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An Experimental Study of Phonological Variation and Variation in Scope Judgments in Korean

Author
Kim, Taehoon Hendrik

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An Experimental Study of Phonological Variation and Variation in Scope Judgments in Korean

A thesis submitted in partial satisfaction
of the requirements for the degree
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by

Taehoon Hendrik Kim

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ABSTRACT OF THE THESIS

An Experimental Study of Phonological Variation and Variation in Scope Judgments in Korean

by

Taehoon Hendrik Kim
Master of Arts in Linguistics
University of California, Los Angeles, 2017
Professor Hilda Koopman, Co-Chair
Professor Robert Theodore Daland, Co-Chair

Korean speakers split into two groups regarding how they interpret a negative sentence with a quantified object, such as *The boy didn't eat every cookie* (Han et al. 2007). For a scenario in which a boy eats some but not all cookies, some speakers regard the sentence as a truthful description of the scenario, while other speakers do not. In other words, only the former accepts the wide scope reading of negation (the not>every reading). One hypothesis of this fact is that each group of speakers has a different grammar, where the distinction rests on whether the verb moves to T or not; this is Han et al.'s (2007) two-grammar hypothesis. Certain theories of the syntax-phonology interface (e.g. Samuels 2011) predict that the grammatical split should be accompanied by a phonological split. Specifically, the prediction is that the Post-Obstruent Tensing process in Korean for speakers who reject the not>every reading should be blocked from applying between the transitive verb and the object of a simple declarative sentence. A two-part experiment composed of a truth-value judgment task and a production task was conducted to test the prediction. The result reproduced the findings of Han et al. (2007) and showed that speakers' scope judgments have no notable correlation with the occurrence of Post-Obstruent Tensing. In the discussion, alternative theories of the syntax-phonology interface and problematic aspects of the two-grammar hypothesis are considered.

The thesis of Taehoon Hendrik Kim is approved.

Sun-Ah Jun

Robert Theodore Daland, Committee Co-Chair

Hilda Koopman, Committee Co-Chair

University of California, Los Angeles

2017

To all past, present, and future researchers of the syntax-phonology interface

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LIST OF ABBREVIATIONS

ACC	accusative
AdvP	adverbial phrase
AP	Accentual Phrase
C	complementizer head
COMP	complementizer
CP	complementizer phrase
DEC	declarative
DO	direct object
DP	determiner phrase
IMP	imperative
IMPRF	imperfective aspect
LF	Logical Form
NEG	negation
NOM	nominative
NP	noun phrase
PF	Phonological Form
PIC	Phase Impenetrability Condition
POT	Post-Obstruent Tensing
PST	past tense
Q	question particle
T	tense head
TP	tense phrase
V	verb
v	light verb
VOT	voice onset time
VP	verb phrase
vP	light verb phrase

ACKNOWLEDGMENTS

With this thesis marking the end of the first two stimulating (and sleepless) years of studies at UCLA, I want to thank those who got me through. I am evermore grateful to the guidance I received from the members of my committee. Robert Daland has been an amazing advisor for me. No one but Robert has handed my research paper back to me with a multiple-page-long comment that contains intricately formulated plans to improve the paper, and is critical and encouraging at the same time; that paper has become this thesis. He always carefully listened to me and understood what I said, and grew the experimentalist in me. Hilda Koopman is primarily responsible for broadening my perspective on the range of possible syntactic analyses. I try to model myself on Hilda with regard to her enthusiasm and skepticism. When I sat down with her for the first time to talk about the ideas that turned into this thesis, she patiently listened to me and helped me seeing the unseen problems; and the same has happened to me every time I have sat down with her with any topic. I am very lucky to have her as my advisor along with Robert. I thank her for tending to the syntactician in me. Sun-Ah Jun—Professor Jun—knows everything about intonation. I cannot be more fortunate to learn intonational phonology directly from her and to have her in my committee. There is no one other than Professor Jun who had a bigger influence on my thoughts about the syntax-phonology interface. I thank her for sharing her wealth of knowledge. I would like to thank an unofficial member of my committee, Tim Hunter. Tim has generously given his time to read my drafts, and to share his solutions to my problems.

A special thanks goes to my friend and colleague, Luke West, for being there in times of need.

SECTION 1

Introduction

A recent theory of the syntax-phonology interface proposed by Samuels (2009, 2011) argues that there is no need for the Prosodic Hierarchy (see, e.g., Selkirk 1984, 1986, Nespor & Vogel 1986) because phonological domains correspond to spell-out domains within the Phase Theory (Chomsky 2000, 2001 et seq.), which makes it thus redundant.[1] Samuels's proposal makes a number of strong predictions about phonological process application. Among these predictions, the one that will form the focus of this thesis is that when speakers assign two different syntactic structures to a single string, each of the two structures may be associated with a different phonetic outcome—sometimes with very subtle distinctions. In this thesis, I will experiment with an interesting way in which this prediction could be tested. This begins with a short description of a series of experiments by Han et al. (2007, 2016).

Han et al. show that sentences like (1), which contain negation and a quantified object, are—in principle—ambiguous between the wide scope reading of universal quantifier in (i) ("every>not reading") and the wide scope reading of negation in (ii) ("not>every reading").[2,3]

(1) namca-ka motun khwukhi-lul an mek-ess-ta
man-NOM every cookie-ACC NEG eat-PST-DEC
i. 'The man didn't eat any cookies.' (every > not)
ii. 'The man didn't eat all cookies.' (not > every)

The general problem was that some speakers accept both readings while the other speakers reject

[1]Pak (2008) also argues for a phase-based interface theory that eliminates the need for prosodic constituency, although the way in which phonological domains are defined is different from Samuels's proposal.

[2]I will use Yale Romanization to transcribe Korean examples in general, otherwise I will use IPA in order to elucidate phonological/phonetic environments.

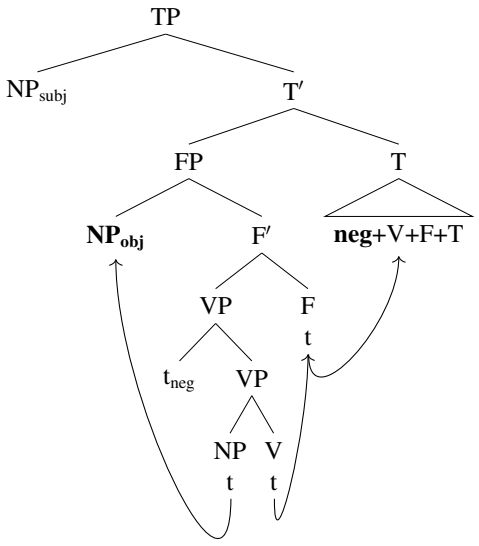
[3]There are two types of negation in Korean: preverbal and post-verbal negation. I discuss them in more detail in section 2.1.1.

the not>every reading. Han et al. used a truth-value judgment task (Crain & Thornton 1998) with sentences like (1) in order to find an explanation for this problem. In the results, Han et al. found that about half of Korean speakers reject the not>every reading, whether they are children or adults.[4] Therefore, Han et al. argue that this asymmetry in scope judgments reflects a population-level split in grammars: speakers who accept the not>every reading have a V-raising grammar, while speakers who reject the not>every reading have a non-V-raising grammar. This account crucially relies on the following assumptions about the grammar of Korean:

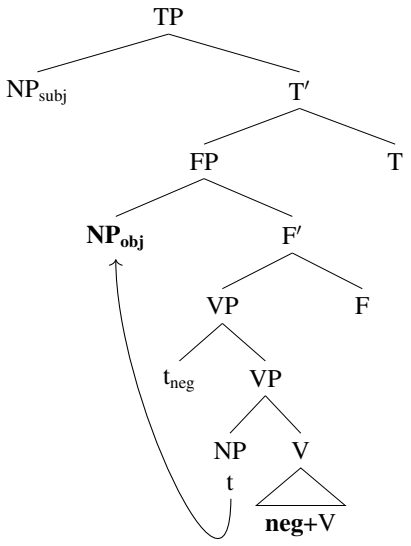
- the scope of a quantified phrase is determined at its surface position
- the object obligatorily moves to a position higher than VP/vP but lower than the subject
- the preverbal negation cliticizes onto the verb in syntax
- whether V-to-T movement occurs or not depends on the speaker

Trees (2) and (3) reflect the structure containing preverbal negation under these assumptions, where (2) is generated by the V-raising grammar and (3) by the non-V-raising grammar. I will assume that each speaker has exactly one of these two structures.[5]

(2)



(3)



[4]Furthermore, Han et al. (2016) found that a speaker's judgments are consistent across multiple test sessions, and children's judgments are not predicted by those of their parents.

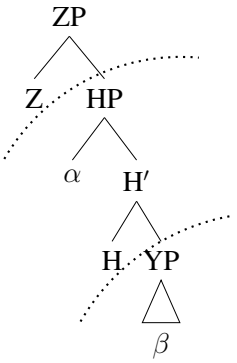
[5](2) and (3) are from Han et al.'s (2007: 21) (45c) and (45b), respectively, with minor modifications.

In short, Han et al.'s account yields the following equivalences:

(4) a. Speakers with obligatory V-raising $\Longleftrightarrow$ accept the not>every reading
b. Speakers without V-raising $\Longleftrightarrow$ reject the not>every reading

This variation, combined with the proposal by Samuels (2011), leads to an interesting prediction. According to Samuels, post-lexical phonological processes (phonological processes above the word level) obey the Phase Impenetrability Condition (Chomsky 2001), defined in (5), where Z and H are phase heads:

(5) *Phase Impenetrability Condition* (Chomsky 2001: 13)



The domain of H is not accessible to operations at ZP; only H and its edge α (the specifiers and adjuncts of H) are accessible to such operations

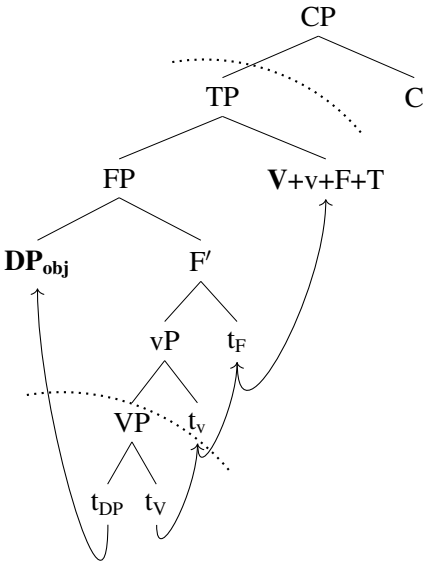
The important consequence of PIC for us is that the phonological content of YP (= the Spell-Out domain of H) and the phonological content of HP excluding YP (= the Spell-Out domain of Z) will each be spelled out at a different point, so that β is spelled out at a point different from the point at which α and H are spelled out.

If Han et al. (2007, 2016) are correct in that there is syntactic variation regarding V-to-T movement in Korean, Samuels's (2011) theory predicts, broadly speaking, that only one group of Korean speakers, and not the other, exhibit post-lexical phonological processes in specific environments, given the same sentence.

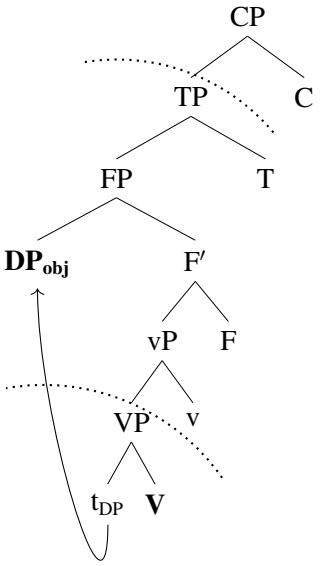
As a first step to making a testable prediction, I will limit 'specific environments' to between the verb and the direct object in a simple declarative sentence with a transitive verb. Then, in the utterance of such sentence by speakers who accept the not>every reading, we predict the occurrence of phonological processes that may apply between the verb and the object. This is because, as illustrated in (6), the V and the object (DP_{obj}) are in the same Spell-Out domain, so that they would

be spelled out together. On the other hand, we do not predict the occurrence of such phonological processes in the utterance of the same sentence by speakers who reject the not>every reading. As shown in (7), this is because the V and the object are not in the same Spell-Out domain for these speakers, so that each would be spelled out at a different point.[6] In both trees, dotted arcs indicate spell-out domains.

(6) *V-raising grammar*



(7) *Non-V-raising grammar*



Next, I will limit 'post-lexical phonological processes' to Post-Obstruent Tensing (Kim-Renaud 1974, Cho 1987, Kang 1992, Inkelas & Cho 1993, Cho & Inkelas 1994, Jun 1993, 1996, 1998, Kim 2001), a phonological rule in which a lenis obstruent becomes a tense obstruent after another obstruent—applying both lexically, as in (8a), and post-lexically, as in (8b)[7]. Relevant obstruents are underlined and tense obstruents are indicated with ' in (8).

(8) a. /hak+tɕa/ → [haktɕ'a] 'scholar'
/pak+sa/ → [paks'a] 'doctor'

b. /tɛhak ka-as'-ʌ/ → [tɛhak k'as'ʌ] 'started college'
college go-PST-DEC
/tɕʰɛk pili-ʌs'-ʌ/ → [tɕʰɛk p'illjʌs'ʌ] 'borrowed a book'
book borrow-PST-DEC

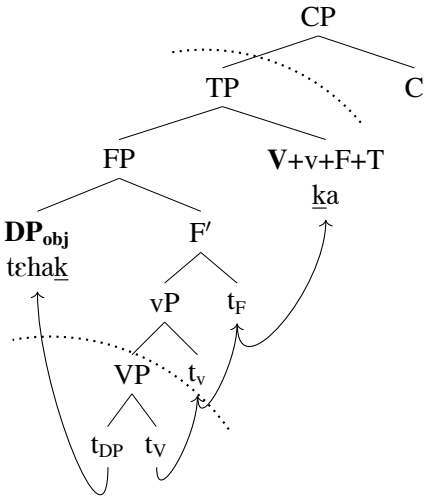
[6] I assume that a transitive verb does not need to move to v. See fn. 19 (section 2.2) for further discussion.

[7] When the rule applies post-lexically, both words need to be within the same Accentual Phrase (see section 2.3).

Consequently, a specific, testable prediction we arrive at is the following:

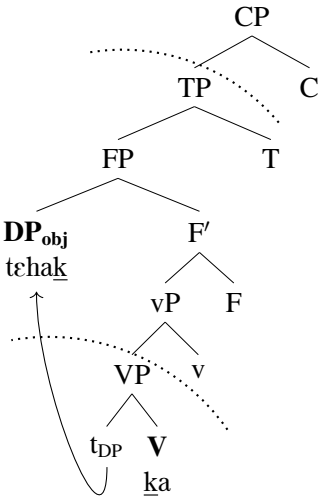
- When speakers who accept the not>every reading utter a simple declarative sentence with a transitive verb immediately preceded by the direct object with a word-final lenis obstruent, a word-initial lenis obstruent of the verb would undergo Post-Obstruent Tensing—see (9).
- When speakers who reject the not>every reading utter the same sentence, the word-initial lenis obstruent of the verb would not undergo Post-Obstruent Tensing—see (10).

(9) *V-raising grammar*



⇒ [tɛhak **k'**a], (8b: 1st example)

(10) *Non-V-raising grammar*



⇒ [tɛhak **k**a]

In summary, if Han et al. (2007, 2016) and Samuels (2011) are both correct, we would predict that only one group of Korean speakers, and not the other, would show Post-Obstruent Tensing between the verb and its direct object, given a simple declarative sentence with a transitive verb. In other words, the acceptance of the not>every reading is predicted to correlate with the occurrence of Post-Obstruent Tensing (POT). So, the linkage between Han et al.'s and Samuels's account to phonological predictions yields the following equivalences, extending (4):

(11) a. V-raisers ⟺ accept not > every ⟺ POT between DO & V
b. Non-V-raisers ⟺ reject not > every ⟺ no POT between DO & V

To test this prediction, I ran an experiment. This thesis reports the details of the experiment and discusses the result and its implications.

Section 2 reviews Han et al. (2007) and Samuels (2011) with the focus on highlighting the important aspects of them.

Section 3 details the experiment and reports the result along with a discussion. This twofold experiment was composed of the truth-value judgment task and the sentence production task. The result of the truth-value judgment task reproduced the result of Han et al.'s (2007) experiment with adults. And the result of the sentence production task showed that the prediction was not borne out: There was no correlation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing.

In section 4, I raise and address the following question: Given the lack of correlation between scope judgments and Post-Obstruent Tensing, which proposal, between Samuels (2011) and Han et al. (2007), should we choose to reject? I discuss each proposal in regard to its tenability, considering some thorny problems for each: (i) Samuels's theory lacks a way to take account of extragrammatical factors like speech rate, which heavily influences the domain of Post-Obstruent Tensing; and (ii) Han et al.'s analysis relies on the assumption that the preverbal negation cliticizes to the verb in syntax, which becomes doubtful considering the facts about the relative scope between the adverb *cal* 'often' and the preverbal negation.

Section 5 concludes.

SECTION 2

Background

2.1 Han et al. (2007, 2016): "Grammar competition" in Korean

There has been a split in the literature with respect to the existence of V-raising in Korean. One of the main reasons that it is difficult to conclude that V raises in Korean is that it is an OV language, and so the standard diagnostic tool for determining the position of verbs (i.e. studying the order between verbs and adverbs) does not work. In the literature, some linguists have argued that V raises in Korean (e.g., Otani & Whitman 1991, Park 1992, Cho 1994, Yi 1994, Choi 1999, Koisumi 2000), while others have argued that it does not (e.g., Yoon 1994, Han & Park 1995, Park 1998).

Han et al. (2007), however, claim that none of the phenomena that linguists of both parties have looked at, such as null object constructions, scrambling and coordination, negative polarity item licensing, and coordination of an untensed conjunct with a tensed one, serves as conclusive evidence for the (non-)existence of V-raising in this language, because all of such data are compatible with both a V-raising analysis and a non-V-raising analysis.

Instead, they seek to answer the question of whether there is V-raising in Korean by looking at the scope interaction between negation and a quantified object. On the basis of adult and children Korean speakers' scope judgements elicited using the truth-value judgment task (Crain & Thornton 1998), they conclude that there is a split in the population of Korean speakers with respect to the status of V-raising.

In this section, I will first review the structure of negation as assumed by Han et al. (2007) (section 2.1.1) and then review their experiments along with the results (section 2.1.2).

2.1.1 Negation

Korean has two forms of negation: preverbal negation ("short form negation"), as in (12a), and post-verbal negation ("long form negation"), as in (12b).

(12) a. *Preverbal negation ("short form negation")*
Inho-ka phica-lul an mek-ess-ta
Inho-NOM pizza-ACC NEG eat-PST-DEC
'Inho did not eat pizza.'
b. *Post-verbal negation ("long form negation")*
Inho-ka phica-lul mek-ci anh-ass-ta
Inho-NOM pizza-ACC eat-COMP NEG-PST-DEC
'Inho did not eat pizza.'

In preverbal negation, the negative marker *an* shows up immediately to the left of the verb. On the other hand, in post-verbal negation, the negative auxiliary verb *anh* (see Sells 1995: 305) follows the verb suffixed with *ci*.[8] In what follows, I will limit the discussion to Han et al.'s (2007) analysis of preverbal negation, as it is sufficient for the purpose of this thesis.

There are four key assumptions Han et al. make about the grammar of Korean, as in (13).[9]

(13) a. the scope of a quantified phrase is determined at its surface position
b. the object obligatory moves to a position higher than VP/vP but lower than the subject
c. the preverbal negation cliticizes onto the verb in syntax
d. whether V-to-T movement occurs or not depends on the speaker

The first assumption is that the scope of a quantifier in a sentence with canonical order (i.e. without scrambling) is determined at its surface, or post-movement, position (as opposed to its base, or pre-movement, position) in overt syntax (Han et al. 2007: 15–16).[10] In other words, there will be no quantifier raising of a quantified argument at LF, and a quantified argument cannot be assumed to undergo reconstruction unless it is scrambled—these are so-called "frozen scope" effects.

[8]The exact nature of the suffix *ci* that shows up on the verb with post-verbal negation has been debatable, at least since Song (1967, 1971, 1973). I gloss it as COMP, a complementizer.

[9]See Han et al. (2007: 15–22, sect. 3.2) for the first three assumptions (13a–13c), and Han et al. (2007: 31–35, sect. 4.1.6) for the fourth assumption (13d).

[10]Han et al. admit that the inverse scope is possible in sentences involving scrambling. See Han et al. (2007: 15, fn. 4) for discussion.

The second assumption is that the object must always move to a position higher than VP/vP but lower than the subject, namely, Spec,FP, for Case reasons (Han et al. 2007: 20), which is based on the examples in which the adverb *cal* 'often' appears to always need to immediately follow the object (Han et al. 2007: 16–17, ex. 38) and the binding data in which the long-distance scrambled object cannot be coreferential with the R-expression in a c-commanding adjunct clause (Han et al. 2007: 17, ex. 40). The subject is assumed to be higher than the object and negation, i.e., in Spec,TP (Han et al. 2007: 19–20).[11]

The third assumption is that preverbal negation is adjoined to VP/vP and is a clitic that cliticizes to the verb in overt syntax (Han et al. 2007: 17–21). This is based on the examples in which preverbal negation appears to need to always immediately precede the verb (Han et al. 2007: 17, ex. 41–43) and the acquisition data from 2- to 3-year-old children in which preverbal negation does not appear adjacent to the verb (Han et al. 2007: 18, ex. 44).[12]

The tree in (14) illustrates the abstract structure of preverbal negation in a simple declarative sentence with a transitive verb, and begins to illustrate the fourth assumption. More precisely, (14) is non-V-raising speakers' structure of preverbal negation. Although the preverbal negation cliticizes to the V from its VP-adjoined position, the V does not move to T in (14).[13] Importantly, the scope of negation in relation to the quantified argument will be determined by the position of negation in overt syntax.[14] Therefore, negation cannot take scope over the object in (14), because the preverbal negation does not c-command the object. This accounts for why some Korean speakers

[11]With regard to the issue of subject movement to TP in languages like Korean and Japanese, namely, the debate on whether the subject raises to Spec,TP from a VP-internal position or it is base-generated in Spec,TP, Han et al. are not committed to a specific assumption and they make it clear that whichever analysis that places the subject higher than the object and negation should suffice them. See Han et al. (2007: 20, fn. 9) for discussion.

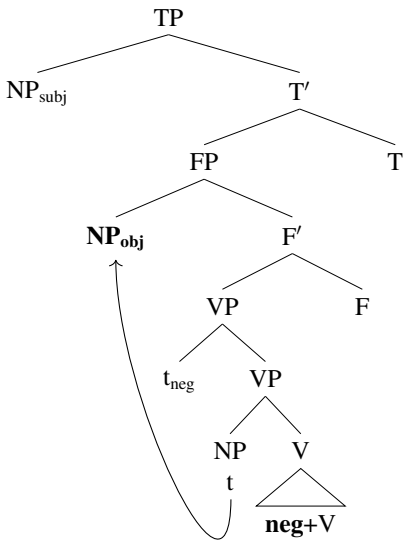
[12]Han et al. (2007: 17) cite Cinque (1999) with reference to this type of analysis of negation. No further remarks are made in this regard. Relevant discussions can be found in Cinque (1999: 120–126). It is worth pointing out that if the cliticization of *an* happens in syntax, the preverbal negation does not c-command its trace after it has undergone cliticization to V, unless V moves to T, because it moves downward from its initial VP/vP adjoined position to V. This issue will be discussed further in section 4.2.

[13]Han et al. (2007: 31–35, sect. 4.1.6) further assume that T lowers to V in (14), presumably in order to connect the difference between (14) and (15) to the difference between English tense lowering and French verb raising; and also to account for the facts about coordination, as discussed in Han et al. (2007: 9–12, sect. 2.4). I will ignore the issue of tense lowering because it will have no effect on the prediction I test in this thesis.

[14]See Han et al. (2007: 18, fn. 7) for discussion about this assumption, which is the corollary of frozen scope effects.

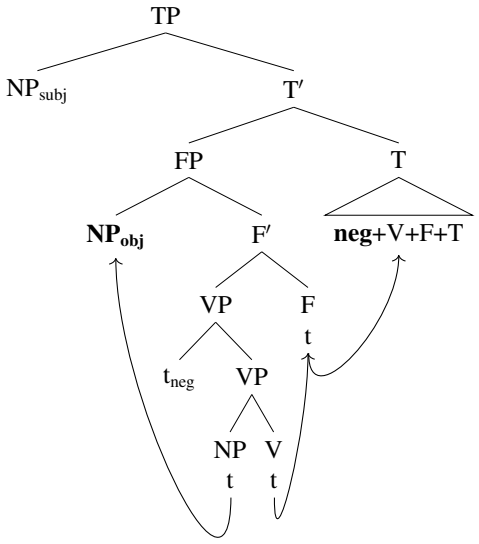
reject the wide scope reading of negation in sentences like (1): these speakers are non-V-raisers.

(14)



In contrast, (15) shows V-raising speakers' structure of preverbal negation. What differs between (14) and (15) is the c-command relation between the preverbal negation and the object. Since the preverbal negation c-commands the object from the head-adjoined position of T in (15), negation can take scope over the object.[15] This accounts for why some Korean speakers accept the wide scope reading of negation in sentences like (1): these speakers are V-raisers.

(15)



[15]Han et al.'s assumptions about the status of head movement are not explicit. On the basis of their assumptions that the preverbal negation cliticizes to the verb, which may or may not undergo movement to T depending on the speaker, and that the position of negation in syntax determines its scope (Han et al. 2007: 17–21), I assume that Han et al. would have to assume that head movement takes place in syntax, as opposed to at PF.

In sum, Han et al., argue that whether or not negation can take scope over the quantified object can be used as a diagnostic tool for V-raising. In what follows, I will introduce Han et al.'s experiments and report their results.

2.1.2 Scope judgment task

Based on the assumptions discussed in section 2.1.1, Han et al. elicited Korean speakers' scope judgments using a truth-value judgment task (Crain & Thornton 1998). They ran two experiments to elicit scope judgments from both adults and children. One experiment tested 160 adults and the other experiment tested 60 4-year-olds. For both experiments, I will limit the discussion to the results from trials with sentences involving preverbal negation and object quantified phrases.

Sentence (16) is an example of test sentence involving object quantified phrase and preverbal negation (from Han et al. 2007: 28):

(16) Khwukhi Monste-ka motun khwukhi-lul an mek-ess-ta
Cookie Monster-NOM every cookie-ACC NEG eat-PST-DEC
i. 'Cookie Monster didn't eat any cookies.' (every > not)
ii. 'Cookie Monster didn't eat all cookies.' (not > every)

This sentence has two possible readings. As in (i), it may have the narrow scope reading of negation (the every>not reading), which would be truthful in a situation where no cookies are eaten. Or, as in (ii), it may have the wide scope reading of negation (the not>every reading) and this would be truthful in a situation where not all cookies are eaten.

To test the existence of these readings, two versions of scenarios were constructed: one associated with the every>not reading and the other associated with the not>every reading. And each reading was associated with four different types of test sentence; sentences like (16), with object quantified phrase and preverbal negation, comprised one type of test sentence.[16]

One version of scenarios was testing the not>every reading (the "not>every scenario"), and the other version of scenarios was testing the every>not reading (the "every>not scenario"). In the

[16] Apart from the (16)-type sentence (with object quantified phrase and preverbal negation), there were (i) sentences with object quantified phrase and post-verbal negation; (ii) sentences with subject quantified phrase and preverbal negation; and (iii) sentences with subject quantified phrase and post-verbal negation.

not>every scenario, Cookie Monster had three cookies but ate only two of them. On the other hand, in the every>not scenario, Cookie Monster did not eat any cookies even though the same number of cookies were available. This is summarized in (17):

(17) a. The not>every scenario: Cookie Monster eats 2 out of 3 cookies
b. The every>not scenario: Cookie Monster eats 0 out of 3 cookies

At the end of the scenario, a Mickey Mouse puppet acted as if he watched the enacted scenario with the participant, and described the situation using (16). Then, the participant was asked to indicate whether Mickey Mouse spoke truthfully.

In the not>every scenario, only V-raising speakers are expected to judge Mickey Mouse's description of the scenario to be truthful. That is, only *Cookie Monster didn't eat all cookies* is a truthful description of a scenario in which Cookie Monster eats two out of three cookies, whereas *Cookie Monster didn't eat any cookies* is not.

In contrast, in the every>not scenario, all speakers are expected to judge Mickey Mouse's description of the scenario to be truthful. Han et al. (2007: 32, fn. 19) and Han et al. (2016: 3, fn. †) note that this is because "the every>not reading entails the not>every reading", so that it results in a sentence with the not>every reading being true in the every>not scenario. In other words, *Cookie Monster didn't eat all cookies*, with the not>every reading, is a truthful description of a scenario in which Cookie Monster does not eat any of the cookies, just as *Cookie Monster didn't eat any cookies* is a truthful description of the scenario.

every > not	not > every
98%	37%

Table 2.1: Mean percentages of acceptances by scenario: Adults

The results from their experiments were as follows. As shown in Table 2.1 (Han et al. 2007: 30), the acceptance rate for the every>not reading was 98%. On the other hand, the acceptance rate for the not>every reading was 37%.

An interesting result is seen in Figure 2.1 (from Han et al. 2007: 31, fig. 4). This graph groups the participants based on their rate of acceptance of the sentences presented with the not>every

scenario. It shows that, surprisingly, participants' acceptance rates for the not>every reading were bimodally distributed, although they were not completely categorical. Namely, with preverbal (short) negation, there were 10 participants who never accepted the not>every reading (0% acceptance) and 6 participants who accepted this reading 100% of the time.

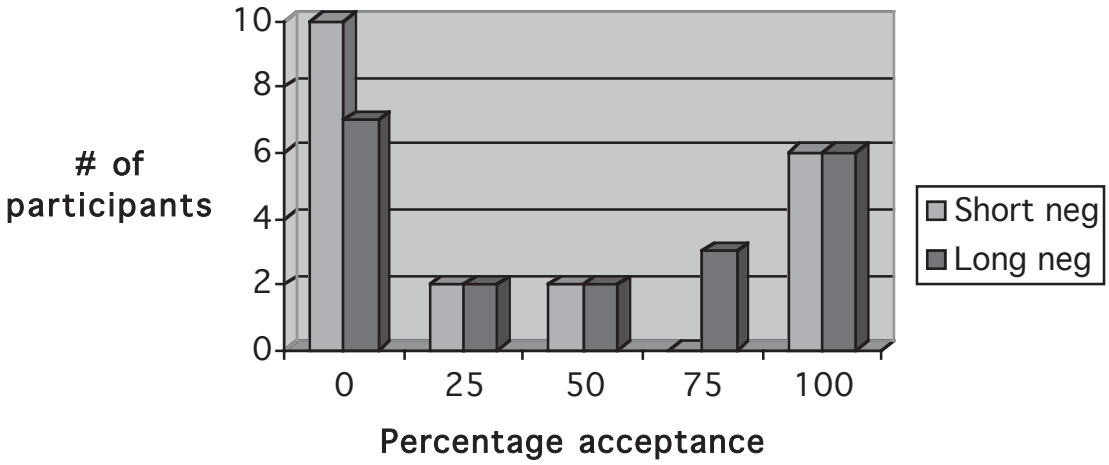


Figure 2.1: Number of participants accepting the not>every reading: Adults

Also, the results from the experiment with children were largely similar to those from the experiment with adults. As shown in Table 2.2 (Han et al. 2007: 36), just like adults, children were more likely to accept the every>not reading (81.67%) than the not>every reading (36.67%). Furthermore, Han et al. report that children's acceptance rates for the not>every reading were bimodally distributed, just like adults'.

every > not	not > every
81.67%	36.67%

Table 2.2: Mean percentages of acceptances by scenario: Children

Based on the bimodal distribution of the participants with respect to the acceptance of the wide scope reading of negation, Han et al. conclude that there is a split in the population of Korean speakers between having a V-raising grammar and having a non-V-raising grammar.

It is important to note that Han et al.'s V-raising analysis is tenable only if their particular assumptions about the preverbal negation in Korean are valid. In particular, they assume that negation can take scope over the quantified object in a V-raising grammar because the preverbal

negation cliticizes onto the verb and moves to the head-adjoined position of T via V-to-T movement, c-commanding the object. Therefore, if the way in which negation takes scope over the quantified object is not by cliticization and V-to-T movement, then it cannot be the case that the V-raising versus non-V-raising distinction is the explanation for the observed split. Nevertheless, regardless of whether one is convinced that Han et al.'s analysis is tenable, the ineluctable fact their experiments discovered is that there is a split in Korean speakers' scope judgments of sentences with negation and the quantified object. In other words, even in the case that we conclude that Han et al.'s V-raising analysis is not tenable, there still needs to be an account of the split in scope judgments. I will come back to this issue in section 4.2, where the relative scope between adverbs and the preverbal negation *an* will be suggested as evidence to doubt that the negation cliticizes to V in Korean. For the moment, it is important to be clear on the predictions that Han et al.'s analysis make for phonological phrasing. I will get these predictions by combining Han et al.'s analysis with Samuels's theory of the syntax-phonology interface, to which I turn now.

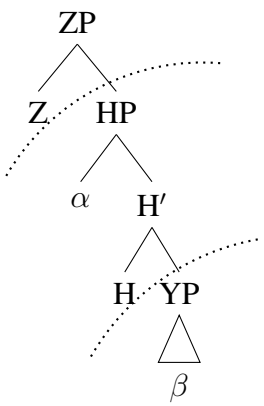
2.2 Samuels (2011): "Phonological derivation by phase"

Samuels (2011: 60–112, ch. 4) presents a theory of syntax-phonology interface based on Phase Theory (Chomsky 2000, 2001, 2004, 2005, 2008) bundled with Distributed Morphology (Halle & Marantz 1993).[17] It is argued that syntactic derivations by phase can allow for phonological forms to emerge, and specifically, in phrase-level phonology, without the need for the prosodic hierarchy (Nespor & Vogel 1986).

"Derivation by phase" (Chomsky 2000, 2001) is guided and constrained by a locality constraint called Phase Impenetrability Condition (PIC), which restricts a portion of the phase from being accessed from outside of the phase. Given (18), an abstract structure where Z and H are phase heads, PIC can be defined as in (19).

[17] Applying Minimalist theorizing to phonology, Samuels (2011), which is a slightly revised version of her doctoral thesis (Samuels 2009), is an exercise in downsizing phonology to a "substance-free" phonology (see, e.g., Hale & Reiss 2000) (proponents of the substance-free phonology argue for a phonological theory without independently derivable, phonetically-motivated rules or constraints, thus making phonology free of 'phonetic substance'). As part of this ambitious theorizing, one of the arguments she puts forward concerns how phonology interacts with syntax and morphology, which is briefly discussed herein.

(18)



(19) *Phase Impenetrability Condition* (Chomsky 2001: 13)
The domain of H is not accessible to operations at ZP; only H and its edge α (the specifiers and adjuncts of H) are accessible to such operations

The Spell-Out domain of a phase is the complement of a phase head. The consequence of PIC relevant to our discussion is that the phonological content of YP (= the Spell-Out domain of H) is spelled out before the phonological content of HP (= the Spell-Out domain of Z) is spelled out, so that β is spelled out at a point different from the point at which α and H are spelled out.

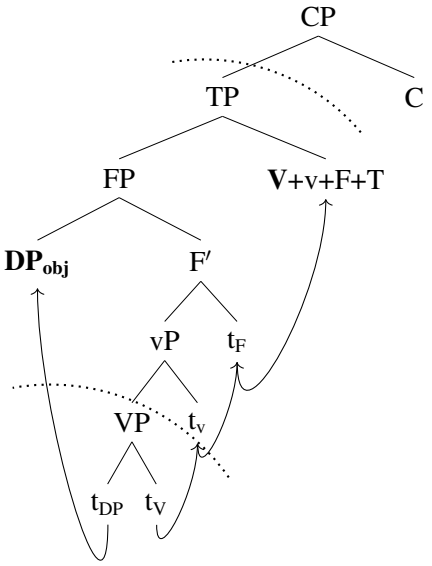
Adopting the null hypothesis for many researchers (see, e.g., Seidl 2001, Marvin 2002, Dobashi 2003, Ishihara 2003, 2007, Kahnemuyipour 2003, 2004, 2005, 2009, Adger 2007, Cheng & Downing 2007, 2016, Kratzer & Selkirk 2007, Pak 2008, Scheer 2008, 2012), Samuels deems "operations" in (19) not only agree and movement in syntax but also phonological operations that can manipulate phonological strings. Operations of relevance to our discussion are post-lexical phonological processes. The domain of these processes is the complement of a phase head (Samuels 2011: 92–93), and phase heads of relevance to us are C and v.[18]

This proposal predicts that post-lexical phonological processes can occur between the verb and the object if the two are in the same Spell-Out domain, while the same processes cannot occur between the two if they are in separate Spell-Out domains. Therefore, if Han et al.'s (2007) V-raising

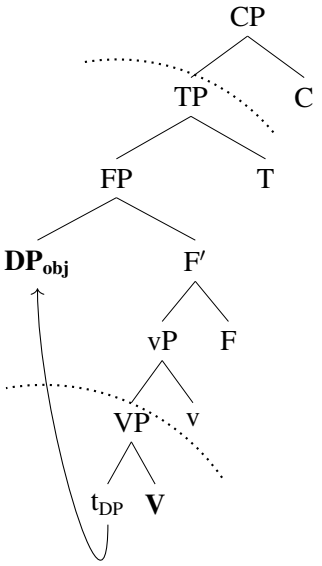
[18] Samuels (2011: 77) (Samuels 2009: 247, fn. 7) assumes an amalgam of Chomsky's (2000, 2001) and Uriagereka's (1999, 2012) conceptions of cyclic Spell-Out, which is the corollary of proposals like Narita (2011, 2012, 2014) and Boeckx (2015). The consequence of Uriagereka's idea that Samuels needs is for a complex specifier or adjunct to constitute a Spell-Out domain on its own. As far as I can see, the only reason which calls for this assumption in her proposal is to attempt to explain variation in phonological phrasing patterns which rests on the branching versus non-branching distinction between syntactic constituents, as discussed in Dobashi (2003) and references therein. See Samuels (2011: 97–101, sect. 4.4.2) for discussion. All in all, this should make no difference in our predictions.

analysis of the "grammatical split" in Korean is correct, V-raising speakers will generate the structure in (20), while non-V-raising speakers will generate the one in (21), for a simple declarative sentence with a transitive verb.[19] In both trees, dotted arcs denote the Spell-Out domains.

(20) *V-raising grammar*



(21) *Non-V-raising grammar*



In (20), V-to-T movement places the verb (V) in the same Spell-Out domain that the object (DP_{obj}) is in (i.e. both within the complement of C), and so post-lexical phonological processes, if applicable, will occur between the V and the object. On the other hand, in (21), the V stays in situ and remains within the complement of v, while the object has moved to a position within the complement of C. As a result, the V and the object will be in two separate Spell-Out domains and so no post-lexical phonological processes will occur between the two.

We should be able to experimentally verify this prediction if we could find a post-lexical phonological rule and an appropriate condition in which the rule may apply between the verb and the direct object. A post-lexical phonological rule of relevance to us is Post-Obstruent Tensing, which I will introduce in the following section.

[19] As mentioned in fn. 6, I assume that a transitive verb does not need to move to v (for discussion, see Kratzer & Selkirk 2007: 104–111). If the V moves to v, the V would not be spelled out when the complement of v is spelled out. And if so, Samuels's theory would predict no difference in the occurrence of Post-Obstruent Tensing between V-raising speakers and non-V-raising speakers.

2.3 Post-Obstruent Tensing

It is well-known that there is a three-way laryngeal distinction in Korean obstruents: tense (fortis), lenis (lax), and aspirated (Sohn 1999). Cho et al. (2002) report that for Seoul Korean speakers, tense stops /p',t',k'/ have the mean voice onset time (VOT) of 20 ms with a weak release burst; lenis stops /p,t,k/ have the mean VOT of 70 ms with a weak release burst; and aspirated stops /p^h,t^h,k^h/ have the mean VOT of 120 ms with a strong release burst. Lenis stops have a lower F0 in the following vowel compared to tense and aspirated stops. Tense obstruents have the muscular tension of the vocal folds and high oral pressure but low airflow (Kim 1965, Han & Weitzman 1970, Hardcastle 1973, Kagaya 1974, Hirose et al. 1974, Kingston 1985, Dart 1987, Silva 1992, Ahn 1999, Shin 2015).

Lenis obstruents in Korean become tense obstruents immediately after another obstruent, both at the word level, as in (22a), and above the word level, as in (22b) and (22c) (first two sets of examples are from Cho & Inkelas 1994: 47, with minor modifications).

(22) a. /makt͡ɛ/ → [makt'͡ɛ] 'stick'
/kak+t͡ɕa/ → [kakt͡ɕ'a] 'each'

b. /kip^h-t͡ako/ → [kipt'͡ago] 'that it is deep'
deep-COMP
/k'ot͡ɕ^h-k͡wa/ → [k'otk'͡wa] 'flower and'
flower-CONJ

c. /jak palɯ-as'-ʌ/ → [jak p'͡allas'ʌ] 'applied the ointment'
medicine apply-PST-DEC
/mjʌnt͡ɕʌp po-as'-ʌ/ → [mjʌndʑʌp p'͡wɐs'ʌ] 'had an interview'
interview take-PST-DEC

This process is known as Post-Obstruent Tensing ("Tensification"; see Kim-Renaud 1974, Cho 1987, Kang 1992, Inkelas & Cho 1993, Cho & Inkelas 1994, Jun 1998, Kim 2001).

Regarding the post-lexical application of Post-Obstruent Tensing, the domain of application of this rule has been claimed to be an Accentual Phrase in the Prosodic Hierarchy (Jun 1993, 1996, 1998). The Accentual Phrase is similar to the Phonological Phrase defined by syntax (Cho 1987, Kang 1992), but is defined by intonation. The size of an Accentual Phrase is slightly larger than a word, but in general corresponds to a word (and the bound morphemes that follow it if there is any). On average, a single Accentual Phrase contains about 3.39 syllables and 1.14 content words

(Kim 2004).

The same two types of sentences—the imperative and the question—are used in (23) and (24) to show that the domain of Post-Obstruent Tensing changes depending on the accentual phrasing of a sentence (as indicated by curly brackets).[20] Post-Obstruent Tensing applies when two lenis stops (underlined in the examples) are within the same Accentual Phrase, such that the second lenis stop becomes a tense stop (indicated by '), as in (23), and otherwise doesn't, as in (24).[21]

(23) *Verb and object within the same Accentual Phrase*

a. /tosila͟k͟ ka͟t͟ɕʌo-a/ → {to∫ila͟k͟ k'ad͟ʑʌwa} 'Bring a lunch box.'
lunch.box bring-IMP

b. /tosila͟k͟ ka͟t͟ɕʌo-as'-ni/ → {to∫ila͟k͟ k'ad͟ʑʌwanni} 'Did you bring a lunch box?'
lunch.box bring-PST-Q

(24) *Verb and object separated by the Accentual Phrase boundary*

a. /tosila͟k͟ ka͟t͟ɕʌo-a/ → {to∫ila͟k͟} {ka͟d͟ʑʌwa} 'Bring a lunch box.'
lunch.box bring-IMP

b. /tosila͟k͟ ka͟t͟ɕʌo-as'-ni/ → {to∫ila͟k͟} {ka͟d͟ʑʌwanni} 'Did you bring a lunch box?'
lunch.box bring-PST-Q

On the other hand, under Samuels's (2011) proposal, the syntactic structure of a sentence, as opposed to its prosodic phrasing, would determine the domain of phonological rules. We will be able to evaluate the validity of this proposal by testing whether the occurrence of Post-Obstruent Tensing correlates with the acceptance of the not>every reading, if Han et al. (2007, 2016) are correct.

In summary, if Han et al. and Samuels are both correct, we predict that the acceptance of the not>every reading correlates with the occurrence of Post-Obstruent Tensing (POT), yielding the equivalences in (25):

(25) a. V-raisers ⟺ accept not > every ⟺ POT between DO & V
b. Non-V-raisers ⟺ reject not > every ⟺ no POT between DO & V

I turn to testing this prediction in the following section.

[20]This type of examples, where there is variation in the occurrence of phonological processes without any obvious structural differences, already poses problems for Samuels's proposal.

[21]The end-based theories such as Cho (1987) and Kang (1992) do not predict variations in the domain of Post-Obstruent Tensing like those between (23) and (24), because a sequence of an object and a verb will always form a single Phonological Phrase, which is the domain of Post-Obstruent Tensing in those theories.

SECTION 3

Experiment

If Han et al. (2007) are right in that there is syntactic variation with respect to V-raising in the population of Korean speakers, Samuels's (2011) proposal makes a prediction that there would be a correlation between speakers' scope judgments and Post-Obstruent Tensing. In other words, we predict that the occurrence of phonological processes, such as Post-Obstruent Tensing, affecting specific segments in particular environments, such as two adjacent lenis obstruents each located in the word-final coda position of a direct object and the word-initial onset position of the verb, will be a function of accepting the not>every reading.[22] Therefore, as in (26), when the word-initial consonant of a verb and the word-final consonant of its direct object are lenis obstruents and are adjacent to each other, the target lenis obstruent /k/ in the verb is predicted to undergo Post-Obstruent Tensing in the utterance of speakers who accept the not>every reading, as in (26a), while it is not in the utterance of speakers who reject the not>every reading, as in (26b).

(26) a. /tosila͟k ka͟tɕʌo-a/
toʃila͟k **k'**adʑʌw-a
lunch.box bring-IMP

b. toʃila͟k **k**adʑʌw-a
lunch.box bring-IMP
'Bring a lunch box.'

To test this prediction, one must first determine whether a speaker accepts the not>every read-

[22] Samuels (2011: 108, fn. 26) mentions in passing that a study that looks at the relation between syntactic variation as suggested in Han et al. (2007) and a potential variation in phonological rule application could be enlightening. However, it is not possible to see the effect of V-raising by looking at a rule that Samuels (2011: 106–111) adopts to show the predictions of her theory, namely, Lenis Stop Voicing (Lisker & Abramson 1964, Kim 1965, Keating et al. 1983, Cho 1987, Silva 1989, 1991, Kang 1992, Jun 1993, 1994, 1995, 1996, 1998), where a lenis stop becomes voiced when it occurs between voiced segments, because Lenis Stop Voicing is a "phonetic" rule in the sense that the application of the rule is sensitive to speech rate, the degree of articulation force and adjacent segment types, and varies across speakers (Jun 1993, 1994, 1996, 1998).

ing, and then analyze the same speaker's production data containing the potential triggering environment for Post-Obstruent Tensing. Accordingly, my experiment had two parts.

The first part of the experiment was a scope judgment task that was designed to determine whether the participant accepts the not>every reading, using a truth-value judgment task (Crain & Thornton 1998). The procedures were adopted and modified from Han et al. (2007).

The second part of the experiment was a sentence production task. Sentences were constructed to test whether participants would apply Post-Obstruent Tensing to the word-initial lenis obstruent of a verb when its immediately preceding object has a word-final lenis obstruent in a simple declarative sentence with a transitive verb.

3.1 Participants

I tested 32 adult speakers of Korean. 27 participants were recruited using UCLA Psychology Department Subject Pool and received one hour of research credit which they could use for fulfilling a course requirement or for extra credit. 5 participants were paid for participation. Of the 32 participants who participated, a total of 6 were excluded: 3 for not having spent at least the first 7 years from birth in South Korea (they were heritage speakers who spent more than 15 years in United States; mean age = 20), and 3 others for failing to correctly produce control sentences in the sentence production task, having a strong reading intonation, or having a strong English-influenced accent. As a result, I report the data from 26 participants (16 females and 10 males) between the ages of 18 and 31 (mean age = 22.7); their average years of residence in South Korea was 15.7 years. Of these 26 participants, 5 reported that they speak a dialect other than Seoul Korean (3 Chonnam, 1 North Kyungsang, and 1 South Kyungsang).[23]

[23]The use of different dialects would not affect the experiment, because accentual phrasing is the same across dialects; dialects differ only in the types of tones that define an Accentual Phrase.

3.2 Materials

3.2.1 Scope judgment task

For the scope judgment task, there were a total of 40 trials. Apart from 2 practice trials, there were 30 critical trials and 8 control trials.

As for critical trials, 30 critical sentences included preverbal negation and a quantified object. 15 of these ought to be true only for speakers who accept the not>every reading. For example, a video showing a dragon pushing two of three cars (Figures 3.2–3.3) was paired with a sentence like (27).

(27) yong-i motun cha-lul an mil-ess-e
dragon-NOM all car-ACC NEG push-PST-DEC
i. 'The dragon didn't push any cars.' (every > not)
ii. 'The dragon didn't push all cars.' (not > every)

Such a sentence has, in principle, two possible readings: the every>not reading and the not>every reading. In order to make sure that both readings were salient and could correspond to thoughts that speakers might have had, a three-sentence-long story that sets up the context (Figure 3.1) was shown on the screen before the video played, as translated in (28).

(28) A dragon was flying over the city. As it looked down, there were three cars. Although it was reluctant to touch humans' possessions, it thought about pushing the cars as it was bored.

After the video played, the character Donald Duck was depicted on the screen as saying the sentence in (27), which appeared at the end of a preamble as translated in (29) (Figure 3.4).

(29) This is a story about the dragon that has seen three cars. The dragon thought about pushing the cars. In the end, [(27)].

The other 15 of the critical sentences were those that must be true for any speaker, regardless of whether the speaker accepts the not>every reading or not. For example, suppose a trial in which the sentence (27), its associated story (28) and preamble (29) are used, but with a video showing a dragon pushing none of three cars—in which case (27) would always be true.

용 한 마리가 도시 위를 날고 있었습니다.

아래를 내려다 보니, 차 세 대가 보였습니다.

사람들의 물건을 건드리는 것이 걸려 망설이면서도, 심심했던 용은 차들을 밀어볼까 하고 생각했습니다.

계속하려면 아무 키나 누르십시오

Figure 3.1: Context-setting story

Figure 3.2: Video for target trial (1)

Figure 3.3: Video for target trial (2)

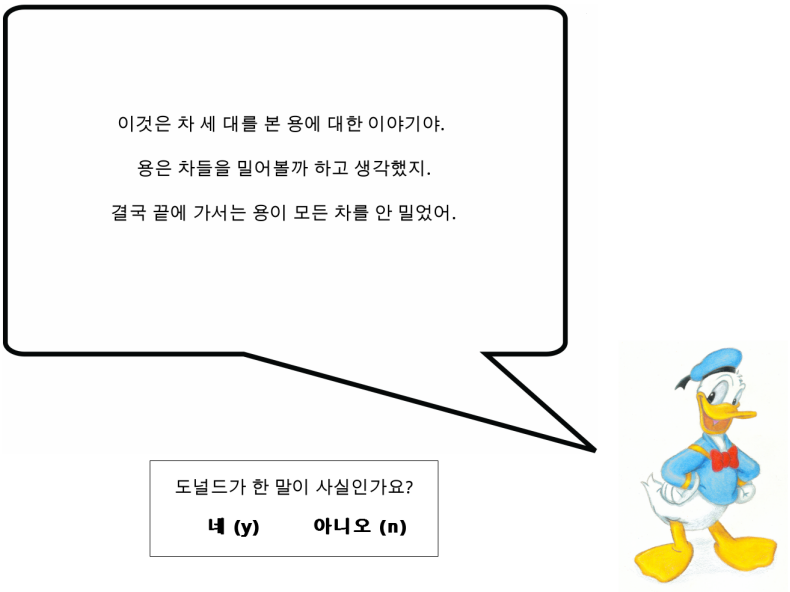


Figure 3.4: Question

On the other hand, control trials ensured that participants understood the task and knew how to use negation and universal quantification in isolation from each other.

There were 2 true negation control trials and 2 false negation control trials. For example, a true negation control trial involved a video depicting a frog, a duck, and a cow. In the video, the frog turns the cow around. After the video, Donald Duck is depicted as saying *The frog didn't turn the duck around*, which would truly describe the scenario depicted in the video. On the other hand, for a false negation control trial, Donald Duck would have wrongly said *The frog didn't turn the cow around* with the same scenario.

Similarly, there were 2 true quantifier control trials and 2 false quantifier control trials. For example, a true quantifier control trial involved a video showing a frog and three ducks. In the video, the frog pets all three ducks. After the video, Donald Duck says *The frog petted every duck*, which would truly describe the scenario depicted in the video. On the other hand, for a false quantifier control trial, Donald Duck would have wrongly said the same sentence for a video in which the frog only pets one of the three ducks.

3.2.2 Sentence production task

For the sentence production task, participants had to read a total of 24 sentences. Of the 24 sentences which were recorded, 18 were critical sentences, 4 were control sentences, and 2 were practice sentences.

As for 18 critical sentences, they contained a sequence of an object and a verb, and each sequence carried the phonological environment for Post-Obstruent Tensing. 9 of these contained the sequence that tends to form a single Accentual Phrase (call these Type I critical sentences) based on factors such as the number of syllables and the frequency of the object-verb sequence (Jun 1993, 1996, 1998, 2003). For example, the object and the verb in these sequences were composed of 1–2 syllables each and are frequently used together, as in (30).

(30) Cinhuy-ka /mikuk̲/ /k̲a-s'-ʌ/
Cinhuy-NOM USA go-PST-DEC
'Cinhuy went to United States.'

The other 9 of the critical sentences contained the sequence in which the object and the verb tend to be phrased separately in two Accentual Phrases (call these Type II critical sentences). For example, as in (31), the object and the verb contained more syllables than those of the Type I critical sentences (2–4 syllables for the object and 3 syllables for the verb). Also, the object and the verb are not as frequently used together as those of the Type I critical sentences.

(31) Yuna-ka /intɕʌlmit'ʌk̲/ /p̲ʌmuli-ʌs'-ʌ/
Yuna-NOM injeolmi.rice.cake mix-PST-DEC
'Yuna made injeolmi rice cake.'

The Type I–II distinction was made to maximize the chances of disconfirming Samuels (2011). According to Jun (2003), a sequence of two words tends to form a single Accentual Phrase if the number of syllables of the sequence is shorter than 6 syllables and the two words are frequently used together. If Post-Obstruent Tensing systematically applies in Type I critical sentences and does not apply in Type II critical sentences, that would significantly weaken Samuels's proposal because the influence of such factors on the domain of phonological processes is merely noted at best by Samuels ("Post-lexical rules [...] tend to be gradient, and to be sensitive to performance factors such as speech rate/style/register and lexical frequency", p. 92), while that would lend further support to Jun's (1993 et seq.) intonational approach to defining prosodic constituents.

As for 4 control sentences, 2 of them contained a segment to which Post-Obstruent Tensing should always apply. For example, /p/ in (32) is in the same phonological word as the trigger /k/, and so /k/ and /p/ should be in the same Accentual Phrase.

(32) Yengho-ka /ɯkp̲aktɕilɯ-ʌs'-ʌ/
Yengho-NOM browbeat-PST-DEC
'Yengho browbeated (someone).'

The other 2 of the control sentences contained a segment to which Post-Obstruent Tensing should never apply. For example, the final segment of the object in (33) is a vowel /u/. Therefore, the following verb-initial /p/ will not undergo Post-Obstruent Tensing.

(33) Mina-ka /paksu/ /p̲at-as'-ʌ/
Mina-NOM applause receive-PST-DEC
'Mina got a round of applause.'

Participants practiced reading sentences aloud with 2 practice sentences. Both practice sentences were Type I critical sentences with the trigger /k/ and the target /tɕ/, as in (34).

(34) Mina-ka /hak̚/ /tɕʌp-ʌs'-ʌ/
Mina-NOM crane fold-PST-DEC
'Mina made a paper crane.'

At the beginning of the practice, participants were asked to read sentences aloud in a way that is as natural as possible and to repeat every sentence three times. If necessary, during the practice, the experimenter instructed participants to adjust their speech rate to speak at a normal rate of speech. For example, if participants read sentences aloud too quickly, they were asked to slow down. All sentences, including the practice sentences, were recorded.

3.3 Results

All participants were at or near ceiling on control trials in the scope judgment task, indicating that they had no difficulty performing the task and knew how to use negation and universal quantification in isolation from each other. Although not perfectly categorical, scope judgments were bimodally distributed. In other words, about half of the participants accepted the not>every reading, replicating the results of Han et al.'s (2007) experiments.

In the sentence production task, 3 participants who failed to correctly produce control sentences were excluded, as noted in section 3.1. I categorized all repetitions of every critical sentence by the presence of Post-Obstruent Tensing. I coded the sentence as "tensed" regardless of its prosodic phrasing if the target lenis obstruent underwent Post-Obstruent Tensing. Judging whether a lenis obstruent became tensed was primarily based on my linguistic intuition as a native Korean speaker. In a case of uncertainty in my judgments, I consulted another native Korean speaker of similar age. Since judgments were reliable across the speakers in general, if we agreed, I moved on; if we did not, I examined the voice onset time of the target lenis obstruent in the spectrogram and waveform, and inspected the intonation (F0) pattern of the sentence, both using Praat 6.0.26 (Boersma & Weenink 2017).[24] The result showed variability within and across participants in the

[24]Prior to the current experiment, I conducted two pilot studies. 8 participants (5 females, mean age = 32.4) par-

occurrence of Post-Obstruent Tensing within critical sentences. Most of the variability was to be expected, considering that there were two groups of critical sentences: one in which the object-verb sequence tends to form a single Accentual Phrase (Type I) and the other in which the object and the verb tend to be in two separate Accentual Phrases (Type II). Accordingly, more than half of the participants tended to apply Post-Obstruent Tensing for Type I critical sentences, but tended to not apply Post-Obstruent Tensing for Type II critical sentences. In general, if the same sentence showed variability in the presence of Post-Obstruent Tensing across participants, it was because different participants produced different prosodic phrasings for that sentence; and similarly, for the case of within-participant variability, it was because the same participant produced different prosodic phrasings for the same sentence.

Since the research question is on the relation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing, Figure 3.5 plots the two together. Each point represents the aggregate responses of an individual participant. The x-axis shows the proportion of critical trials in the scope judgment task where the participant accepted the not>every reading. The y-axis shows the proportion of "tensed" repetitions of the critical sentences in the sentence production task, in which the participant applied Post-Obstruent Tensing between the object and the verb.

Visual inspection reveals that the scope judgments are bimodally distributed but not perfectly categorical, replicating Han et al. (2007). In contrast, the occurrence of Post-Obstruent Tensing is variable within and across participants. Evidently there is not a deterministic relationship between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing. To investigate whether there is any relationship at all, I conducted a linear regression, whose dependent variable was the proportion of critical trials in the scope judgment task where the participant accepted the not>every reading, and whose independent variable was the proportion of "tensed"

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ticipated in the first pilot study, in which 3 of them accepted the not>every reading. Although the overall structure of the experiment was similar to the current experiment, it was web-based and had a smaller number of critical trials for both the scope judgment task (12 critical trials) and the sentence production task (6 critical trials), indicating a weaker statistical power of the experiment. Specifically, the rule used in critical trials for the sentence production task was Lenis Stop Voicing instead of Post-Obstruent Tensing (see fn. 22). It was more difficult to categorize obstruents by voicing based on my perception than by tense/lenis distinction, because there is no phonemic voicing distinction for obstruents in Korean. I discuss the second pilot study in section 3.4.

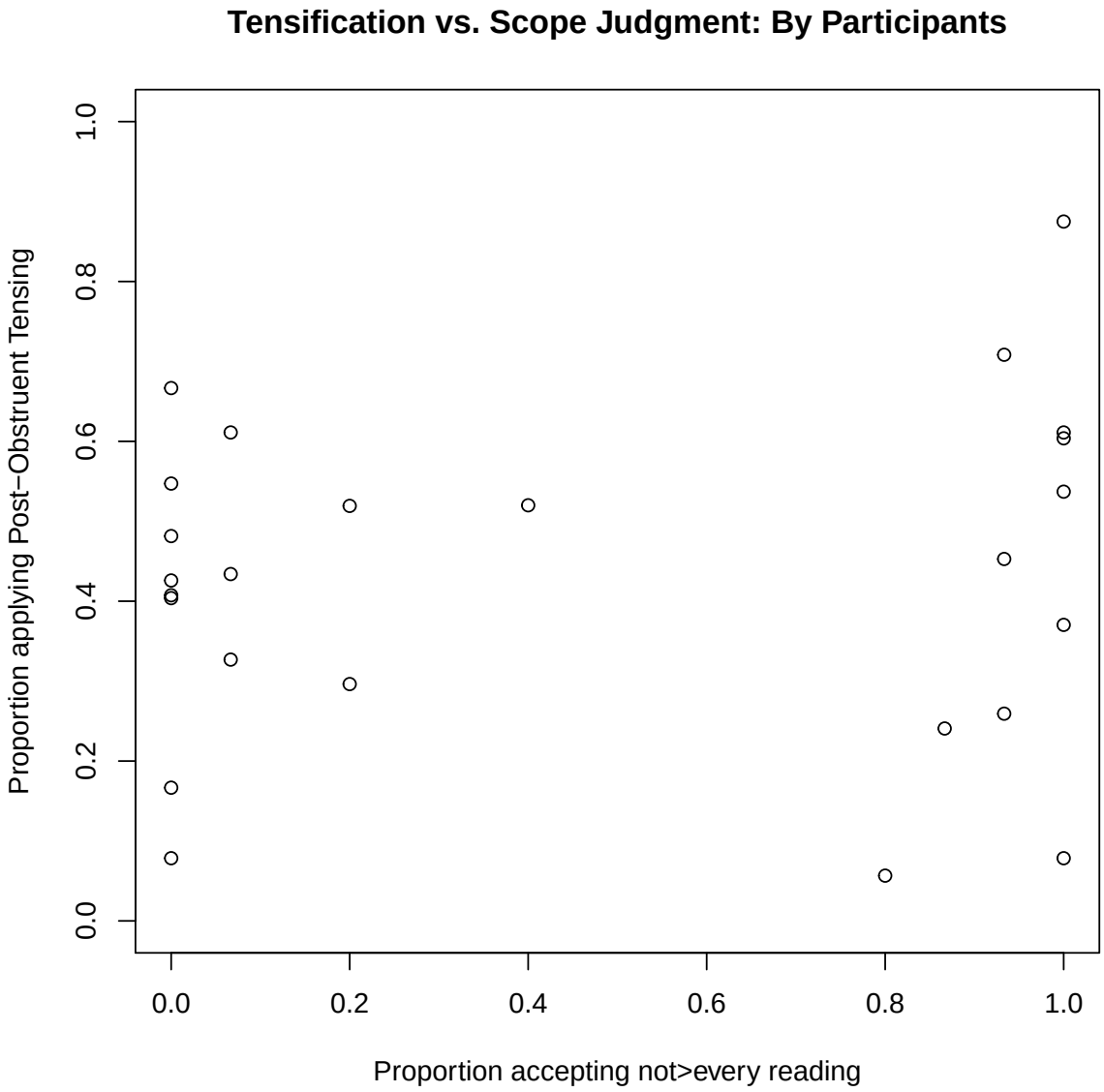

Figure 3.5: Proportion applying Post-Obstruent versus proportion accepting the not>every reading: By participants

repetitions of the critical sentences from the sentence production task (analysis was done in R 3.3.3; R Core Team 2017). The occurrence of Post-Obstruent Tensing was not significantly predicted by the acceptance of the not>every reading ($z = 0.052$, $p = 0.958$).

Inspecting individual production data from the sentence production task makes this clear. In addition, the production data suggest that the occurrence of Post-Obstruent Tensing is related to the accentual phrasing (Jun 1993, 1996, 1998). For example, the object and the verb in the Type II critical sentence (35) might have a lower chance to form a single Accentual Phrase compared to a Type I critical sentence because they contain more syllables than those of the Type I critical sentences, although there is always a possibility that a speaker might phrase the object and the verb in a Type II critical sentence as a single Accentual Phrase.

(35) Sohuy-ka cwungkwuk tanyewa-ss-e
Sohuy-NOM China visit-PST-DEC
'Sohuy visited China.'

Figure 3.6 and Figure 3.7 were produced by two different speakers, both of whom rejected the not>every reading more than 80% of the time.[25] As can be seen, one speaker phrased the object and the verb separately as two Accentual Phrases, producing a lenis stop [t] (Figure 3.6), while the other speaker phrased the object and the verb together as a single Accentual Phrase (Figure 3.7). This would be unexpected under Samuels's (2011) theory because two speakers with the same grammar ought to have the same phonological outcome given the same syntactic structure.

A striking case is shown in Figures 3.8 and 3.9, both of which are produced by the same speaker who accepted the not>every reading 100% of the time. Figure 3.8 is the first repetition of (35) and Figure 3.9 is the second repetition of the same sentence. As can be seen, the speaker phrased the object and the verb as a single Accentual Phrase in the first repetition, producing a tense stop

[25]The spectrograms and waveforms in Figures 3.6–3.9 are transcribed according to K-ToBI (Korean TOnes and Break Indices; Jun 2000, 2005). The topmost part of the figure is a waveform, and just below the waveform is a corresponding spectrogram with a pitch track drawn on top of it. Below the spectrogram are three tiers: the words tier, the phonological tone tier, and the phonetic tone tier. The words tier provides each word, the phonological tone tier provides underlying tones, and the phonetic tone tier provides the surface tones of an Accentual Phrase. An Accentual Phrase is marked by a Low or High tone on the initial syllable and a High tone (Ha) on the final syllable. When an Accentual Phrase is longer than three syllables, the second syllable can show a High tone (+H) and the penultimate syllable can show a Low tone (L+). The whole sentence forms one Intonational Phrase, whose final boundary is marked by a Low tone (L%). The Intonational-Phrase-final boundary tone overrides an Accentual-Phrase-final boundary tone.

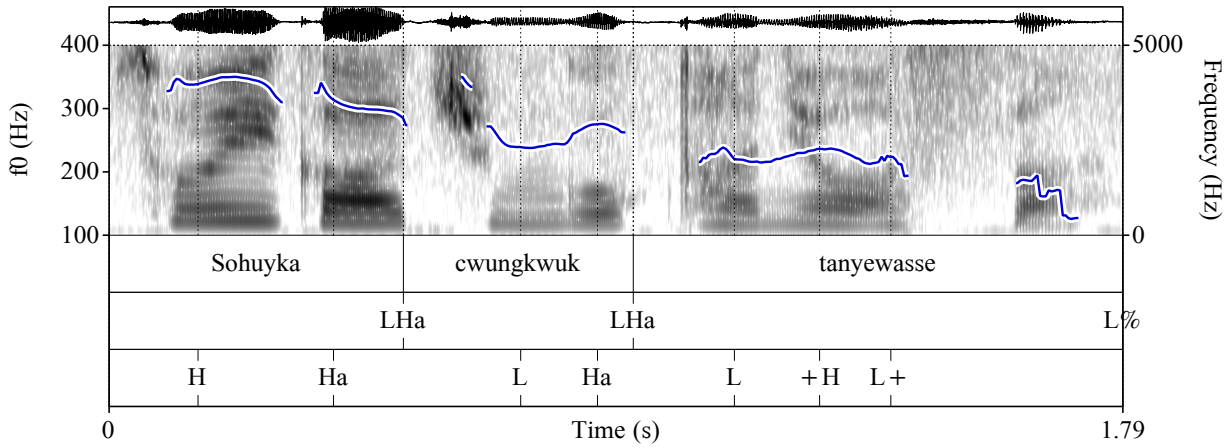

Figure 3.6: Subject 16's production of (35), *Sohuyka cwungkwuk tanyewasse* (Sohuy-NOM China visited) 'Sohuy visited China', illustrating the object and the verb in two separate APs.

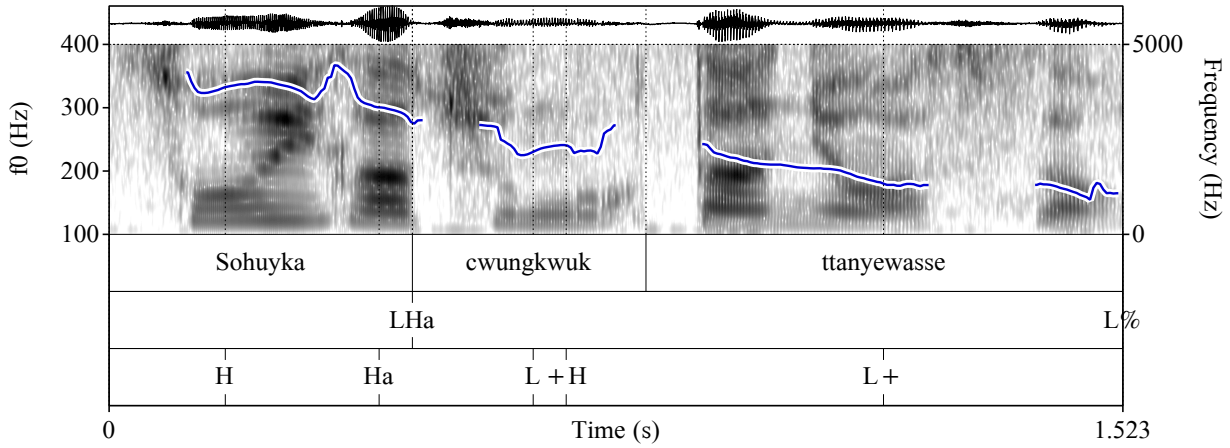

Figure 3.7: Subject 21's production of (35), *Sohuyka cwungkwuk tanyewasse* (Sohuy-NOM China visited) 'Sohuy visited China', illustrating the object-verb sequence forming a single AP.

[t’] (Figure 3.8), but as two Accentual Phrases in the second repetition, producing a lenis stop [t] (Figure 3.9). It is worth mentioning that this is not the first or only speaker who phrased the same sentence in multiple ways over the course of the sentence production task.

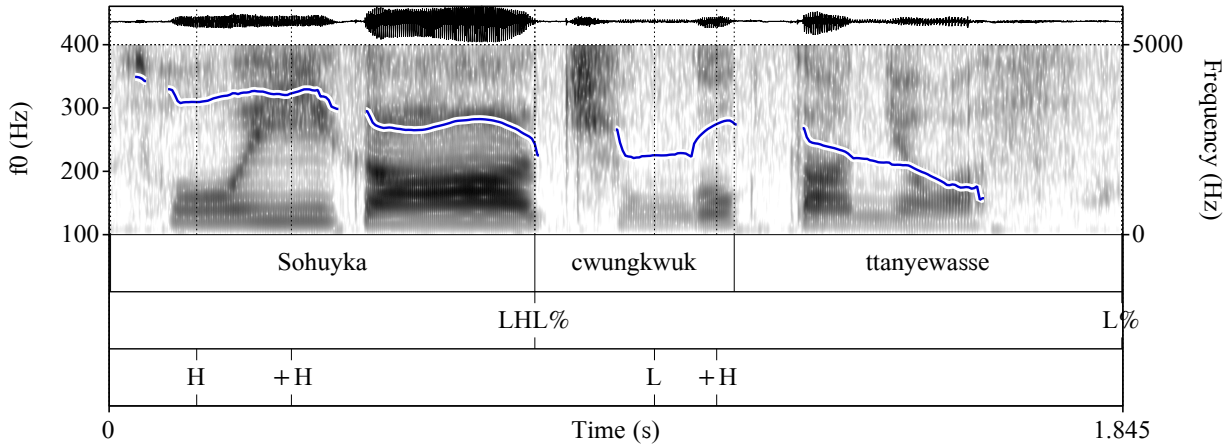

Figure 3.8: Subject 22’s production of (35), *Sohuyka cwungkwuk tanyewasse* (Sohuy-NOM China visited) ‘Sohuy visited China’, illustrating the object-verb sequence forming a single AP.

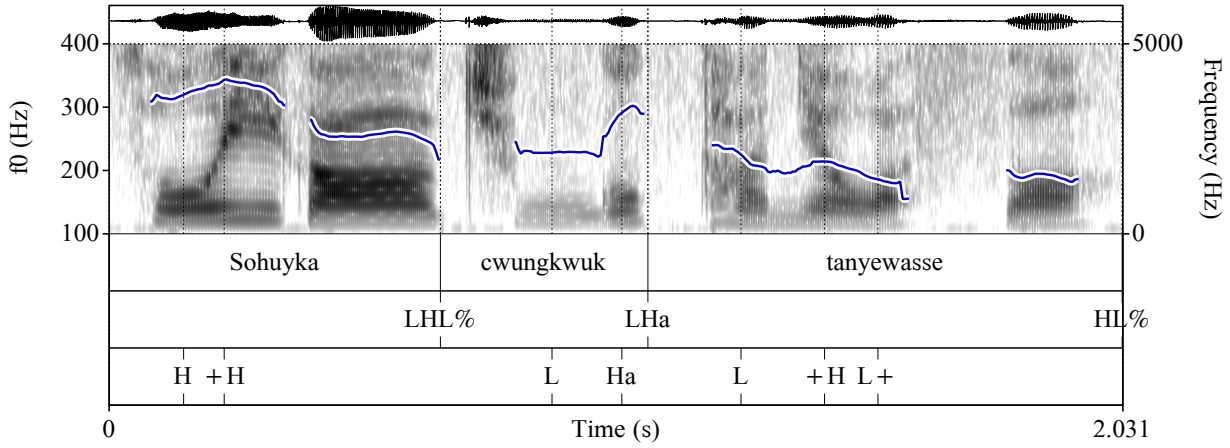

Figure 3.9: Subject 22’s production of (35), *Sohuyka cwungkwuk tanyewasse* (Sohuy-NOM China visited) ‘Sohuy visited China’, illustrating the object and the verb in two separate APs.

In summary, the occurrence of Post-Obstruent Tensing in a sentence correlated generally with the accentual phrasing of the sentence within and across participants.

3.4 Discussion

The result of the experiment shows that there is no notable correlation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing. The scope judgment task replicated the results of Han et al.'s truth-value judgment tasks. This means that the truth-value judgment task in the way it was conducted here worked successfully. It is worth mentioning that the way in which the context-setting story was phrased in the scope judgment task could have a huge impact on the result. Prior to the current experiment, I conducted two pilot studies (as mentioned in fn. 24). In the most recent pilot study that was nearly identical to the current experiment except that context-setting stories were different from those of the current experiment, I failed to replicate the split in the population with respect to scope judgments. It appeared that the stories somehow biased the majority of participants to accept the not>every reading. Although the reason for this was not entirely clear, one of the possible contributing factors might be that the story contained a phrase that was similar to its associated critical sentence.[26] So, in the current experiment, the story was carefully written so as to avoid any possible biases.[27]

Regarding the bimodal distribution of scope judgments, it is interesting to ask whether it was really the case that the half of the participants failed to access the not>every reading. In other words, it is logically possible that the participants gave more categorical responses although their scope judgments were gradient, because they were making an overt choice over the truth of a sentence. And there was one participant who behaved as if he had a variable grammar, accepting not>every reading 40% of the time. Nonetheless, the scope judgments were significantly more bimodal than the Post-Obsturent Tensing applications, despite the fact that both were recorded using a categorical response variable.

In the next section, I discuss the implication of the lack of correlation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing.

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[26] I will illustrate this using translations of Korean sentences. For example, the context-setting story *There was a frog. A frog's friend wondered whether the frog would eat all cookies. Then the frog...* was shown before the video in which the frog ate two out of three cookies, for the critical sentence *The frog did not eat all cookies*. In the story, the embedded wh-clause containing the quantified object looked very similar to the critical sentence.

[27] See, for example, the context-setting story (28) for the critical sentence (27) (Korean version of the story shown in Figure 3.1), where the quantity of an item corresponding to the direct object is described without using 'all'.

SECTION 4

Implications

In section 2, I showed that Han et al.'s (2007) analysis of preverbal negation, together with Samuels's (2011) theory of the syntax-phonology interface, makes predictions about Korean speakers: those who accept the wide scope reading of negation (the not>every reading) were expected to apply Post-Obstruent Tensing between the verb and its object in a simple declarative sentence with a transitive verb; those who reject it were not. In section 3, I found that there is no correlation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing. Therefore, at least one of these assumptions must be incorrect.

I address the possibility that Samuels's theory of the syntax-phonology interface might be untenable in section 4.1, and the possibility that the Han et al.'s analysis of preverbal negation might be untenable in section 4.2. I will tentatively conclude that if we have to choose between rejecting one of the two proposals, it should be Samuels's.

4.1 Samuels's (2011) theory is too strong

Samuels's (2009, 2011) theory of the syntax-phonology interface seems unable to predict the occurrence of Post-Obstruent Tensing. It is because this theory has no way of taking into account factors that are known to affect the domain of Post-Obstruent Tensing, such as the number of syllables, frequency of two adjacent words, and speech rate (Jun 1993, 1996, 1998, 2003).

This is not at all a new challenging problem for syntax-based theories of the syntax-phonology interface. Proponents of the earlier syntax-based theories were aware of such factors that play a role in determining the domain of phrase-level phonological processes, and tried to account for observed variations by positing optional "restructuring rules" (e.g. Kang 1992). However, as Jun

(1998: 219–221) points out, the existence of non-systematic variations regarding the occurrence of processes like Post-Obstruent Tensing within and across speakers make restructuring rules seem more of post hoc than explanatory, without much predictive power. For example, as we have seen in section 3.3 (see Figures 3.8–3.9), one of the participants in the current experiment could easily produce two possible types of accentual phrasing for the same sentence during the sentence production task, as if s/he wanted to help the experimenter out by showing that there are two possible ways to phrase the verb and the object, together or separately.

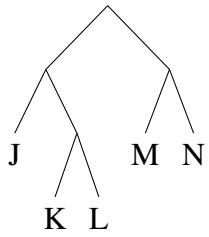
This lack of isomorphism between syntactic phrasing and prosodic phrasing is essentially what motivated Jun (1993: 74–115; ch. 3) to give up on syntax-based approaches to phrase-level phonology (e.g., Cho 1987, 1990, Silva 1989, Kang 1992), and to pursue a prosody-based ("intonational") approach to phrase-level phonology. In this approach, the prosodic phrasing of a sentence is assumed to be determined based on both linguistic and non-linguistic factors, and the intonation pattern of the sentence is used to identify its prosodic phrasing. Therefore, the intonational approach can describe the phonological phrasing of a sentence that is incorrectly ruled out or unable to be predicted in syntax-based approaches. However, as Jun (1993: 76) admits, this approach cannot predict what the actual prosodic phrasing of a given sentence would be.

On the other hand, Pak (2008), the other proponent of a phase-based theory of the syntax-phonology interface who wants to do away with the Prosodic Hierarchy, attempts to tackle this "variable-domain" problem by expanding on independently-needed theories of linearization operations at PF (Embick & Noyer 2001, 2007, Embick 2007). When a syntactic structure is transferred to PF as the result of cyclic Spell-Out, it must be collapsed into a string and linear order between individual nodes in the structure must be established. What encodes information on how individual nodes are concatenated from left to right is called linearization statements. Linearization statements are generated by the operation Linearization as soon as the operation Vocabulary Insertion adds corresponding phonological content to terminal nodes with feature bundles.

A novel assumption Pak puts forth is that these linearization statements serve as domains of phonological rules. Specifically, while one type of phonological rules applies to a chain of nodes within each Spell-Out domain, the other type of rules applies to chains of nodes at the end of the derivation when so-called Late-Linearization operations apply. Pak argues that Late-Linearization

is sensitive to performance-related factors in that such factors may reconstitute the way in which nodes are chained together, as in (37).[28]

(36)



→ J-K-L, M-N

(37) Late-Linearization of J-K-L, M-N:
   a. Default: (J-K-L),(M-N)
   b. Fast speech: (J-K-L-M-N)
   c. Slow speech: (J)(K-L)(M)(N), ...

As the result, the rules apply at this stage are predicted to be variable depending on performance-related factors, so that boundaries may be removed in fast speech and may be added in slow speech, for example.[29] Pak call these phrase-level rules "late-linearization rules".

In the context of current discussion, Post-Obstruent Tensing, which demonstrates sensitivity to performance-related factors like speech rate, might be classified as a late-linearization rule. And if so, it would tell us nothing about the status of V-raising in Korean. Furthermore, if all rules that have been known to apply within the Accentual Phrase, e.g., Post-Obstruent Tensing, Lenis Stop Voicing, and Vowel Shortening, are late-linearization rules, it would mean that looking at the distribution of the occurrence of these rules, as opposed to the rules that apply within each Spell-Out domain, is not a good way of exploring the syntactic structure in Korean. It entails in some sense admitting that all late-linearization rules lie outside of the domain of syntax, and thus any approach that attempts to subsume the account of these rules under a purely syntax-based theory must be placed under scrutiny.

[28](37) is from Pak's (2008: 33–34) (40) and (41), with modifications.

[29]However, it is not clear how other (linguistic) factors like the number of syllables and frequency of words would influence the deletion or addition of such boundaries in this proposal.

4.2 Troubling assumptions in Han et al.'s (2007) analysis

If Samuels (2011) is correct and thus phase-spell out domains correspond to domains of all phonological rules, it would be reasonable to inspect for the tenability of Han et al.'s (2007) analysis. To do so, let us review the assumptions that Han et al.'s analysis crucially rely on:

(38) 1. the scope of a quantified phrase is determined at its surface position
2. the object obligatorily moves a position higher than VP/vP but lower than the subject
3. the preverbal negation cliticizes onto the verb in syntax
4. whether V-to-T movement occurs depends on the speaker

I would like to focus the discussion on the third assumption in which the preverbal negation *an* cliticizes to the verb in syntax. This assumption is especially crucial to the V-raising account of the split in scope judgments in that the way the negation takes wide scope over a quantified object is by cliticizing to the verb before the verb moves to T. If the preverbal negation is not a clitic, this analysis would not be tenable.

One of Han et al.'s supporting arguments for treating the preverbal negation *an* as a clitic comes from examples containing the VP/vP-adverb and negation, such as (39); and from examples with the coordinated VP structure, as in (40).

(39) a. Toli-ka maykcwu-lul cal an masi-n-ta
Toli-NOM beer-ACC often NEG drink-IMPRF-DEC
'Toli doesn't drink beer often.'
b. *Toli-ka maykcwu-lul an cal masi-n-ta
Toli-NOM beer-ACC NEG often drink-IMPRF-DEC

(40) a. Toli-ka khwukhi-lul ppalli kuliko kheyikhu-lul chenchenhi an mek-ess-ta
Toli-NOM cookie-ACC quickly and cake-ACC slowly NEG eat-PST-DEC
'Toli didn't eat cookies quickly and he didn't eat cake slowly.'
b. *Toli-ka khwukhi-lul ppalli an kuliko kheyikhu-lul chenchenhi an mekessta
T.-NOM cookie-ACC quickly NEG and cake-ACC slowly NEG ate.DEC

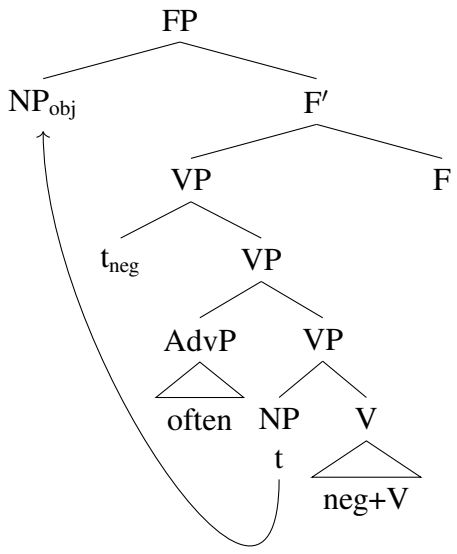
A pair in (39) shows that the adverb cannot intervene between *an* and the verb; and a pair in (40) shows that *an* cannot be stranded without the verb in the first conjunct. Han et al. argue that the fact that *an* must be adjacent to the verb is evidence that it is a clitic.

However, there is reason to doubt that *an* is cliticized to the verb in (39a). Although it is not discussed in Han et al. (2007), the negation in (39a) unambiguously takes wide scope over the adverb *cal* 'often' (Whitman 2005), as shown in (41). That is, (41) is unambiguous for all speakers:

(41) Toli-ka maykcwu-lul cal an masi-n-ta
Toli-NOM beer-ACC often NEG drink-IMPRF-DEC
i. 'Toli doesn't drink beer often.' (not > often)
*ii. 'Toli often doesn't drink beer.' (*often > not)

The prediction that would be made by the structure of (41) under Han et al.'s clitic analysis of preverbal negation goes against the fact above. As shown in (42), if the negation cliticizes to the verb when there is a scope-bearing adverb like 'often', Han et al. would incorrectly predict that speakers without V-raising will reject the the wide scope reading of negation (not>often) while accepting the wide scope reading of 'often' (often>not).[30]

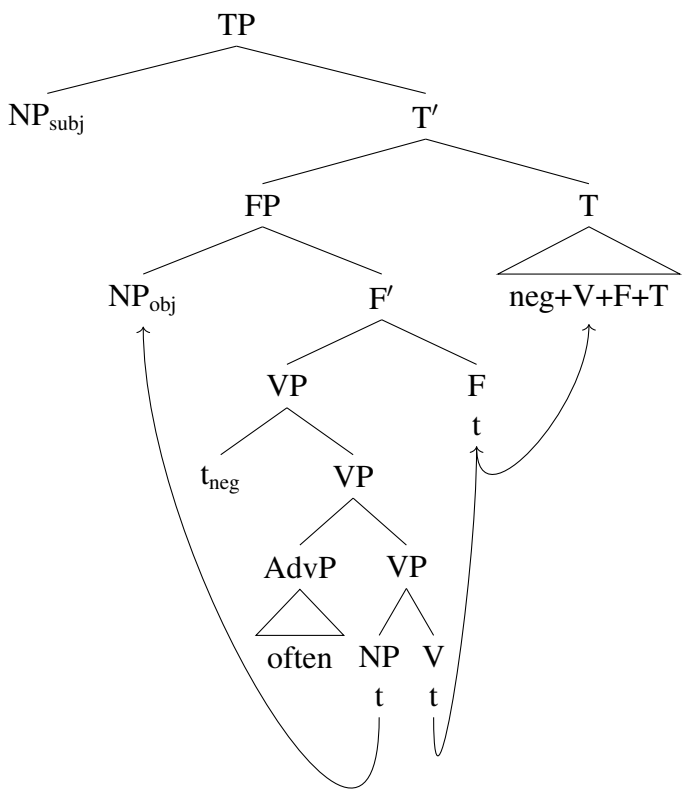
(42)



On the other hand, as for speakers with V-raising, Han et al. would correctly predict that (41) has only the wide scope reading of negation, because negation c-commands 'often' once V has raised to T after cliticization, as shown in (43).

[30]Whether 'often' is initially adjoined below or above the negation does not make a difference regarding the prediction discussed, because the negation always cliticizes (moves downward) to the verb.

(43)



One way to resolve this problem is to say that the cliticization of *an* for non-V-raising speakers does not take place in the syntax. One evidence that suggests there might be a difference in the type of cliticization that *an* undergoes between (42) and (43) is the c-command relation between negation and its trace (copy). In (42), which is the structure generated by the non-V-raising grammar, negation does not c-command its trace after it cliticizes to V. In contrast, in (43), which is the structure generated by the V-raising grammar, negation does c-command its trace at the end of the derivation by virtue of the V-to-T movement that took place after cliticization.

That negation is not allowed to c-command its trace after cliticization in (42) suggests that this cliticization may not be a syntactic cliticization but takes place post-syntactically on the way to PF. If this is correct, the fact that 'often' does not take scope over negation in (42) can be explained under the assumption that scope relations are determined in the syntax; negation c-commands 'often' until it cliticizes to the verb. So, what I propose to solve the scope puzzle posed by (41) is that the cliticization of the preverbal negation *an* is post-syntactic for non-V-raising speakers.

If the cliticization of *an* in the non-V-raising grammar is post-syntactic, the question arises as to how *an* can move past the intervening adverb to the verb, considering that post-syntactic operations

are sensitive to linear adjacency. One reasonable assumption we can make about the stage at which the cliticization of *an* takes place after Spell-Out is that, assuming Distributed Morphology (Halle & Marantz 1993, 1994), this is a type of Lowering operation that takes place before Vocabulary Insertion like English T to V movement (Embick & Noyer 2001). If we assume that the preverbal negation *an* is a head, then the presence of the intervening adverb 'well' between *an* and the verb would not prevent the head-to-head movement from *an* to the verb, because the head-to-head movement does not require linear adjacency between heads because it is a type of Lowering that operates in terms of hierarchical structure (Embick & Noyer 2001: 561–562).

There is a worry, however, that the derivation of (41) for V-raising speakers, as illustrated in (43), must involve a downward movement (= cliticization) of the preverbal negation *an* in syntax. The use of downward movement in syntax is a problem carried over from Han et al.'s clitic analysis, which must be tolerated anyway if one were to accept their analysis. Although Han et al. are not explicit about this, under the assumption that scope is defined in terms of hierarchical structures, the downward movement of the preverbal negation cannot take place after Spell-Out (= at PF), because the negation must be able to take scope over the object after its host (= V) moves to T for V-raising speakers.[31] Therefore, the downward movement in Han et al.'s analysis had better take place in syntax.

For the sake of countering the scope problem in hand, let us assume that there exists downward movement in syntax. Then we could argue that only V-raising speakers' preverbal negation moves downward to the verb in syntax, as opposed to after Spell-Out. Importantly, it must not be the case that the cliticization takes place in syntax for both V-raising speakers and non-V-raising speakers. If that were the case for both speakers, that would nullify our solution to the scope problem of (41) for non-V-raising speakers; we avoided 'often' taking scope over negation by saying that the cliticization takes place after Spell-Out for non-V-raising speakers, so that negation would take scope over 'often' in syntax.[32] In other words, we could argue that the V-raising grammar and the non-V-raising grammar each employ a different type of Lowering operations when it comes to the

[31]The V-to-T movement should take place in syntax (= before Spell-Out) for Han et al.'s analysis to be tenable. See fn. 15 for the discussion.

[32]For discussions on the timing of Lowering, see Skinner (2009).

cliticization of the preverbal negation *an*, where the former makes use of a syntactic Lowering and the latter a post-syntactic Lowering.[33]

In this subsection, I discussed whether the clitic analysis of preverbal negation proposed by Han et al. (2007) can be maintained. The problem with Han et al.'s analysis was that it makes an incorrect prediction regarding the relative scope between the adverb 'often' and the negation. I suggested that this can be resolved by assuming a difference in the nature of cliticization between the V-raising grammar and the non-V-raising grammar: syntactic versus post-syntactic. Whether this line of analysis can be maintained must be carefully investigated in the future research.

[33]Tim Hunter (personal communication) suggests another way to resolve the scope problem posed by (41). If V always moves to F (i.e. the head of the projection into which the object moves; or for that matter any position lower than the object but higher than negation) in the grammar of speakers without V-to-T movement, so that the V to which the negation has cliticized (neg+V) raises to F, negation would take scope over 'often' while the object sill takes scope over negation. Therefore, this solves the scope puzzle while still being able to account for the rejection of the not>every reading. However, under this solution, Samuels's theory will predict no difference in the occurrence of Post-Obstruent Tensing between speakers with V-to-T movement and speakers without V-to-T movement, because the verb and the object will be in the same Spell-Out domain for both groups of speakers.

SECTION 5

Conclusion

In this thesis, I experimentally investigated predictions of the phase-based theory of the syntax-phonology interface without the Prosodic Hierarchy, proposed by Samuels (2011), in regard to the domain of Post-Obstruent Tensing, a post-lexical phonological process in Korean. The result of the experiment suggests that this type of theory is too strong, in ruling out both acceptable sentences with the occurrence of Post-Obstruent Tensing and those without. The pattern of the occurrence of Post-Obstruent Tensing, or its absence, was best predicted by accentual phrasing (Jun 1993 et seq.) of a sentence.

The basis of the idea for the investigation was Han et al.'s (2007) findings, which revealed that there is a split in Korean speakers' scope judgments involving the scope interactions between the quantified object and negation. To account for the split, Han et al. argue that there are two subtly different grammars in the population of Korean speakers, one with V-to-T movement and one without. If this argument is correct, the following prediction under Samuels's theory should hold: non-V-raising speakers' post-lexical Post-Obstruent Tensing process should be blocked from applying between the transitive verb and the object of a simple declarative sentence. The experiment conducted here demonstrates that this prediction does not hold true, as the result of the experiment showed that there is no correlation between the acceptance of the not>every reading and the occurrence of Post-Obstruent Tensing.

To the extent that Samuels's theory is successful, the experimental result also leaves the question of whether it is tenable to connect the split in scope judgements with V-to-T movement, because Han et al. have loose ends in their analysis. And this calls for an alternative analysis of the split, which I will leave for future research.

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