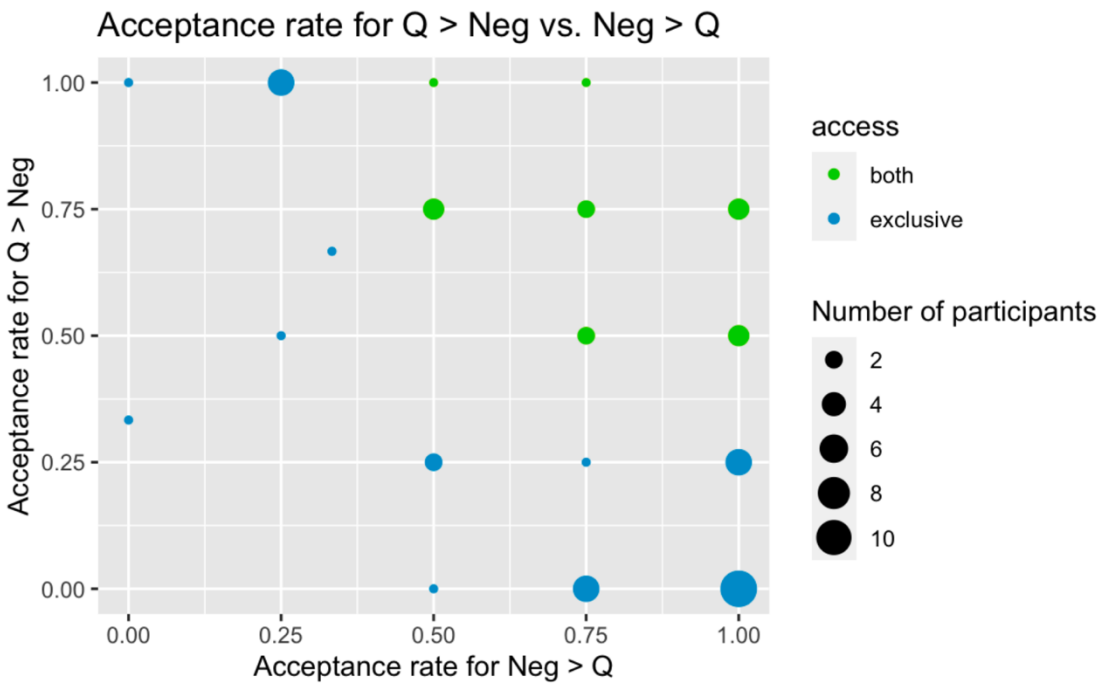


Figure 4: ***Acceptance rates for scope readings, Neg>Q on x-axis and Q>Neg on y-axis. Size of dots represent the number of participants that accepted the two readings at the given particular rate (e.g., rightmost bottom dot means they accepted the Neg>Q reading at 100%, and Q>Neg reading at 0%, meaning they never accepted Q>Neg reading.***

One potential reason that participants had exclusive access to one of the two readings in this follow-up study was that there was no filler trial between each test trial, which made participants more 'consistent' with their choice of scope acceptance. That is, once they decided to accept one reading, it was easier for them to retain that and reject the other reading in the following trials. Though exclusion of filler trials was largely accidental, this helped show that possibly greater exposure to English did not make participants more likely to accept both readings.

Another surprising finding was that the majority of participants now consistently accepted neg>Q, not Q>neg, as shown in Figure 5. To follow up further on these surprising findings, we now sought to test whether the context of scenarios can influence participants' access to readings.

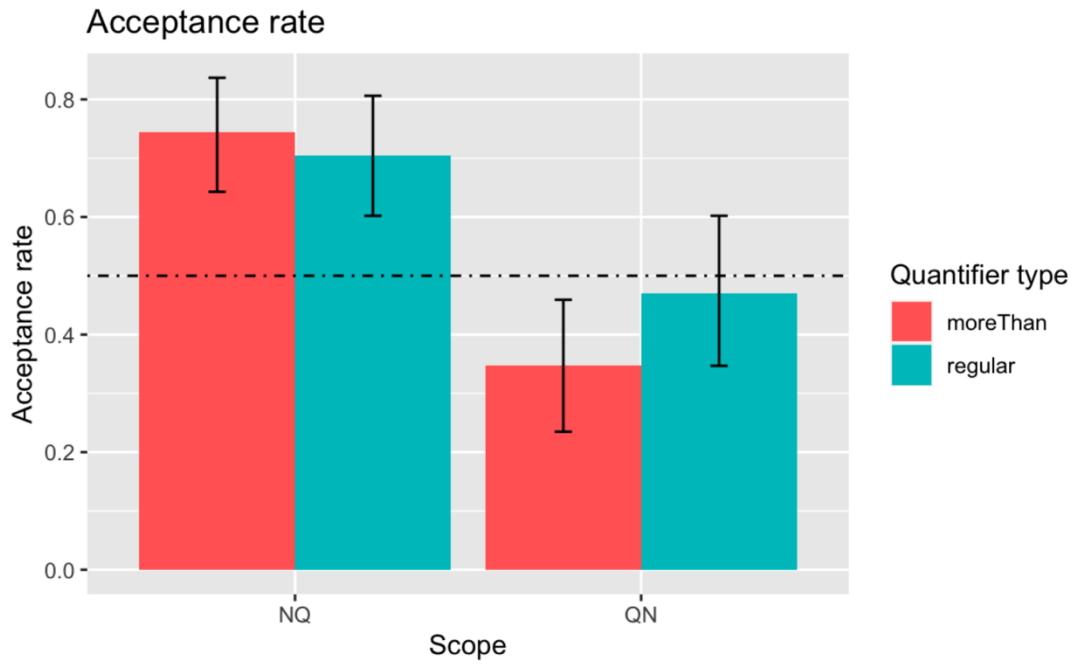


Figure 5: ***Acceptance rates (y-axis) for the scope readings (Neg>Q and Q>Neg, x-axis), by quantifier type (color).***

5.2. Follow-up study 2

5.2.1. Participants and Design

Participants were 40 (21 males, 19 females) adult Korean speakers (mean age: 31.4 years). The participants were recruited and participated in the experiment online, through a site that mainly targeted people who live or lived in Montreal, Canada. The majority of participants

had fewer than 3 years of exposure to English (10 participants had 0-1 year of exposure, 7 had 1-2 years of exposure, 10 had 2-3 years of exposure, and 13 had more than 3 years of exposure). The participants were given monetary reimbursements. For this follow-up study 2, everything else remained identical to follow-up study 1, but this time we also added a context that endorsed the scope reading of that particular trial and added filler trials.

5.2.2 Materials and procedure

Each participant completed the study online. They went through two practice trials that were unambiguous, and then completed eight test trials and eight filler trials presented in a pseudorandom order.

In each test trial, participants first saw a picture that had unaltered items (*e.g.*, paper intact, not crumpled up, as in Figure 6) and a description of the situation (*e.g.*, "These are Suyoon's paper. There are ten pieces of paper. Mom said that Suyoon needs to crumple all pieces of paper and throw them out. Wonder what happened next?" (see Gualmini, Hulsey, Hacquard, and Fox (2008) and the references cited there). Then, once the participant clicked the "Next" button, a second picture, as in Figure 7 (*e.g.*, five pieces of paper crumpled up and five pieces of paper intact), and description showed up with the test sentence (*e.g.*, Picture showing "Look what eventually happened. Based on this picture above, is this sentence true? 'Suyoon did not crumple up four or more pieces of paper.' "). Half of the test trials used "more than" quantifier and the other half used the standard numeral quantifier. Half of the test trials used short negation and the other half used long negation. All the test trials used a prenominal quantifier.

Figure 6: ***Sample image of first test scenario presented to participants***

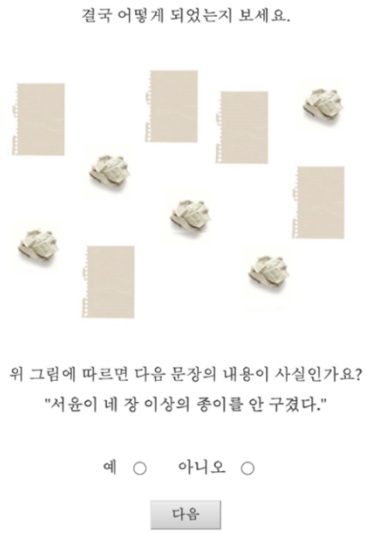


Figure 7: ***Sample image of second test scenario presented to participants***

5.2.3 Results and discussion

Based on the changes we made to the follow-up study 2, we now saw similar results to what we found in the main study: that approximately a quarter of the participants accepted both readings (Figure 8). Thus, while participants showed no sign of access to both readings under constraints that made it difficult to access them (Follow-up study 1), once the context became

supportive of accessing both readings, more participants accepted both readings simultaneously (Follow-up study 2).

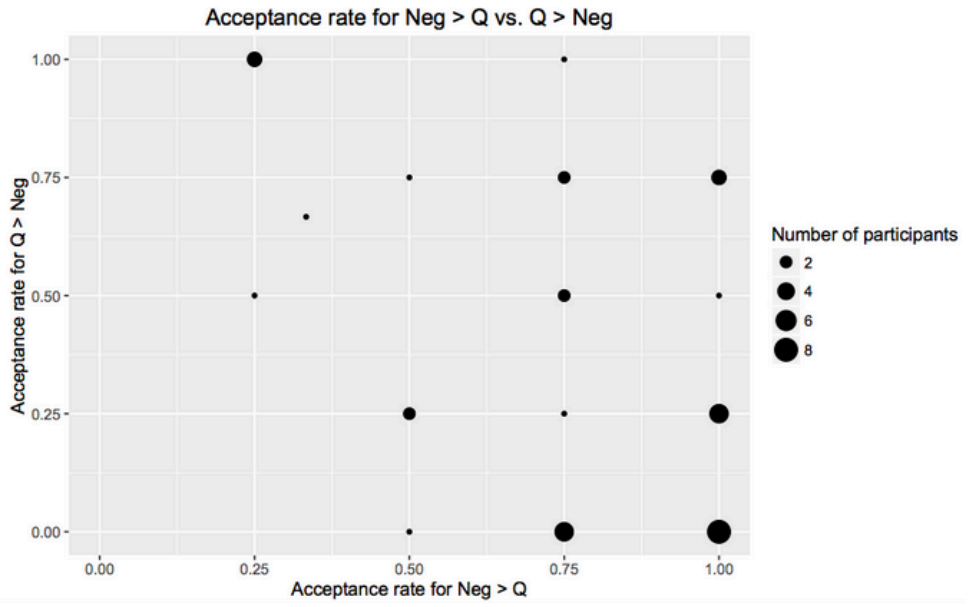


Figure 8 : ***Acceptance rates for scope readings, Neg>Q on x-axis and Q>Neg on y-axis. Size of dots represent the number of participants that accepted the two readings at the given particular rate (e.g., rightmost bottom dot means they accepted the Neg>Q reading at 100%, and Q>Neg reading at 0%, meaning they never accepted Q>Neg reading.***

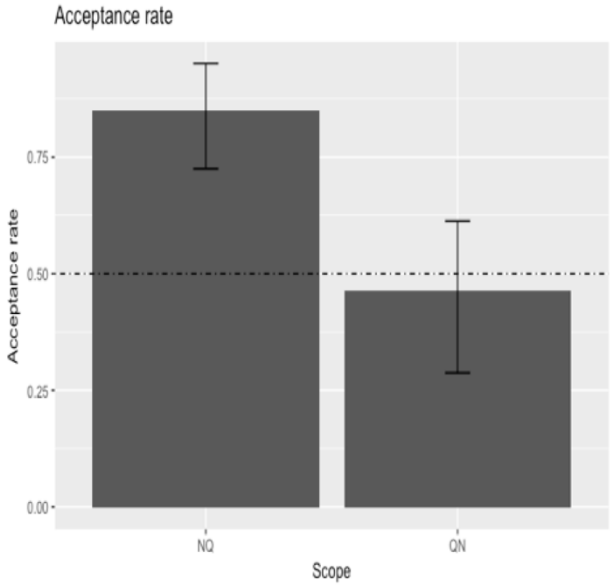


Figure 9: ***Acceptance rates (y-axis) for the scope readings (Neg>Q and Q>Neg, x-axis), by quantifier type (color).***

One interesting point to note is that even the contexts provided in the follow-up study 2 did not affect the response patterns significantly, retaining the pattern of one reading yielding close-to-ceiling acceptances and the other yielding roughly around 50%. This could mean that the particular contexts we currently use are, after all, not very supportive of the readings that were apparently endorsed, or that once participants have access to one reading over the other, it is difficult to access the other reading real-time.

Since a quarter of the participants did accept both readings (in both our main study and follow-up study 2, the results suggest that HLM's conclusion that all Korean speakers have exclusive access to only one of the two grammars, high negation or low negation, needs to be revisited.

The majority of participants accepted the Q>neg reading in the original HLM study and our main study, but this pattern flipped to the Neg>Q reading yielding more acceptances in the

follow-up studies 1 and 2. This could be due to the change in target sample demographics (i.e., participants are exposed to English more than the original target population), or the change in the experiment. Given the possibility for the former, this could be a major issue in case participants are too influenced by English, and thus have an "alternative path" to accessing both readings. However, it would then create a problem for the findings of the follow-up study 1 because most of the participants did NOT have access to both readings, they seemed to have exclusive access to one reading or the other.

(15) Kyengmin-i sey-kay isang-uy sangca-lul an yel-ess-ta. (short neg)

Kyungmin-Nom 3-Cl more-Gen box-Acc Neg open-Pst-Decl

'Kyungmin did not open three or more boxes.'

(16) Kyengmin-i sey-kay isang-uy sangca-lul yel-ci anh-ass-ta. (long neg)

Kyungmin-Nom 3-Cl more-Gen box-Acc open-Ci neg-Pst-Decl

'Kyungmin did not open three or more boxes.'

(17) *3 or more* > *not* reading (low negation): There are three or more boxes that Kyungmin did not open.

(18) *not* > *3 or more* reading (high negation): It is not the case that Kyungmin opened three or more boxes

5.3 Summary of the two follow-up studies

HLM predicts that people have exclusive access to one of the two possible readings, Q>neg or neg>Q. However, their studies had the problem of (i) between-subjects design and (ii)

entailment. In our main study, we removed both of these problems and found that there were indeed people who had access to both readings (approximately 25% of the sample).

In our follow-up study 1, we added another quantifier type to see if this pattern held. There were a few other changes to the procedure: (a) participants were recruited online, on a community website geared towards the Korean population living in North America. We included a questionnaire to survey how long the participants were exposed to English; (b) the study was posted online and involved pictures instead of videos; (c) the study had no filler trials.
The results of the follow-up study 1 showed that, surprisingly, no participant seemed to have access to both readings. Another surprising finding was that the majority of participants now consistently accepted the neg>Q reading, not the Q>neg reading. Though exclusion of filler trials was largely accidental, this helped show that possibly greater exposure to English did not make participants more likely to accept both readings.

Follow-up study 2 was an attempt to see if participants could access both readings based on the change of context. For each trial, a context was added to endorse the scope reading of that particular trial, and filler trials were added back in. Based on these changes, we now saw similar results to what we found in our main study: that approximately a quarter of the participants accepted both readings. Thus, while participants showed no sign of access to both readings under constraints that made it difficult to access both readings (follow-up study 1), once the context became supportive of accessing both readings, more participants accepted both readings simultaneously (follow-up study 2).

5.4 Remaining issues

Follow-up study 1 had zero participant accessing both readings. This is perhaps due to the lack of filter trials in-between, which made participants more "consistent" with their choice of scope acceptance. That is, once they decided to accept one reading, it was easier for them to retain that and reject the other reading in the following trials. Given that participants from the same pool showed different response patterns, that is, a quarter of the participants accepting both readings, this suggests that people have differential access to the readings depending on the context.

Even the contexts provided in the follow-up study 2 did not affect the response patterns significantly, retaining the pattern of one reading yielding close-to-ceiling acceptances and the other yielding around 50%. This could mean that the particular contexts we used are after all not very supportive of the readings that were apparently endorsed, or that once participants have access to one reading over the other, it is difficult to access the other reading real-time. Since a quarter of the participants did accept both readings (in the main study and follow-up study 2), it seems clear that speakers do have access to both scope readings, contra HLM's claim.

Finally, the majority of participants accepted Q>neg in the original HLM and our main study, but this pattern flipped to neg>Q yielding more acceptances in the follow-up studies 1 and 2. This could be due to the change in target sample demographics (i.e. participants are exposed to English more than the original target population), or the change in the experiment. Given the possibility for the former, this could be a major issue in case participants are too influenced by English syntax, and thus have an "alternative path" to accessing both readings.

6. Conclusion

This paper has shown that HLM's prediction was not borne out that removing an entailment relation in the two potential scope readings of test sentences would reveal the true picture of the two-grammar hypothesis, where the acceptance rate of each reading is about 50%. Moreover, the within-subjects design allowed us to verify individual speakers' scope judgment behavior, which did not fit with predictions made by the two-grammar hypothesis. Additionally, the results of our experiments challenge Zeijlstra (2022)'s analysis, where it is predicted that high negation readings that are not entailed by low negation readings such as those tested in our study (see Appendix A) are inaccessible. Since a portion of the Korean speaking population accepts high negation readings of Object QP sentences with numerical quantifiers, the variation in the population cannot be uniquely attributed to the polarity sensitivity of the universal quantifier.

The question remains as to why the Neg>Object QP (high negation) reading is often felt to be harder to access in Korean and Japanese, and whether the reason has to do with the grammar itself.[13] Additional research is needed to test Kim (2017) and Hildebrandt (2022)'s analyses of the I-lowering grammar as involving post-syntactic verb raising. The difficulty in accessing the Neg>Object QP (high negation) reading could also be due to the burden of inverse scope readings on working memory (Lee and O'Grady 2016). It remains to be seen how speakers would perform if they are given contexts biased toward the high negation reading. There is also a need for a finer-grained approach, where more attention is paid to the properties of individual scope bearing expressions (see, for example, Zeijlstra 2017), as well as to their syntactic environments.

Finally, in HLM's model, Korean speakers randomly set parameters either to low negation via I-lowering or to high negation via V-raising, because of the poverty of stimulus, namely that children do not get enough input that involves negation and object QPs where the intended interpretation is clear (HLM p. 2 & p. 35). It would be worth revisiting the question of whether this is a well-grounded assumption, in view of Gualmini and Schwarz (2009)'s discussions of what could count as positive evidence in the acquisition of semantics.

For example, evidence from dialogues may very well play a role. If sentence (19) was uttered to a child in a situation where she is in the middle of carrying cushions one by one from the living room to her own room, the intended meaning, *not>all*, seems clear enough.

(19) Zenbu motte-ika-nai-de yo! (Japanese)
all hold-go-Neg-TE Prt
'Don't take them all away!'

Likewise, if (20) was uttered when a parent notices that there is some rice left on the child's plate, it is clear that the parent meant *not>all*.

(20) Zenbu tabe-nakat-ta-ra, ookiku nar-e-nai yo.
all eat-Neg-Pst-if big become-can-Neg Prt
'If you don't eat (it/them) all, you wouldn't be able to become big.'

In both examples, specific contexts of utterance make it very clear where negation takes scope with respect to 'all'. Even if the child contests the parent's utterance by saying that she has only carried/eaten some, indicating that the child's interpretation of (19)/(20) was *all>not*, a subsequent dialogue could make it clear what the parent intended by, for example, using an unambiguous paraphrase.

Appendix A: Sentence Captions

(Note: here we provide sentences with only short negation and prenominal quantifiers for the lack of space, but all four types of sentences were shown to participants across trials)

(i) Yeca-ka sey-kwen-uy chayk-ul an phyel-chyess-ta.
Woman-Nom 3-Cl-Gen book-Acc Neg open-Pst-Decl
'The woman did not open three books.'

(ii) Yeca-ka sey-kay-uy suthikhe-lul an ttey-ess-ta.
Woman-Nom 3-Cl-Gen sticker-Acc Neg peel-Pst-Decl
'The woman did not peel off three stickers.'

(iii) Yeca-ka sey-kay-uy khep-ul an twicip-ess-ta.
woman-Nom 3-Cl-Gen cup-Acc Neg flip-Pst-Decl
'The woman did not flip three cups.'

(iv) Yeca-ka ney-kay-uy isswusikay-lul an pwulethu-lyess-ta.
woman-Nom 4-Cl-Gen toothpick-Acc Neg break-Pst-Decl
'The woman did not break four toothpicks.'

(v) Yeca-ka sey-kay-uy seymo-lul an chil-hayss-ta.
woman-Nom 3-Cl-Gen triangle-Acc Neg color-Pst-Decl
'The woman did not color three triangles.'

(vi) Yeca-ka ney-kay-uy pheyn-ul an ssess-ta.
woman-Nom 4-Cl-Gen pen-Acc Neg use-Pst-Decl
'The woman did not use four pens.'

(vii) Yeca-ka sey-kay-uy pheyn-ul an kkenayss-ta.
woman-Nom 3-Cl-Gen pen-Acc Neg take.out-Pst-Decl
'The woman did not take out four pens.'

(viii) Yeca-ka ney-cang-uy congi-lul an kwukyess-ta.
woman-Nom 4-Cl-Gen paper-Acc Neg crumple-Pst-Decl
'The woman did not crumple four (pieces of) paper.

Appendix B: Situation Clip Contexts

(ix) For sentence (i): Q>Neg: Out of six books, the woman opened three books.

Neg>Q: Out of four books, the woman opened two books.

(x) For sentence (ii): Q>Neg: Out of six stickers, the woman peeled three stickers.

Neg>Q: Out of four stickers, the woman peeled two stickers.

(xi) For sentence (iii): Q>Neg: Out of six cups, the woman flipped three cups.

Neg>Q: Out of four cups, the woman flipped two cups.

(xii) For sentence (iv): Q>Neg: Out of eight toothpicks, the woman broke four toothpicks.

Neg>Q: Out of six toothpicks, the woman broke three toothpicks.

(xiii) For sentence (v): Q>Neg: Out of six triangles, the woman colored three triangles.

Neg>Q: Out of four triangles, the woman colored two triangles.

(xiv) For sentence (vi): Q>Neg: Out of eight pens, the woman used four pens.

Neg>Q: Out of six pens, the woman used three pens.

(xv) For sentence (vii): Q>Neg: Out of six pens, the woman took out three pens.

Neg>Q: Out of four pens, the woman took out two pens.

(xvi) For sentence (viii): Q>Neg: Out of eight (pieces of) paper, the woman crumpled four.

Neg>Q: Out of six (pieces of) paper, the woman crumpled three.

References

Begheli, Filippo. 1995. *The phrase structure of quantifier scope.* Doctoral dissertation, University of California, Los Angeles, CA.

Crain, Stephen, and Rosalind Thornton. 1998. *Investigations into universal grammar: A guide to research in acquisition of syntax and semantics*. Cambridge, MA: MIT Press.

Fodor, Janet Dean, and Ivan Sag. 1982. Referential and quantificational indefinites. *Linguistics and philosophy* 5:355–398.

Gibson, Edward, Ev Fedorenko, Steven Piantadosi, and Andrea Gualmini. 2011. Intersubject variability in the ability to use context during language comprehension. In *The 24th Annual Conference on Human Sentence Processing*. Stanford, CA.

Goro, Takuya. 2007. *Language-specific constraints on scope interpretation in first language acquisition*. Doctoral Dissertation, University of Maryland, College Park.

Gualmini, Andrea, Sarah Hulsey, Valentine Hacquard, and Danny Fox. 2008. The question-answer requirement for scope assignment. *Natural Language Semantics* 16:205–237.

Gualmini, Andrea, and Bernhard Schwarz. 2009. Solving learnability problems in the acquisition of semantics. *Journal of Semantics* 26:185–215.

Hagstrom, Paul. 1995. Negation, focus, and *do*-support in Korean. Ms., MIT.

Han, Chung-hye. 2008. An experimental investigation into the placement of the verb in Japanese and Korean. In *Proceedings of the International Conference on East Asian Linguistics*, ed. Kyumin Kim Sarah Clarke, Manami Hirayama and Eugenia Suh, Toronto Working Papers in Linguistics 28, 71–87. University of Toronto.

Han, Chung-hye, Jeffrey Lidz, and Julien Musolino. 2007. Verb-raising and grammar competition in Korean: Evidence from negation and quantifier scope. *Linguistic Inquiry* 38:1–47.

Han, Chung-hye, Jeffrey Lidz, and Dennis Ryan Storoshenko. 2011. Variation in negation and quantifier scope judgments in Korean. In *Proceedings of the Annual Meeting of the Chicago Linguistic Society (CLS) 47*. Chicago, IL: University of Chicago, Chicago Linguistics Society.

Han, Chung-hye, Julien Musolino, and Jeffrey Lidz. 2016. Endogenous sources of variation in language acquisition. *Proceedings of the National Academy of Sciences* 113:942–947.

Han, Chung-hye, Dennis Ryan Storoshenko, and Yasuko Sakurai. 2004. Scope of negation, and clause structure in Japanese. In *Berkeley Linguistics Society (BLS) 30*, ed. Marc Ettlinger, Nicholas Fleisher, and Mischa Park-Doob, 118–129. Berkeley, CA: Berkeley Linguistics Society.

Han, Chung-hye, Dennis Ryan Storoshenko, and Yasuko Sakurai. 2008. An experimental investigation into the syntax of negation in Japanese. *Language Research* 44:1–31.

Hildebrandt, Gwen. 2022. " Syntactic and Post-Syntactic Verb-Raising in Korean: Correlations Between Judgments of Negation Scope and Verb-Stranding Ellipsis." Volume 28 of *Japanese/Korean Linguistics.*

Hirotani, Masako. 2004. *Prosody and LF: Processing Japanese wh-questions*. Doctoral Dissertation, University of Massachusetts, Amherst, MA.

Imani, Ikumi. 1993. Nihongo-no jooken-hyoogen. In *Hitei-ryookabun-o zenken-ni motsu jookenbun-ni tsuite (on conditional clauses including quantifiers and negative elements)*, ed. by Takashi Masuoka. Tokyo: Kurosio.

Ishihara, Shinichiro. 2007. Major phrase, focus intonation, multiple spell-out (MaP, FI, MSO). *Linguistic Review* 24:137–167.

Jun, Sun-Ah, and Mira Oh. 1996. A prosodic analysis of three types of wh-phrase in Korean. *Language and Speech* 39:37–61.

Kim, Ae-Ryung. 2002. Two positions of negation in Korean. In *Syntax and semantics*, ed. Noriko Akatsuka and Susan Strauss, volume 10 of *Japanese/Korean Linguistics*, 587–600. Stanford, CA: CSLI Publications.

Kim, Meesook, Chung-hye Han, Jeffrey Lidz, and Julien Musolino. 2008. Korean children's interpretation of sentences containing 'every' and 'not'. In *Japanese Korean Linguistics volume 13*, ed. Mutsuko Endo Hudson, Peter Sells, and Sun-Ah Jun. CSLI Publications, Stanford.

Kim, Shin-sook and Peter Sells. 2007. Reconstruction and scope of negation in Korean (and Japanese). In the *Workshop on Altaic Formal Linguistics* (WAFL), ed. MIT Working Papers in Linguistics 62 Andrew Simpson, volume 7. Cambridge, MA: MIT, MIT Working Papers in Linguistics.

Kim, Taehoon H. 2017. *An Experimental Study of Phonological Variation and Variation in Scope Judgments in Korean*. Master's thesis. University of California, Los Angeles.

Kratzer, Angelika. 1998. Scope or pseudoscope? Are there wide-scope indefinites*? Events and grammar* 163–196.

Kwak, Hye-Young. 2010. *Scope interpretation in first and second language acquisition: Numeral quantifiers and negation*. Doctoral Dissertation, University of Hawai'i, Manoa, Honolulu, HI.

Lee, Sunyoung and William O'Grady. 2016. Psycholinguistic Evidence for Inverse Scope in Korean. *Journal of Psycholinguistic Research 45*, 871–882. https://doi.org/10.1007/s10936-015-9380-4

Marty, Paul, Emmanuel Chemla, and Benjamin Spector. 2013. Interpreting numerals and scalar items under memory load. *Lingua* 133:152–163.

Muromatsu, Keiko. 1998. *On the syntax of classifiers*. Doctoral Dissertation, University of Maryland, College Park, MD.

Musolino, Julien, and Jeffrey Lidz. 2002. Preschool logic: truth and felicity in the acquisition of quantification. In *Proceedings of the 26th Boston University Conference on Language Development*, ed. S. Fish B. Skarabela and A. H. J. Do, 406–416. Somerville, MA: Cascadilla Press.

Nomura, Junya. 2013. DP-internal movements and floating quantifiers in Japanese. In *Proceedings of the 8th Workshop on Altaic Formal Linguistics (WAFL 8)*, MIT Working Papers in Linguistics 67, ed. Umut ¨Ozge. Somerville, MA: MITWPL.

Ochi, Masao. 2012. Numeral classifiers, plural/collective elements, and nominal ellipsis. *Nanzan Linguistics* 8:89–107.

Papafragou, Anna, and Julien Musolino. 2003. Scalar implicatures: Experiments at the semantics-pragmatics interface. *Cognition* 86:253–282.

Reinhart, Tanya. 1997. Quantifier scope: How labor is divided between QR and choice functions. *Linguistics and philosophy* 20:335–397.

Ruys, E.G., and Yoad Winter. 2011. Quantifier Scope in Formal Linguistics. *Handbook of Philosophical Logic* 16:159–225.

Sato, Yosuke, and Masako Maeda. 2021. Syntactic head movement in Japanese: Evidence from verb-echo answers and negative scope reversal. *Linguistic Inquiry* 52:359-376.

Schwarz, Bernhard. 2011. Long distance indefinites and choice functions. *Language and Linguistics Compass* 5:880–897.

Takahashi, Shoichi. 2006. More than two quantifiers. *Natural Language Semantics* 14:57-101.

Winter, Yoad. 1997. Choice functions and the scopal semantics of indefinites. *Linguistics and philosophy* 20:399–467.

Yoon, Erica J., and Junko Shimoyama. 2013. The two-grammar model for Korean and its consequences. In *Proceedings of the 8th Workshop on Altaic Formal Linguistics (WAFL 8)*, MIT Working Papers in Linguistics 67, ed. Umut Özge, 381–393. Somerville, MA: MITWPL.

Zeijlstra, Hedde. 2017. Two varieties of Korean, or the ban against rightward head movement. Poster presented at NELS 47.

Zeijlstra, Hedde. 2022. Two Varieties of Korean: Rightward Head Movement or Polarity Sensitivity? *Linguistic Inquiry* 1–20.

FOOTNOTES

[*Acknowledgments to be added later.]

[1] Though subject QPs are also looked at, they are not relevant to the main concerns in this paper.

[2] A similar claim is made for Japanese as well in Han (2008) and Han, Storoshenko, and Sakurai (2004, 2008) and some of the points we will raise below for HLM's analysis of Korean carry over to their analysis of Japanese. See also follow-up studies on the two-grammar hypothesis, such as Han, Lidz, and Storoshenko (2011) and Han, Musolino, and Lidz (2016).

[3] If only half of the speakers indeed had the low negation (i.e., neg>Q only) grammar as claimed by HLM, we would run into immediate problems with certain scope-bearing expressions in Korean and Japanese (e.g., *only, also, or*, etc.) whose preferred interpretation is narrow scope negation, as in (i). We would like to thank Shin-sook Kim and Hideaki Yamashita for drawing our attention to such data (see Goro 2007 for scope properties of disjunction in Japanese).

(i) Hanako-wa Mari-mo shootaishi-nakat-ta. (Japanese)

Hanako-WA Mari-also invite-not-past

'Mari also, Hanako didn't invite.'

[4] Reversing entailment is also predicted to lead to a different judgment pattern, namely, the pattern where the Object QP>Neg reading is accepted by about 50% of the population, while the Neg>Object QP reading is accepted by close to 100% of the population. This can in principle be tested by replacing a universal QP with an existential QP, but we have not tested the predictions

as complications arise (i) due to the positive polarity nature of muwun-ka ‘something’ and (ii) due to an extra existence assumption that needs to be added to a scenario.

[5] From here on, we use an-at-ta ‘NEG-PST-DECL’ in our examples, as opposed to ani-ha-yess-ta ‘NEG-do-PST-DECL’ used in HLM. The former is assumed to be a phonological contraction of the latter (Hagstrom 1995) and is more common than the non-contracted form in spoken Korean.

[6] When this group of speakers (i.e., high negation grammar speakers) accept test sentences in the every>not context by suppressing scalar implicature computation, it is expected that it involves less effort (in terms of response time and less memory cost) than when they compute scalar implicature. See, for instance, Marty, Chemla and Spector (2013) and the references there.

[7] HLM explains that they used the between-subjects design to avoid the issue of the ‘contaminating effect’ when speakers are exposed to two different readings during one study session: “once participants become aware of one of the possible interpretations for these statements, they may later find it difficult to assign a similar statement a different interpretation. In other words, the initial interpretation that participants assign to statements containing a QP and negation may influence the way they interpret subsequent statements containing the same elements. (p. 27)” However, this so-called contaminating effect remains in their procedure, because once participants become aware of one of the possible interpretations for these statements, they may find it difficult to reject a similar interpretation to a similar statement. Hence, a potential contaminating effect continues to exist regardless of design. However, if the two-grammar model is correct, that is, if each speaker has exclusive access to one reading, then there should be no contaminating effect since the speaker could not have access to the other

reading. We used the within-subjects design with the counterbalanced scope condition, such that a half of the speakers were presented with Q>Neg in the first test trial, and the other half with Neg>Q.

[8] See Kim, Han, Lidz, and Musolino (2008) for a higher acceptance rate (76.7%) for the not>every reading with long negation.

[9] We did not use 'floating' numeral quantifiers, which follow a case-marked NP (e.g., kup-eul se-jan 'cup-ACC 3-CL'), because there is a possibility that they do not form a constituent with the NP (see Yoon and Shimoyama (2013)). Even though there was no interaction between scope and quantifier type, as reported in section 5, this may simply mean that this type of experiment failed to reveal subtle variations. More careful considerations are necessary regarding interpretive properties of different forms of numeral quantifiers (see, e.g., Muromatsu 1998, Kwak 2010, Ochi 2012, Nomura 2013). For comments and discussions on this point, we would like to thank Junya Nomura and John Whitman.

[10] In an effort not to affect the participants' judgments, we avoided the use of voiced reading of sentences, thereby departing from HLM's design (see, for instance, Hirotani 2004, Ishihara 2007, Jun and Oh 2006). We would like to thank Shin Ishihara and Duygu Özge for comments and pointers on this issue.

[11] There were three speakers who primarily accepted neg>Q: one speaker who only accepted neg>Q, and two speakers who accepted neg>Q 100% of the time and Q>neg only 25% of the

time. There was only one speaker who showed an anomalous pattern of responses, with the acceptance rate of 50% to neg>Q and 25% to Q>neg.

[12] In the following sentence, the two types of numeral quantifiers we used indeed seem to take non-local scope out of the relative clause island as in (b), while the modified numeral 'n or more' does not.

(i) {{Mit-tsu-no shitsumon/shitsumon mit-tsu} / mit-tsu-ijoo-no shitsumon}-ni kotae-ta

3-CL-GEN question/question 3-CL / 3-CL-or.more-GEN question-DAT answer-PAST

dono kodomo-mo gohoobi-o morat-ta.

which child-every reward-ACC receive-PAST

'Every child who answered {three questions/three or more questions} received a reward.'

(a) Each child who answered any three/three or more questions received a reward. ('three (or more) questions' interpreted within the relative clause)

(b) There are three/three or more questions such that each child who answered them/any of them received a reward. ('three (or more) questions' interpreted outside the relative clause)

[13] See Imani (1993), where it is pointed out that a high negation reading is easily obtained in Japanese in the antecedent of conditionals. It should also be pointed out that negation is interpreted high in so-called Verb-Echo answers discussed in Sato and Maeda (2021).

[14] As it stands, massive miscommunication is expected among Korean speakers in the current model of HLM. For example, imagine that speaker A of high negation Korean converses with speaker B of low negation Korean as in (i). Though A's intended interpretation was *not>every*, B can only interpret A's utterance as conveying the *every>not* meaning.

(i) Speaker A [high neg]: I did not read every article. (intended: not>every)
Speaker B [low neg]: I told you to read at least some! (interpreted: every>not)