# Poor Performance on Scrambled Korean OSV Sentences by Korean Heritage Children: Performance, Not Competence

**Kitaek Kim, William O'Grady, and Kamil Ud Deen**

## 1. Introduction

Heritage speakers are "child and adult members of a linguistic minority who grew up exposed to their home language and the majority language" (Montrul, 2010, p. 4). It is common for their proficiency in the heritage language to fall short of the native-speaker level of their parents (Montrul, 2006). For example, Song, O'Grady, Cho, and Lee (1997) report that Korean heritage children (KHC) in the United States (ages 3–12) showed difficulty in understanding scrambled Korean OSV sentences: in a picture selection comprehension test, the KHC systematically misinterpreted these patterns as canonical SOV sentences, even when a context sentence was used to make the scrambled sentence sound natural. This suggests that the KHC did not make the necessary use of case marker information to establish the syntactic relations of the arguments. Rather, they interpreted the sentences linearly, with the first NP as the subject and the second NP as the direct object.

There are two possible accounts for this performance. The first is that the KHC are not aware of the function of Korean case markers. The second is that KHC have adult-like knowledge of the case markers, but that they are not able to use case effectively in the course of comprehension for extraneous reasons. The current study aims to address this issue.

## 2. Background information & Previous studies

### *2.1. Background information about Korean*

Korean, a canonically SOV language, uses case to mark grammatical relations. However, on occasion, Korean speakers may omit case markers, relying on word order to distinguish between the verb's arguments (the first NP is the subject; the second is the direct object). Thus the case-marked SOV sentence in (1a) has the same meaning as the caseless sentence in (1b).

(1) a. Wensungi-ka kay-lul cha.[1]
Monkey-NOM dog-ACC kick
'A monkey is kicking a dog.'

b. Wensungi kay cha.
Monkey dog kick
'A monkey is kicking a dog.'

c. Wensungi-lul kay-ka cha.
Monkey-ACC dog-NOM kick
'A monkey, a dog is kicking.'

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[1] Abbreviations for glosses are ACC (accusative), NOM (nominative), PST (past), SE (sentence ender), and TOP (topic).

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Korean also allows scrambling, which makes case marker information crucial for interpretation. Thus, thanks to case, the OSV sentence in (1c) has a different meaning from (1b), despite the similarity in word order. Without the case marking, (1c) would be interpreted as 'a monkey is kicking a dog.'

### *2.2. Acquisition studies*

Native Korean children start producing Korean case markers at quite an early age. Based on a study of five monolingual children, Kim (1997) reports that the first case marker to emerge in production is the nominative marker *-ka* (between 1;8 and 2;0). The accusative marker *-lul* emerges slightly later: Three children in Kim's study began to produce it between 1;11 and 2;3, and the remaining two children did so between 2;6 and 2;8.[2]

Work by Cho (1981) and Chung (1994) suggests that monolingual Korean children are able to use case markers to interpret scrambled OSV sentences by approximately 4 years of age. Prior to that time, there is a tendency to interpret the first NP as subject and the second NP as direct object.

Scrambling is one way for flexible word-order languages to encode information structure. In Korean and Japanese, scrambled OSV sentences sound somewhat unnatural out of context, but are natural when the context makes the direct object topical. Otsu (1994) was the first to test whether context helps children understand scrambled OSV sentences. He reports that in an act-out task, a context sentence helped monolingual Japanese children (ages 3–4) understand scrambled OSV sentences. This suggests that children may actually be aware of the function of case, but are poor at using that knowledge in the absence of an appropriate context. Kim, O'Grady & Cho (1995) identified a similar effect in monolingual Korean children ($n$ = 68, ages: 2–8). Using a picture selection task, they found that the presence of the sort of context illustrated in Figure 1 leads to a noticeable improvement in monolingual Korean children's comprehension of OSV sentences.

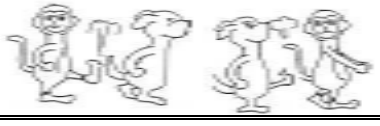
| | Spoken stimuli | Visual stimuli |
|---|---|---|
| Context | Yeki wensungi isse. Kwiyepci?<br>Here monkey exist be cute<br>'Here is a monkey. He is cute, isn't he?' |  |
| Test sentence | I wensungi-lul kay-ka cha.<br>This monkey-ACC dog-NOM kick<br>'This monkey, a dog is kicking.' |  |

*Figure 1.* An example context-condition item (Song et al., 1997, p. 114, (6))

Adult controls performed at ceiling in all conditions, showing full knowledge of scrambled word order. Henceforth, we therefore assume that OSV word order is comprehended at ceiling by adults, in line with Kim et.al. and many other studies.

Recently, the effect of context on Korean adults' real-time interpretation of OSV sentences was reported by Hwang (2008). She showed that whereas native Korean adults processed OSV more slowly than canonical SOV sentences in a self-paced reading task, reading is facilitated by a context that makes a sentence-initial direct object more topical.

Song et al. (1997) investigated whether KHC in the U.S. (ages 3–12) understood scrambled Korean OSV sentences and whether a context sentence brings about an improvement in comprehension. In their picture-selection test, however, the KHC showed poor comprehension of OSV sentences, regardless of the presence or absence of a context sentence.

Song et al.'s result can be understood in either of two ways. On the one hand, the KHC may not have been aware of the function of case in Korean. On the other hand, the KHC may have been aware of the function of case, but were unable to use it effectively in online comprehension. In this paper, we pursue the second possibility.

[2] Kim (1997) reports that the rate of accusative case drop was much higher than that of nominative case drop in these children's speech. Cho (1981) reports that adults are likely to drop accusative markers more than nominative markers: Of all the subject arguments in the speech of one mother to her child, 35.1% occurred without the case marker; in contrast, 87.4% of direct objects occurred without the case marker.

There are two factors that might contribute to KHC's failure to use case marking. The first is that children might fail to perceive case markers because they are relatively weak acoustically (O'Grady, Kwak, Lee, & Lee, 2011). If the case markers in an OSV sentence such as (2a) are not perceived, children would hear the utterance as if it were the canonical SOV pattern in (2b). This in turn would create the impression that they had no knowledge of case markers when in fact the issue is one of perception, not knowledge.

(2) a. Elmo-lul Big Bird-ka an-ayo.
Elmo-ACC Big Bird-NOM hug-SE
'Big Bird is hugging Elmo.'

b. Elmo Big Bird an-ayo.
Elmo Big Bird hug-SE
'Elmo is hugging Big Bird.'

A second reason for the children's failure to apply their knowledge has to do with the possibility that the context used in Song et al. (1997) was not as felicitous as we anticipated. For example, let us revisit Figure 1: "Here is a monkey. He is cute, isn't he? This monkey, a dog is kicking." Pointing out that a monkey is cute bears no obvious relation to the fact that a dog is kicking the monkey.

### *2.3. Methodological design*

To address these matters, we made two methodological innovations over previous studies. First, we manipulated the prosodic salience of the case markers in the test sentences. Since prominence is signaled by a number of acoustic features, including a rise in fundamental frequency (F0), an increase in duration, and an increase in intensity (Ladd, 1996), we manipulated the pitch, intensity, and duration of the case markers using Praat (Boersma & Weenink, 2008) and Goldwave. In order to ensure that this manipulation did not result in unnatural sentences, we conducted an analysis of the speech production of six Korean native speakers, and we elicited acceptability judgments from 94 native Korean adults. Based upon these two norming procedures, we manipulated the case markers by increasing the pitch by a factor of 1.1, the intensity by a factor of 2, and the duration by a factor of 2.

Second, we provided a felicitous context to motivate scrambling, adopting the contexts in Hwang (2008). See Figure 2 for a sample context and test sentence.

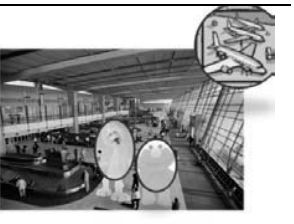
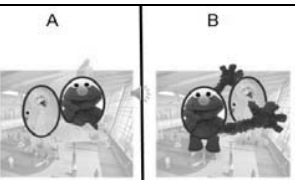
| | Spoken stimuli | Visual stimuli |
|---|---|---|
| Context | Na-nun cikum konghang-ey iss-eyo.<br>I TOP now airport at stay-SE<br>'I am in an airport now.'<br><br>Ceki Big Bird-nun pihayngki-eyse nayly-ess-eyo.<br>There Big Bird-TOP airplane-from land-PST-SE<br>'There, Big Bird landed in his plane.' |  |
| Test sentence | I Big Bird-lul Elmo-ka an-ayo.<br>This Big Bird-ACC Elmo-NOM hug-SE<br>'This Big Bird, Elmo is hugging.' |  |

*Figure 2.* An example context-condition item in the current study

In the first context sentence, we introduced an airport setting, which is relevant to the upcoming hugging event between Big Bird and Elmo in the test sentence. Hugging is often used to express gladness or sadness, and an airport is one place where this is frequently observed.

The second context sentence was designed to increase the topicality of the first-mentioned NP—a crucial contributor to the naturalness of OSV patterns. In order to make Big Bird still more prominent, we depicted him in his natural color while Elmo is de-emphasized in black and white. Furthermore, in our animation for this item, Big Bird moved his head from side to side, while Elmo was stationary. With such manipulations, we expected participants to concentrate more on Big Bird than on Elmo as they listened to the context sentences, making Big Bird the more natural candidate to be the referent of the first NP in the scrambled sentence, as the use of the scrambled Korean OSV is motivated only in a context where the first NP is a topic.

### *2.4. Research Questions and Hypotheses*

The research questions we explore are as follows:

1. Are Korean heritage children (KHC) aware that Korean is a case language, i.e., that it uses case to mark grammatical relations?
2. Are they able to use case effectively and systematically in comprehension?

Our hypotheses can be stated as follows:

1. If KHC are not aware that Korean is a case language, no manipulation of prosody or context can increase comprehension accuracy.
2. If KHC are aware that Korean is a case language, the manipulation of prosody and/or context should help them perceive the case markers and thereby improve their understanding of scrambled OSV sentences.

## 3. Current study

### *3.1. Subjects*

Thirty-four KHC (ages 8–14) and 23 monolingual Korean controls (ages 10–11) participated in our study. The KHC, recruited from a Saturday Korean-language school in Hawai‘i, had been born mostly in the United States[3] and had Korean-speaking parents.[4] All of them reported being more comfortable speaking English than Korean. Participants filled out a language background survey which gathered information such as length of time spent in Korea, the amount of input they received in Korean/English from various sources, the amount of Korean/English they produce in an average day, as well as self-assessments of their own abilities to speak/read/write/understand in Korean/English. We return to (part of) the results of this survey in the analysis of the experimental data below. The monolingual children were recruited from an elementary school in South Korea; none had lived in an English-speaking country for more than three months. All participants completed three experiments with a one- or two-week interval in between. The order of the experiments was randomized.

### *3.2. Materials*

We conducted three picture-selection experiments: A baseline task with no manipulation, a task in which prosody was manipulated to make case markers prominent, and a task in which context was manipulated to increase the naturalness of OSV sentences. In each experiment, participants were presented with 28 stimuli consisting of 7 canonical SOV sentences, 7 scrambled OSV sentences, and 14 non-transitive filler sentences. In addition, 3 practice items were used to train the children on the task, which involved listening to a sentence and then choosing the picture (from two options) that best illustrates the sentence’s meaning. The presentation sequence was randomized; however, care was taken that no two consecutive items included the same verb and no three consecutive items included the

[3] Four KHC were born in Korea and immigrated to the U.S. before age 4.
[4] Two KHC had a non-Korean parent: One had a Japanese father and the other had an American father.

same word order. This was to avoid carry-over from one trial to the next. In addition, target pictures (right vs. left) were counterbalanced for SOV items, OSV items, and fillers. Half of the participants were given the sentences in the initial randomized order, while the other half were given the sentences in reversed randomized order. The following are examples of the experimental sentences (see Figure 3 as well).

(3) a. Canonical SOV

| | | |
|---|---|---|
| Big Bird-ka | Elmo-lul | an-ayo. |
| Big Bird-NOM | Elmo-ACC | hug-SE |

'Big Bird is hugging Elmo.'

b. Scrambled OSV

| | | |
|---|---|---|
| Big Bird-lul | Elmo-ka | an-ayo. |
| Big Bird-ACC | Elmo-NOM | hug-SE |

'Elmo is hugging Big Bird.'

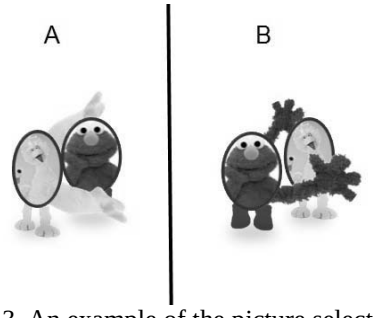



*Figure 3.* An example of the picture selection task

As they listened to the context and test items, the participants watched slides on a computer screen. On each slide, a black vertical line separated two scenes. The scenes depicted on each side differed in a single crucial way. As seen in Figure 3, for example, both sides included Elmo and Big Bird. However, on the left side, Big Bird hugs Elmo; on the right side, Elmo hugs Big Bird. Participants were asked to indicate their choice of matching scene by marking either A (for the left side) or B (for the right) on a sheet of paper.

If case markers are not perceived and used, *Big Bird* should be regarded as the subject in both (3a) and (3b), giving the canonical SOV word order. Thus, children should select the picture that depicts Big Bird hugging Elmo for both (3a) and (3b), i.e., A in Figure 3. However, if the participants make use of case marker information, they should choose the picture in which Elmo hugs Big Bird, i.e., B in Figure 3, only for (3b), the scrambled OSV sentence.

The stimuli were created using a Text-To-Speech (TTS) program with the most updated version of the TTS voice source (Yumi's voice). The use of the TTS program had two motivations. First, the TTS source comes from a professional speaker, which helps ensure the pronunciation is clear and of high quality. Second, the use of the TTS program avoids inconsistent pronunciations and unintentional prosodic cues. The naturalness of the pronunciation of the TTS source was confirmed by acceptability judgments by native Korean adults ($n$ = 94).

### *3.3. Results*

The control group of monolingual Korean children showed high accuracy across all three experiments, both in canonical SOV sentences (base 93.8%; prosody 95.7%; context 96.9%) and in scrambled OSV sentences (base 82.6%; prosody 87.6%; context 88.2%). The KHC showed high accuracy across all three tests for the SOV sentences (base 99.2%; prosody 97.9%; context 98.3%), but poor accuracy in the OSV sentences (base 27.3%; prosody 48.7%; context 41.6%). Figure 4 displays the accuracy rates on the scrambled OSV items by native Korean children and KHC.

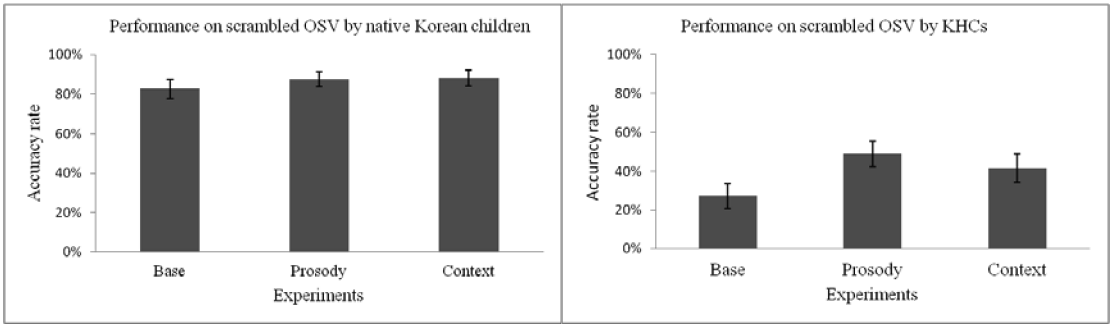



*Figure 4.* Accuracy rates on the scrambled OSV by native Korean children controls and KHC

The differences in the mean scores for the three experiments (baseline vs. prosody vs. context) and the two word orders (SOV vs. OSV) were analyzed in a series of repeated-measure analyses of variance (ANOVA) with post-hoc Bonferroni adjustments for multiple comparisons (alpha level = .05). For the monolingual children, we found a main effect of word order [$F_1(1, 22) = 5.961$, $p < .03$; $F_2(1, 6) = 18.134$, $p < .01$], a marginal main effect of experiment type [$F_1(2, 44) = 3.003$, $p < .06$; $F_2(2, 12) < .03$], and a lack of interaction effect between word order and experiment type [($F_1(2, 44) = .346$, $p > .710$; $F_2(2, 12) = .074$, $p > .929$]. For KHC, we found a main effect of word order [$F_1(1, 33) = 89.965$, $p < .001$; $F_2(1, 6) = 859.846$, $p < .001$], a main effect of experiment type [$F_1(2, 66) = 10.095$, $p < .001$; $F_2(2, 12) = 79.641$, $p < .01$], and an interaction between word order and experiment type [$F_1(2, 66) = 11.944$, $p < .001$; $F_2(2, 12) = 50.786$, $p < .001$]. A multiple comparisons test (the post-hoc Bonferroni adjustments) shows that the KHC performed significantly better on the prosody and context experiments relative to the baseline experiment, but there was no significant difference between the prosody and context experiments.

In sum, the KHC showed ceiling performance on SOV, but attained only 27.3% accuracy on OSV in the baseline experiment. This suggests that they rely on word order for inferring grammatical relations. However, the OSV accuracy rates increased to 48.7% in the prosody experiment and to 41.6% in the context experiment. These results suggest that poor performance on the baseline experiment is not due to a lack of knowledge of case markers: if the KHC were truly ignorant of the function of case, our manipulations would not have had an impact on their interpretive success.

The differences in success on scrambled OSV sentences between the baseline experiment (27.3%) and the manipulation experiments (prosody 48.7%; context 41.6%) are not particularly large (despite the difference is significant), and accuracy rates in the latter experiments appear to fall within the range of chance performance. Crucially, however, this is often the case with averaged results, which reflect the good and poor performance of all participants, potentially masking underlying contrasts. In order to investigate this matter further, we examined the individual data and divided the participants into three groups based on their patterns of performance. Figure 5 shows the accuracy rates of the three groups (P1 to P17 in Group 1; P18 to P26 in Group 2; P 27 to P34 in Group 3) on each experiment.

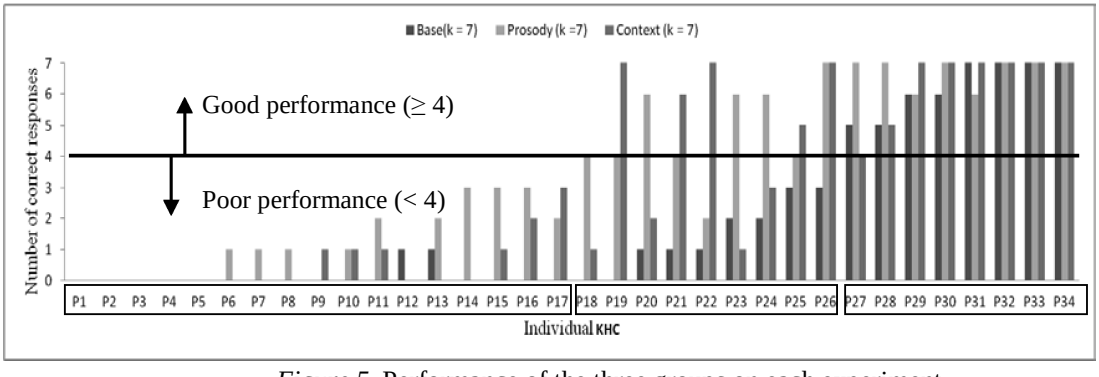



*Figure 5.* Performance of the three groups on each experiment

In assigning participants to a group, we assumed that 3 or fewer correct (out of 7) is categorized as poor performance (i.e., range of accurate responses rates = 0% to 42.9%); and 4 or more being correct as good performance (range of accurate responses rates = 57.1% to 100%). In accordance with these criteria, Group 1 ($n$ = 17) consists of participants who showed poor performance across the three experiments; Group 2 ($n$ = 9) consists of those who showed poor performance in the baseline experiment, but showed good performance in either of the facilitating experiments; and Group 3 ($n$ = 8) consists of those who showed good performance across the three experiments.

Having grouped participants in this manner, we matched the results of our background survey to the groups and found that on average, participants who fell into Group 1 (poor performance) spoke Korean less and heard less Korean than participants in Group 2, who likewise spoke and heard Korean less than those in Group 3. Thus our groupings align with the overall amount of exposure (input and output) reported by the participants. This is illustrated in Table 1, which includes the amount of perceived input and output (on average) from and to their parents when the KHC were younger. (Data are missing from two participants in Group 1 and one participant in Group 2.)

Table 1.
*Perceived amount of input when they were younger children*

| | Input | | Output | |
|---|---|---|---|---|
| | from father | From mother | to father | to mother |
| Group 1 ($n$ = 15) | 2.27 | 1.73 | 2.80 | 2.60 |
| Group 2 ($n$ = 8) | 2.63 | 1.38 | 2.63 | 1.50 |
| Group 3 ($n$ = 8) | 1.63 | 1.13 | 2.13 | 1.75 |

*Note*. 1= Korean all the time; 2=Korean usually more than English; 3= Korean as much as English; 4= English usually more than Korean; 5= English all the time

The differences in the number of accurate responses between prosody and baseline and between context and baseline condition are plotted in Figures 6 and 7 for each individual. Positive scores indicate gains in accuracy.

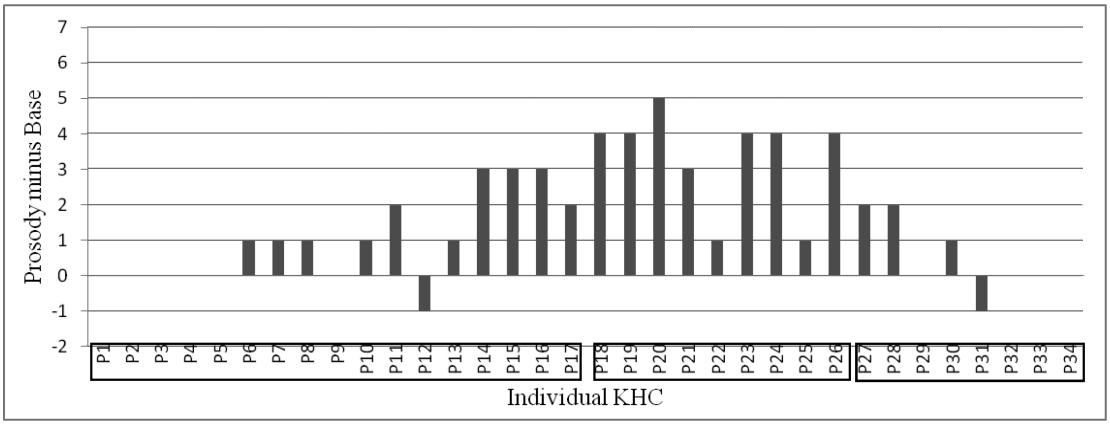



*Figure 6.* Prosody–baseline difference in the KHC

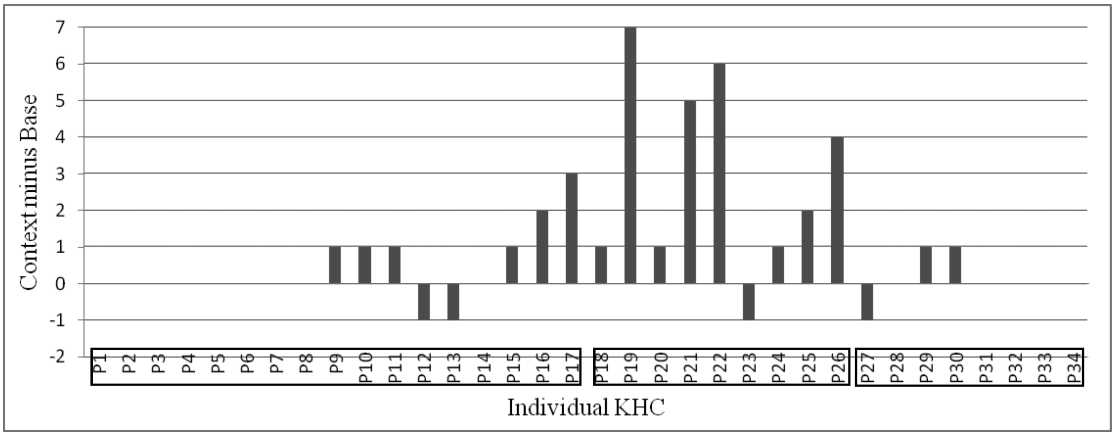



*Figure 7.* Context–baseline difference in the KHC

Figures 6 and 7 point toward a tendency for KHC to improve their performance in the facilitating experiments. The improvement is particularly dramatic for the nine Group 2 participants

Clearly, the participants in Group 3 are aware of the function of case in Korean, as seen in their good performance across the three experiments. The performance of the participants in Group 2 is more intriguing. Although accuracy rates in the context and prosody conditions fall within the range of chance performance, the dramatic improvement vis-à-vis the baseline condition suggests an important change in interpretive strategy. Group 2's comprehension of OSV sentences in the baseline condition appears to have been guided almost entirely by a canonical word order strategy, resulting in the consistent misinterpretation of the test items as SOV patterns. In the context and prosody conditions, in contrast, there is evident competition between case and word order, with the apparently chance scores reflecting the fact that neither interpretive strategy is dominant. Crucially, however, case has clearly come into play, tempering participants' reliance on the canonical word order strategy.

We remain uncertain about whether the poor performance of Group 1 should be attributed to a lack of knowledge of case markers or to a failure to make effective use of that knowledge. In order to investigate the possibility further, we conducted a series of production tasks involving picture description. For reasons of space, we do not introduce the production studies, but expect to discuss them in an independent paper.

## 4. Discussion and Conclusion

Our first research question asked whether KHC are aware that Korean is a case language. In the picture selection comprehension test, we found that at least the KHC in Group 2 and Group 3 had such an awareness. Our second research question asked whether KHC are able to use case effectively and systematically in comprehension. The KHC in Group 3 were clearly able to do so, but the children in Groups 1 and 2 were far less successful, as they failed to use case marker information in the baseline comprehension task. Nonetheless, as our results and discussion show, these deficits, particularly in Group 2, appear to reflect problems of use rather than deficits of knowledge per se.[5]

The fact that KHC perform poorly on the base condition can therefore not be taken to indicate a deficit in their knowledge of case markers. Rather, what seems to be at play here is a more complex set of factors. The first factor is simply perception and the ability to integrate inflectional information into the computation of language. The increased saliency of the case markers in the prosody condition evidently facilitates the processing of the case marker, making it relevant to comprehension.

A second factor is expectation. When the context permits children to anticipate a scrambled direct object, they are better able to process OSV sentences. In contrast, when they anticipate an SOV

[5] An anonymous reviewer asks whether this could be framed as a case of missing surface inflection, as in the Missing Surface Inflection Hypothesis (MSIH) (Haznedar & Schwartz, 1997; Prévost & White, 2000). The MSIH has traditionally been seen as being relevant to production—the erroneous behavior came from production data, and the argument was made specifically about production. As such, our results are irrelevant to the MSIH; however, see Schwartz (2009) who argues that MSIH should, and can, be extended to comprehension data.

sentence (the default in Korean), children can only modify their expectation if they attend to the case marking—a difficult task, as the results of our baseline experiment show. However, when the context provides sufficient reason to expect a fronted object, and children can reasonably hypothesize that the first nominal is an object (and therefore don't initially make the wrong hypothesis about the argument order), comprehension improves significantly.

Taken together, our results show that multiple factors contribute to the apparent failure to comprehend scrambled sentences. These factors relate to the prosodic prominence of case markers, as well as the contextual likelihood of scrambling. When these factors are manipulated, at least some children reveal knowledge of case marking that would otherwise have seemed absent. Thus failure to make use of case marking in the course of comprehending particular sentences cannot be equated with an unfamiliarity with case and its function in Korean.

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