Influence of Intonation, Morphology, and Syntax on the Semantic Scope of Wh-phrases in Kyeongsang Korean

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So Young Lee and Jiwon Yun. 2018. Influence of Intonation, Morphology, and Syntax on the Semantic Scope of Wh-phrases in Kyeongsang Korean. Language and Information 22.3, 23-43. Text Visualization and Concordance Retrieval Using Project Gutenberg. This paper investigates the influence of prosody, morphology, and syntax on the processing of the semantic scope configuration of wh-phrases in Kyeongsang Korean. Through a carefully designed perception experiment, we examined how intonation, sentence-final particles, and long-distance scrambling of wh-phrases affect the judgment on the wh-scope. The results of the experiment suggest that while intonation and the surface syntactic position of wh-phrases do have a certain effect, wh-scope interpretation depends mostly on the sentence-final particles. However, the gang-up effect of intonation and long-distance scrambling was found: when they both indicate a matrix scope reading, the wh-phrase is likely to receive a matrix scope reading even if the sentence-final particle indicates an embedded scope reading. In sum, our study confirms the influence of intonation on wh-scope and newly discovers the influence of long-distance scrambling but observes that neither of them is as strong as morphological marking. We also found a general preference for an embedded scope reading that does not violate the wh-island constraint, which explains the alleged wh-island effect in the previous literature. Overall, however, our data confirm the more recent argument that the wh-island constraint is violable in Korean.

Key words: wh-islands, prosody, sentence-final particles, long-distance scrambling, reconstruction

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1. Introduction

It has been argued that prosody can facilitate \textit{wh}-island violation in \textit{wh}-in-situ languages like Korean and Japanese (Nishigauchi 1990, 1999; Watanabe 1992; H.S. Han 1992; H.S. Choe 1995; Yoshida 1998). For example, when appropriate prosody is applied to \textit{nwukwu-lul} ‘who’ in (1), the sentence can be interpreted as a \textit{wh}-question even though the \textit{wh}-word occurs within a \textit{wh}-island (H.S. Lee 1982, C.M. Suh 1987, Deguchi and Kitagawa 2002, Ishihara 2003, Hirotani 2005, Smith 2010, and H.K. Hwang 2011).

\begin{exe}
\begin{exe}
(1) Miswu-nun [Cangmi-ka nwukwu-lul mannassnun-ci] mwuless-e?
\end{exe}
\end{exe}

\begin{exe}
\begin{exe}
Miswu-Top Cangmi-Nom who-Acc met-Comp asked-Int\textsuperscript{b}
\end{exe}
\end{exe}

\begin{exe}
\begin{exe}
a. ‘Did Miswu ask who Cangmi met?’
b. ‘Who did Miswu ask whether Cangmi met?’
\end{exe}
\end{exe}

In addition to prosody, there are other factors that can affect the interpretation of \textit{wh}-scope, such as sentence-final particles and the surface syntactic position of the \textit{wh}-phrase. A question then arises: if more than one factor is present in a given sentence, how do these factors interact? The question leads to a series of related questions: Are their effects additive? Are their effects weighted with respect to each other? Do they ever cancel each other out?

This paper investigates this “interaction question” through a perception experiment in Kyeongsang Korean, a dialect whose inventory of sentence-final particles is richer and their use is considerably more frequent than standard Korean. Section 2 presents a brief overview of three factors – prosody, sentence-final particles, and word order – that are relevant to semantic scope interpretation of \textit{wh}-phrases in Kyeongsang Korean. Section 3 presents the design and methodology of a perception experiment and Section 4 presents the results of the experiment. The theoretical implications are discussed in Section 5. Section 6 briefly sketches directions for further research and concludes the paper.

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\textsuperscript{1) The abbreviations in the gloss are as follows. Acc: accusative case, Comp: complementizer, Int: intimate sentence ending, Nom: nominative case, Q: question ending, Top: topic. The internal structure of a complex verb is ignored in the gloss unless it is relevant to the discussion in the paper.}
2. Three factors related to the semantic scope of *wh*-phrases in Kyeongsang Korean

2.1 Wh-intonation

As noted in the literature, intonation can mark the semantic scope of *wh*-phrases in Kyeongsang Korean. The correlation between the prosody and the semantic scope of *wh*-phrases in Korean and Japanese has been reported by a number of researchers including H.S. Lee (1982), C.M. Suh (1987), Deguchi and Kitagawa (2002), Ishihara (2003), Hirotani (2005), Smith (2010), and H.K. Hwang (2011). In Kyeongsang Korean, F0 pitch compression or high plateau prosodically marks the domain of the semantic scope of *wh*-phrases (Gim 1970, Kubo 1993, and Hwang 2011) (*wh*-intonation henceforth). (2) and (3) illustrate the basic *wh*-intonation patterns with F0 pitch compression in Kyeongsang Korean.

(2) Embedded scope reading (Hwang, 2011)

Minho-nun Yumi-ka nwukwu-lul mannassnun-ci kwungkumhayha-na?
Minho-Top [Yumi-Nom who-Acc meet-past-Comp] wonder-Q[-wh]?
‘Does Minho wonder who Yumi met?’

(3) Matrix scope reading (Hwang, 2011)

Minho-nun Yumi-ka nwukwu-lul mannassnun-ci kwungkumhayha-no?
Minho-Top [Yumi-Nom who-Acc meet-past-Comp] wonder-Q[+wh]?
‘Who does Minho wonder whether Yumi met?’
When the *wh*-phrase takes embedded scope as in (2), *wh*-intonation initiates right after the *wh*-phrase and lasts until the embedded clause complementizer, and then the pitch is reset after that. On the other hand, when the *wh*-phrase takes matrix scope as in (3), *wh*-intonation starts at the *wh*-phrase and continues to the end of the sentence.

2.2 Sentence-final particles

In Kyeongsang Korean, there are two different sentence-final particles to indicate different types of interrogatives: -*na* for yes/no questions and -*no* for *wh*-questions, as shown in (4).

(4) a. Mary-ka satang-ul mekess-na?
Mary-Nom candy-Acc eat-Q[wh]?
'Did Mary eat candy?'
b. Mary-ka mwues-ul mekess-no?
Mary-Nom what-Acc eat-Q[+wh]?
'What did Mary eat?'

In addition to marking different question types, these sentence-final particles can function as morphological markers of the semantic scope of *wh*-phrases in complex sentences. As seen in (1), an embedded *wh*-phrase is ambiguous between a matrix scope reading and an embedded scope reading when the sentence ending does not indicate the question type. However, when -*na* and -*no* are utilized, the semantic scope of the *wh*-phrase is decided depending on the sentence-final particles.
Influence of Intonation, Morphology, and Syntax on the Semantic Scope of Wh-phrases in Kyeongsang Korean

(5) a. Miswu-nun [Cangmi-ka nwukwu-lul munnassnun-ci] 
   Miswu-Top Cangmi-Nom who-Acc met-Comp
   mwuless-na?
   asked-Q[-whi]?
   ‘Did Miswu ask who Cangmi met?’

b. Miswu-nun [Cangmi-ka nwukwu-lul munnassnun-ci] 
   Miswu-Top Cangmi-Nom who-Acc met-Comp
   mwuless-no?
   asked-Q[+whi]?
   ‘Who did Miswu ask whether Cangmi met?’

In (5), when the sentence ends with -na, the semantic scope of the wh-phrase is the embedded clause because the sentence is interpreted as a yes/no question, but when the sentence ends with -no, the semantic scope of the wh-phrase is the matrix clause because the sentence is interpreted as a wh-question. Thus, Kyeongsang Korean provides a good test case to see the effect of sentence-final particles on processing the semantic scope of wh-phrases.

2.3 Syntactic position of wh-phrases

One of the characteristics of the Korean language is scrambling. Although Korean is a wh-in-situ language, wh-phrases can be scrambled in the sentence. They can freely move from where they were originally generated, within the clause (6) or even out of the clause (7).

(6) Miswu-nun [nwukwu-lul, Cangmi-ka ti munnassnun-ci] mwuless-e?
   Miswu-Top who-Acc Cangmi-Nom met-Comp asked-Int?
   a. ‘Did Miswu ask who Cangmi met?’
   b. ‘Who did Miswu ask whether Cangmi met?’

(7) Nwukwu-lul, Miswu-nun [Cangmi-ka ti munnassnun-ci] mwuless-e?
   who-Acc Miswu-Top Cangmi-Nom met-Comp asked-Int?
   a. ‘Did Miswu ask who Cangmi met?’
   b. ‘Who did Miswu ask whether Cangmi met?’

If a wh-phrase is overtly moved into the matrix clause as in (7) (long-distance scrambling henceforth), one might expect that the wh-phrase would not subject to the wh-island effect anymore. According to Saito (1989) and Tada (1993), however, reconstruction happens
obligatorily in the case of long-distance scrambling in Japanese, so the *wh*-phrase at LF is still under the *wh*-island effect. That is, the surface syntactic positions of *wh*-phrases are not directly related to their semantic scope. However, the rigid reconstruction at LF argued by Saito (1989) and Tada (1993) is based on the data that has a declarative sentence ending form in the matrix clause as shown in (8).

   John-Nom Mary-Nom what-Acc bought-Comp know
   'John knows what Mary bought.'

   What-Acc John-Nom Mary-Nom bought-Comp know
   'John knows what Mary bought.'

In (8b), since the whole sentence must be interpreted as a declarative sentence due to the sentence-ending form, the *wh*-phrases cannot take matrix scope. Thus, the *wh*-phrase scrambled into the matrix clause is forced to be interpreted in its original position at LF.

Contrary to Saito (1989) and Tada (1993), Takahashi (1993) argues that long-distance *wh*-phrase scrambling in Japanese is the same kind of movement as *wh*-movement in English. He distinguishes the long-distance *wh*-phrase scrambling in interrogatives such as (9) from the one in declaratives such as (8).

(9) a. John-wa [Mary-ga nani-o tabeta-ka] siritagatteiru-no?
   John-Top Mary-Nom what-Acc ate-Comp want.to.know-Q?
   'Does John want to know what Mary ate?'

b. Nani-o John-wa [Mary-ga t tabeta-ka] siritagatteiru-no?
   What-Acc John-Top Mary-Nom ate-Comp want.to.know-Q?
   'What does John want to know whether Mary ate?'

According to Takahashi, the scrambled *wh*-phrase in (9b) receives only a matrix scope reading since *wh*-movement over a clause boundary prohibits the *wh*-phrase from being lowered to the embedded clause in LF.
3. Experiment

3.1 Overview and stimuli

So far, we have seen three factors (i.e. prosody, morphology, and syntax) that can affect the semantic scope of wh-phrases in Kyeongsang Korean. In order to see whether and/or how those factors interact with each other, we conducted a perception experiment. To examine the relative contributions and potential interactions of prosodic cues (wh-intonation), morphological cues (sentence-final particles), and syntactic cues (surface syntactic position of wh-phrase), we crossed all three variables to yield a 2x2x2 factorial design. Thus, each set of stimuli consisted of eight different types of sentences as in (10). In the experiment, 4 sets of fully crossed stimuli (32 sentences) were used. The full list of stimuli is in Appendix.

(10) A representative set of stimuli

\[
\begin{array}{llll}
Sm & Se & Wh & Ve-Comp \\
Sc & Sc & Sc & Sc \\
Sm & Sc & Sc & Sm \\
\end{array}
\]

Syntactic position of a wh-phrase: embedded clause

Intonation: embedded scope

Morphology: embedded scope

\(a. \) Type 1

\[
\text{Miswu-nun} \quad [\text{Cangmi-ka} \quad \text{nwukwu-lul} \quad \text{mannassnun-ci}] \quad \text{mwuless-na?} \\
\text{Miswu-Top} \quad \text{Cangmi-Nom} \quad \text{who-Acc} \quad \text{met-Comp} \quad \text{asked-Q[-wh]}? \\
\text{Sm} \quad \text{Se} \quad \text{Wh} \quad \text{Ve-Comp} \quad \text{Vm-Q[-wh]} \\
\]

‘Did Miswu ask who Cangmi met?’

Syntactic position of a wh-phrase: embedded clause

Intonation: embedded scope

Morphology: embedded scope

\(b. \) Type 2

\[
\text{Miswu-nun} \quad [\text{Cangmi-ka} \quad \text{nwukwu-lul} \quad \text{mannassnun-ci}] \quad \text{mwuless-no?} \\
\text{Miswu-Top} \quad \text{Cangmi-Nom} \quad \text{Who-Acc} \quad \text{met-Comp} \quad \text{asked-Q[+wh]}? \\
\text{Sm} \quad \text{Se} \quad \text{Wh} \quad \text{Ve-Comp} \quad \text{Vm-Q[+wh]} \\
\]

‘Did Miswu ask who Cangmi met?’ or ‘Who did Miswu ask whether Cangmi met?’

Syntactic position of a wh-phrase: embedded clause

Intonation: embedded scope

Morphology: matrix scope
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c. Type 3

Miswu-nun [Cangmi-ka nwukwu-lul manassnun-ci] mwuless-na?
Miswu-Top Cangmi-Nom Who-Acc met-Comp asked-Q[-wh]? 
Sm Se Wh Ve-Comp Vm-Q[-wh]

‘Did Miswu ask who Cangmi met?’ or ‘Who did Miswu ask whether Cangmi met?’

Syntactic position of a *wh*-phrase: embedded clause
Intonation [: matrix scope
Morphology: embedded scope

d. Type 4

Miswu-nun [Cangmi-ka nwukwu-lul manassnun-ci] mwuless-no?
Miswu-Top Cangmi-Nom who-Acc met-Comp asked-Q[+wh]? 
Sm Se Wh Ve-Comp Vm-Q[+wh]

‘Who Did Miswu ask whether Cangmi met?’

Syntactic position of a *wh*-phrase: embedded clause
Intonation [: matrix scope
Morphology: matrix scope

e. Type 5

Nwukwu-lul Miswu-nun [Cangmi-ka t manassnun-ci] mwuless-na?
who-Acc Miswu-Top Cangmi-Nom met-Comp asked-Q[+wh]?

Wh Sm Se t Ve-Comp Vm-Q[+wh]

‘Did Miswu ask who Cangmi met?’

Syntactic position of a *wh*-phrase: matrix clause
Intonation [: embedded scope
Morphology: embedded scope

f. Type 6

Nwukwu-lul Miswu-nun [Cangmi-ka t manassnun-ci] mwuless-no?
who-Acc Miswu-Top Cangmi-Nom met-Comp asked-Q[+wh]?

Wh Sm Se t Ve-Comp Vm-Q[+wh]

‘Did Miswu ask who Cangmi met?’ or ‘Who did Miswu ask whether Cangmi met?’

Syntactic position of a *wh*-phrase: matrix clause
Intonation [: embedded scope
Morphology: matrix scope

g. Type 7

Nwukwu-lul Miswu-nun [Cangmi-ka t manassnun-ci] mwuless-na?
who-Acc Miswu-Top Cangmi-Nom met-Comp asked-Q[-wh]?

Wh Sm Se t Ve-Comp Vm-Q[-wh]

Syntactic position of a *wh*-phrase: matrix clause
Intonation [: embedded scope
Morphology: matrix scope
'Did Miswu ask who Cangmi met?' or 'Who did Miswu ask whether Cangmi met?'
Syntactic position of a wh-phrase: matrix clause
Intonation:_matrix scope
Morphology: embedded scope

h. Type 8

<table>
<thead>
<tr>
<th></th>
<th>Nwukwu-lul</th>
<th>Miswu-nun</th>
<th>[Cangmi-ka</th>
<th>t</th>
<th>mannassun-ci]</th>
<th>mwuless-no?</th>
</tr>
</thead>
<tbody>
<tr>
<td>who-Acc</td>
<td>Miswu-Top</td>
<td>Cangmi-Nom</td>
<td>met-Comp</td>
<td></td>
<td>asked-Q[+wh]</td>
<td></td>
</tr>
<tr>
<td>Wh</td>
<td>Sm</td>
<td>Se</td>
<td>t</td>
<td>Ve-Comp</td>
<td>Vm-Q[+wh]</td>
<td></td>
</tr>
</tbody>
</table>

‘Who did Miswu ask whether Cangmi met?’
Syntactic position of a wh-phrase: matrix clause
Intonation:_matrix scope
Morphology: matrix scope

3.2 Prediction

Among the three factors (i.e. prosody, morphology, and syntax), we predict that morphology has the strongest effect for the following reasons. First, we predict morphology has a stronger effect than prosody on processing wh-scope, based on the study by Hirotani (2005). In order to see the relation between prosody and wh-scope, Hirotani conducted a production test. In the test, she used different question ending forms in Tokyo Japanese, -nokai[-wh] and -ndai[+wh] as in (11), which explicitly mark the scope of the wh-phrase as the embedded clause and the matrix clause, respectively.

(11) a. Yamazaki-wa [Ninomiya-ga dare-o maneita-ka] morasita-nokai?
     Yamazaki-Top [Ninomiya-Nom who-Acc invited-Comp] revealed-Q[-wh]?
  ‘Did Yamazaki reveal who Ninomiya invited?’
b. Yamazaki-wa [Ninomiya-ga dare-o maneita-ka] morasita-ndai?
   Yamazaki-Top [Ninomiya-Nom who-Acc invited-Comp] revealed-Q[+wh]?
  ‘Who did Yamazaki reveal whether Ninomiya invited?’

The results of the test in Hirotani (2005) indicate that the use of a specific wh-intonation to disambiguate wh-scope was optional when sentence-ending forms explicitly indicated the wh-scope. This suggests that morphology plays a more important role in marking wh-scope than prosody in production. Based on this, we can make a similar prediction that morphological cues will have a stronger effect than prosodic cues in perception.

Second, we predict morphology has a stronger effect than the syntactic position of
wh-phrases on processing wh-scope. As mentioned in section 2.3, while the syntactic movement of wh-phrases is not necessary to form wh-questions in Korean, it is expected based on Takahashi’s claim that a matrix scope reading would be more easily available when the wh-phrase appears in the matrix clause on the surface. However, even if the scrambling of wh-phrases would lead to a better acceptability of a matrix scope reading, it is expected that it cannot override the effect of the prominent morphological marker since the claims of Saito (1989), Tada (1993), and Takahashi (1993) are all consistent in that the reconstruction at LF is affected by the matrix clause complementizer. Thus, we predict the responses to all types of stimuli are decided by the sentence-final particles, as summarized in (12).

(12) Prediction

<table>
<thead>
<tr>
<th>Type</th>
<th>The position of wh-phrase</th>
<th>Wh-intonation</th>
<th>Sentence-final particles</th>
<th>Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>E</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>M</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>E</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>E</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>M</td>
<td>E</td>
<td>E</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

E: Embedded, M: Matrix

3.3 Recording

All target and filler stimuli were recorded by the first author, a native speaker of the Kyeongsang dialect who was born and grew up in Kyeongsang province. The recording was conducted in the Phonetics Lab in the Department of Linguistics, Stony Brook University. The mismatched sentences were produced on purpose. Since the mismatched sentences do not occur naturally, the first author practiced those sentences several times before recording, performed audio and visual inspections of the sound files after recording, and re-recorded them if necessary. PRAAT 5.4.02 was used in recording and analyzing the audio files.

3.4 Participants

112 subjects participated in this experiment. All of them were born and raised in Kyeongsang province. Among the 112 subjects, 72 were female and 40 were male. The range
of their ages was from 20 to 64 and the average age was 28. They were recruited through social media and volunteered to participate without payment. Participation in the experiment was anonymous.

3.5 Procedures

The test was conducted through Qualtrics, an online survey software. The test consisted of a forced-choice task and an acceptability judgment task. In the forced choice task, participants were asked to listen to the stimuli and choose the most plausible continuation of the stimuli. Since all the stimuli had the form of a question, the task was to choose between two possible answers to the question. One was ‘Yes or No’ as a possible answer to yes/no questions and the other was the name of a person or an object as a possible answer to *wh*-questions, as illustrated in (13). The stimuli were pseudo-randomized so that the same set of stimuli did not repeat in a row. The stimuli were provided as sound without text. Each stimulus was given in a single webpage and subjects had to click on the ‘next’ button to move on to the next stimulus.

(13) An example of a forced-choice task

Q: Miyeni-nun Cwunwu-ka nwukwu-lul cohahayssnun-ci mwuless-na?
   Miyen-Top Cwunwu-Nom who-Acc liked-Comp asked-Q
   ‘Did Miyen ask what Cwunwu liked?’
   ‘What did Miyen ask whether Cwunwu liked?’
A: a. Ung / Ani (‘yes / no’)   b. Tayhi (‘Taehee’)

As mentioned earlier, intonation and sentence particles are well-matched in real-world speech, but in this experiment the mismatched cases were produced intentionally. In the forced choice task, because participants were forced to choose one of the two given answers even in mismatched sentences, it was hard to see how the participants judged the acceptability of the mismatched sentences. In order to examine how well participants accepted each type of sentence, an acceptability judgment task followed the forced choice task. In the acceptability judgment task, subjects were asked to evaluate the naturalness of the sentence on a 7-point scale from 0 (the least natural) to 6 (the most natural). Subjects could replay the sound files in both tasks whenever they wanted before leaving the page, but they were not allowed to go back to the previous task after they answered.
4. Results

This section analyzes the responses from 108 participants. Responses from four participants were excluded from the analysis because of their unreliable response patterns. The average length of the audio files was about 3 seconds but the response time of each question from the four participants, including the time to play audio files, was shorter than 3 seconds. Thus, those participants were believed to have answered the questions without listening to the stimuli.

4.1 Forced choice task

The responses for eight different sentence types are summarized as below.

(14) Results of the forced choice task

<table>
<thead>
<tr>
<th>Type</th>
<th>The position of wh-phrase</th>
<th>Wh-intonation</th>
<th>Sentence-final particles</th>
<th>Wh-question responses</th>
<th>Majority responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>14.8%</td>
<td>E</td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>E</td>
<td>M</td>
<td>71.3%</td>
<td>M</td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>M</td>
<td>E</td>
<td>22.2%</td>
<td>E</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>M</td>
<td>M</td>
<td>87.0%</td>
<td>M</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>E</td>
<td>E</td>
<td>24.1%</td>
<td>E</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>E</td>
<td>M</td>
<td>89.8%</td>
<td>M</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>M</td>
<td>E</td>
<td>67.6%</td>
<td>M</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>84.2%</td>
<td>M</td>
</tr>
</tbody>
</table>

As seen in (14), the majority of the responses for each type mostly correlates with what the sentence-final particle indicates. In most cases, participants processed the scope of the wh-phrase as the embedded clause when the sentence-final particle indicated a yes/no question and they processed the scope of the wh-phrase as the matrix clause when the sentence-final particle indicated a wh-question, even when factors other than sentence-final particles indicated a different reading.

However, the responses of Type 7 are against this general trend. In Type 7, even though the sentence-final particle marked a yes/no question, the responses to this sentence type shows that participants interpreted it as a wh-question most of the time. As shown in the configuration of Type 7 in (15), the syntactic position of wh-phrases is in the matrix clause and wh-intonation also marks the semantic scope of the wh-phrase as the matrix clause. This
suggests that while neither intonation nor long-distance scrambling is stronger than the sentence-final particle when they are considered individually, the combination of long-distance scrambling and \textit{wh}-intonation can show a gang-up effect and override the effect of a sentence-final particle.

(15) Configuration of Type 7

\[
\begin{array}{cccc}
\text{Wh} & \text{Sm} & \text{Se} & \text{Ve-Comp} \\
\rightarrow & & & \text{Vm-Q[-wh]} \\
\end{array}
\]

a. Syntactic position of \textit{wh}-phrase: Matrix clause
b. \textit{Wh}-intonation: Matrix
c. Sentence-final particle: Embedded

In order to see the effect of each factor in more detail, we conducted pairwise comparison for each factor while the other two factors were fixed. First, let us take a look at the effect of sentence-final particles in (16). The results of the \textit{t}-tests show that regardless of whether the other factors are matched together (16a and b) or not (16c and d), the differences between the two sentence-final particles are significant in all cases. This confirms that morphology (sentence-final particles) has an independently strong impact on interpreting the semantic scope of a \textit{wh}-phrase.

(16) The effect of sentence-final particles

<table>
<thead>
<tr>
<th>\textit{Wh}-Position</th>
<th>Intonation</th>
<th>Sentence-final particle</th>
<th>\textit{p}-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. E</td>
<td>E</td>
<td>E (Type 1)</td>
<td>vs M (Type 2)</td>
</tr>
<tr>
<td>b. M</td>
<td>M</td>
<td>E (Type 7)</td>
<td>vs M (Type 8)</td>
</tr>
<tr>
<td>c. E</td>
<td>M</td>
<td>E (Type 3)</td>
<td>vs M (Type 4)</td>
</tr>
<tr>
<td>d. M</td>
<td>E</td>
<td>E (Type 5)</td>
<td>vs M (Type 6)</td>
</tr>
</tbody>
</table>

Next, the effect of prosody is shown in (17). When the syntactic positions of \textit{wh}-phrases and sentence-final particles are matched together, the difference between the two types were not significant, as seen in (17a and b). However, when they are not matched together, the differences between the two types in (17c and d) are statistically significant. Thus, we can say that intonation has impact on determining the semantic scope of a \textit{wh}-phrase when the other two factors are not matched.
(17) The effect of intonation

<table>
<thead>
<tr>
<th>Wh-Position</th>
<th>Sentence-final particle</th>
<th>Intonation</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>E</td>
<td>E (Type 1)</td>
<td>vs M (Type 3)</td>
</tr>
<tr>
<td>b.</td>
<td>M</td>
<td>M (Type 6)</td>
<td>vs M (Type 8)</td>
</tr>
<tr>
<td>c.</td>
<td>E</td>
<td>M (Type 2)</td>
<td>vs M (Type 4)</td>
</tr>
<tr>
<td>d.</td>
<td>M</td>
<td>E (Type 5)</td>
<td>vs M (Type 7)</td>
</tr>
</tbody>
</table>

Finally, the effect of syntactic positions of a *wh*-phrase is summarized in (18). Similar to the effect of intonation, when the other factors (intonation and sentence-final particles) are not matched together (18c and d), the differences between both types are significant. The syntactic position of the *wh*-phrase also has an effect on the semantic scope of *wh*-phrases when the other factors are not matched.

(18) The effect of the syntactic position of the *wh*-phrase

<table>
<thead>
<tr>
<th>Intonation</th>
<th>Sentence-final particle</th>
<th>$Wh$-position</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>E</td>
<td>E (Type 1)</td>
<td>vs M (Type 5)</td>
</tr>
<tr>
<td>b.</td>
<td>M</td>
<td>M (Type 4)</td>
<td>vs M (Type 8)</td>
</tr>
<tr>
<td>c.</td>
<td>E</td>
<td>M (Type 2)</td>
<td>vs M (Type 6)</td>
</tr>
<tr>
<td>d.</td>
<td>M</td>
<td>E (Type 3)</td>
<td>vs M (Type 7)</td>
</tr>
</tbody>
</table>

To sum up, sentence-final particles seem to be the strongest factor that affects the processing of the semantic scope of *wh*-phrases. However, the statistical results show that even though the sentence-final particles independently play a decisive role, the syntactic position of a *wh*-phrase and intonation have an impact when the other factors are not matched together.

4.2 Acceptability Judgment Task

The results of the acceptability judgment task are given below.

The results of the acceptability judgment task show that the speakers disfavored long-distance *wh*-scrambling constructions. Since the scrambling of *wh*-words is optional in Korean, it is expected that long-distance scrambling constructions (Type 5-8) would be as acceptable as their non-scrambled counterparts (Type 1-4, respectively). However, the acceptability of scrambling constructions was relatively lower than that of the corresponding non-scrambling constructions. This shows there is a baseline preference for avoiding *wh*-island effects.
### Results of the acceptability judgment task

<table>
<thead>
<tr>
<th>Type</th>
<th>The position of wh-phrase</th>
<th>Wh-intonation</th>
<th>Sentence-final particles</th>
<th>Naturalness (Min: 0, Max: 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>3.7</td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>E</td>
<td>M</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>M</td>
<td>E</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>M</td>
<td>M</td>
<td>2.7</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>E</td>
<td>E</td>
<td>2.1</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>E</td>
<td>M</td>
<td>2.3</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>M</td>
<td>E</td>
<td>2.0</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>2.5</td>
</tr>
</tbody>
</table>

The acceptability rate of Type 7 was the lowest. Recall that Type 7 showed an exceptional pattern in the forced choice task, too. In Type 7, the *wh*-phrase generated in an embedded clause is moved to the beginning of the sentence, so listeners will hear the *wh*-phrase at the very beginning of the sentence and the prosodic cues that mark the matrix scope of the *wh*-phrase last until the end of the sentence. Thus, listeners are likely to hold the strong expectation that the sentence is a *wh*-question almost until the end of the sentence. However, at the end of the sentence, listeners encounter the sentence-final particle marking an embedded scope reading of the *wh*-phrase, which is opposite to their expectation. The sudden discrepancy between the sentence-final particle and the combination of syntactic position and intonation could make listeners judge the sentence as the least natural one.

### 4.3 Response time

While participants were responding to the forced-choice questions, their response time was also measured. The response time we measured indicates how long participants stayed on each page. The time runs from the first click to the last click in the given webpage. The first click indicates the moment participants clicked the “play” button of the audio file and the last click indicates the moment participants clicked the “next” button in order to move to the next step. We should note that since this survey was conducted online, the response time might have been affected by an unstable network system, and the data we collected only provide an approximate pattern.

In the analysis of response time, we excluded too fast responses (less than 3 seconds) as well as too slow responses (more than 60 seconds). As mentioned before, the length of all audio files was about 3 seconds. If the response time was faster than 3 seconds, it means the
subject did not listen to the full stimuli before answering to questions. Responses that took more than 60 seconds were about one percent of the entire responses, and we excluded them in the analysis. The average response time of each type is given below.

<table>
<thead>
<tr>
<th>Type</th>
<th>The position of wh-phrase</th>
<th>Wh-intonation</th>
<th>Sentence-final particles</th>
<th>Average response time (s)</th>
<th>p-value (comparison with Type 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>10.17</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>E</td>
<td>M</td>
<td>12.56</td>
<td>.01</td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>M</td>
<td>E</td>
<td>11.66</td>
<td>.02</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>M</td>
<td>M</td>
<td>10.91</td>
<td>.16</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>E</td>
<td>E</td>
<td>14.62</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>E</td>
<td>M</td>
<td>11.21</td>
<td>.08</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>M</td>
<td>E</td>
<td>14.42</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>11.45</td>
<td>.09</td>
</tr>
</tbody>
</table>

As shown in (20), it took a significantly more amount of time to answer Type 5 and Type 7 than the others. This result correlates with the acceptability results in (19), where Type 5 and Type 7 were the least acceptable ones. As shown in the configuration of Type 5 and Type 7 in (21), the syntactic position of wh-phrases is in the matrix clause, but the sentence-final particle indicates an embedded scope reading. This suggests a strong influence of long-distance scrambling on processing wh-scope, and the mismatch between long-distance scrambling and sentence-final morphology requires more time and effort to process the sentence.

(21) Configuration of Type 5 & Type 7

\[
\text{Wh} \quad \text{Sm} \quad [\text{Se} \quad t \quad \text{Ve-Comp}] \quad \text{Vm-Q[-wh]} \]

5. Discussion

The finding in this study shows that there is an analogue to Hirotani(2005)’s findings in comprehension. Hirotani (2005)’s production test showed that the use of prosody was optional when morphology explicitly marked wh-scope. Our experimental results also show that the morpho-syntactic cues in the constructions like (22) are dominant.
In particular, in Type 3, where the surface syntactic structure was the same as (22) and the sentence-final particle marked an embedded scope reading but prosody marked a matrix scope one, the majority of the responses was to interpret it as a yes-no question. It is evident that even though prosody can generally mark a violation of the *wh*-island constraint, the *wh*-island effect does not disappear when the morphology marks an embedded clause reading.

However, as seen in the result of Type 7, when the sentence involved long-distance scrambling of a *wh*-phrase, even if morphology indicates an embedded clause, the *wh*-island effect was cancelled when the prosody marks a violation of *wh*-island constraint. This shows the tendency that *wh*-phrases that move into the matrix clause tend to associate with the matrix clause complementizers, especially when prosody facilitates a matrix scope reading. Contrary to Saito (1989, 1992), Tada (1993), and Aoshima, et al (2003), our experimental results support the claim by Takahashi (1993) that *wh*-phrases in long-distance scrambling constructions do not undergo reconstruction into the embedded clause, when there is any other factor that facilitates a matrix scope reading. In our experiment, *wh*-phrases in long-distance scrambling constructions were not lowered into the embedded clause whenever another factor, either prosody or morphology, marks a matrix scope reading (in Type 6, 7, and 8).

6. Conclusion

This paper has investigated how prosodic cues, morphological cues, and the surface syntactic position of *wh*-phrases interact with each other on processing semantic *wh*-scope. The experimental results show that the sentence-final particles are the strongest independent effect on *wh*-scope among the three factors, but the combination of long-distance scrambling and intonation showed a gang-up effect: they can override the effect of morphology. Overall, there was a baseline preference for an embedded scope reading of the *wh*-phrase, which explains the alleged *wh*-island effect from previous literature. However, this study confirms the more recent argument that the *wh*-island constraint is violable. The use of a sentence-final particle, intonation, and/or *wh*-scrambling can indicate a violation of the *wh*-island constraint.
<References>


So Young Lee · Jiwon Yun

Influence of Intonation, Morphology, and Syntax on the Semantic Scope of Wh-phrases in Kyeongsang Korean

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Appendix

A. Sentences

The target stimuli consisted of 4 sets of distinct sentences. Each set consisted of 8 different types that were fully crossed between two different syntactic positions, two different intonations and two different sentence-final particles (2x2x2 = 8). For space limitation, sentences with long-distance scrambling are omitted below.

Set A

*Miswu-nun Cangmi-ka nwukwul mannassnun-ci mvuless-na/no?
*Miswu-Top Cangmi-Nom who.Acc met-Comp asked-Q

‘Did Miswu ask who Cangmi met?’ or ‘Who did Miswu ask whether Cangmi met?’

Set B

*Cwuyeni-nun Minwu-ka muel mekessnun-ci mvuless-na/no?
*Cwuyeni-Top Minwu-Nom what.Acc ate-Comp asked-Q

‘Did Cwuyeni ask what Minwu ate?’ or ‘What did Cwuyeni ask whether Minwu ate?’

Set C

*Ciwu-nun Mila-ka muel ssessnun-ci mvuless-na/no?
*Ciwu-Top Mila-Nom what.Acc wrote-Comp asked-Q

‘Did Ciwu ask what Mila wrote?’ or ‘What did Ciwu ask whether Mila wrote?’

Set D

*Miyeni-nun Cwunwu-ka nwukwul cohahayssnun-ci mvuless-na/no?
*Miyeni-Top Cwunwu-Nom who.Acc liked-Comp asked-Q

‘Did Miyeni ask who Cwunwu liked?’ or ‘Who did Miyeni ask whether Cwunwu liked?’
B. Pitch contours

The pitch contours of the stimuli in Set A are presented below as an example.