Default Phrasing and Attachment Preference in Korean

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Abstract

This paper tests the validity of the Implicit Prosody Hypothesis (IPH) (Fodor 1998, 2002) based on production and perception experiments on Korean data. IPH states that attachment of a relative clause (RC) in a sentence with a complex noun phrase is influenced by a default prosodic contour of the structure projected in silent reading. It predicts that speakers of a language who prefer high attachment would produce a prosodic break between the RC and the adjacent noun phrase. Results show that Koreans prefer high attachment of an RC, but they do not produce a larger prosodic break between the RC and the adjacent noun phrase. Instead, the most common default phrasing is to produce each word in the same prosodic unit, an Accentual Phrase. Though this does not support IPH, the perception data show some sensitivity to prosody.

1. Introduction

Studies have shown that languages differ in their preference of RC (relative clause) attachment when an RC modifies a complex noun phrase. For example, in the sentence 'Someone shot the servant of the actress who was on the balcony', the RC ('who was on the balcony') can modify the whole NP ('the servant of the actress', i.e. the servant), known as *high* attachment, or the NP immediately adjacent to the RC ('the actress'), known as *low* attachment. High attachment is preferred by speakers of Dutch, French, German, Japanese, and Spanish, while low attachment is preferred by speakers of English, Arabic, Norwegian, Romanian, and Swedish (see [1, 2] for more details). This apparent cross-linguistic difference in the resolution of RC attachment has raised some dilemmas for the universalist view of sentence processing [3, 4, 5], which hypothesizes that the human sentence processing mechanism is innate and universal. There have been several attempts to explain the cross-linguistic differences (e.g. Tuning, Two Factor Model, Construal, Attachment-Binding, and Implicit Prosody), and this paper tests the validity of the Implicit Prosody Hypothesis (IPH) proposed by Fodor [6, 7].

The IPH states that a default prosodic contour projected in silent reading favors the syntactic analysis associated with the default prosody for the construction. Since languages differ in their prosody, attachment preferences would differ across languages. This hypothesis is supported by the effect of prosody on attachment resolution. Short RCs tend to attach low and long RCs tend to attach high. [8] found that speakers interpret a prosodic break before an RC (in a sequence of NP1 NP2 RC) as a marker of a stronger syntactic boundary, which prompts high attachment (i.e., RC modifying NP1). This suggests that speakers of a language with high attachment preference would tend to produce a prosodic boundary between the RC and the adjacent noun in the default phrasing of a sentence, but not between the two nouns (i.e. NP1 and NP2).

This prediction was tested in production and perception experiments on Japanese data [9]. Since Japanese speakers are known to prefer high attachment [10], it was expected that they would produce a larger prosodic boundary between the RC and the adjacent noun phrase than between the two noun phrases (i.e., RC//NP1-NP2 in Japanese word order). Subjects read sentences where the target phrase, RC NP1 NP2, was located either sentence initially or medially. Target sentences were also varied in the length and the accentedness of the RC, NP1, and NP2. Subjects either briefly skimmed the sentence before reading (Skimming group) or read without skimming (Non-skimming group). Three weeks later, the same subjects answered a questionnaire about the attachment of the RCs for the same target sentences.

Results showed that Japanese speakers, both the skimming and non-skimming groups, preferred high attachment (66%), confirming previous findings; and 67.15% of the time, they produced a larger prosodic boundary between the RC and NP1 than between NP1 and NP2 (called 'early' boundary), supporting the IPH. The length and the location of the target phrase (RC, NP1, and NP2) influenced their default phrasing as well as their interpretation of RC attachment. 'Early' boundary was found more often in long RC sentences and less often in short RC sentences compared to sentences with default length RCs. In perception data, long RCs were interpreted as high attachment more often than default length RCs, but short RCs did not differ in interpretation from the default length RCs. 'Early' boundary was found more often when the target phrase was in sentence-initial position than in medial position. But the attachment was not influenced by the location of the target phrase. Finally, though subjects in both groups produced an early boundary most of the time, the subjects in the skimming group had a tendency to produce a 'neutral' boundary (RC/NP1/NP2, i.e., no sub-grouping among the three) more often than those in the non-skimming group (26% vs. 24%). In sum, the data showed that the default phrasing of the same structure is quite consistent across subjects, and that there is a correlation between the prosodic pattern and of a structure and the interpretation of the structure.

In the current paper, we will examine how native speakers of Korean interpret the same structure, and whether their default phrasing is correlated with the preference of RC attachment, if there is one. Jun [11], based on informal observation, found that native speakers of Korean prefer high attachment, but the attachment preference of an RC by Korean subjects has not been systematically examined. If Korean speakers indeed prefer high attachment, the IPH would predict that most of the target phrases be produced with an 'early' boundary as in Japanese. However, this may not be the case because Schafer & Jun [12] found that in the structure of 'Adjective NP1-possessive NP2' (e.g., wise baby's daddy) the

most common default phrasing in Korean was to produce each word in one AP. It would be interesting if the same strategy is used in producing the target structure 'RC NP1 NP2'.

The results from Korean would also be interesting because Korean and Japanese differ but also share certain prosodic and morphosyntactic features. Both languages have the same word order ('Subject Object Verb' and 'RC NP1-possessive NP2' order), but modifiers, such as an RC, are morphologically marked in Korean but not in Japanese. Both languages have an Accentual Phrase (AP), a prosodic unit larger than a Word and smaller than an Intonation Phrase, but Japanese (Tokyo) has lexical pitch accent while Korean (Seoul) does not. Thus, Korean AP tones are purely phrasal tones while Japanese AP tones are influenced by lexical tones [13, 14].

2. Method

2.1. Subjects

Thirty native speakers of Seoul Korean participated in both the production and the perception experiment. They were students at UCLA, and their period of stay in the U.S. varied from 3 days to 8 years. Subjects were randomly divided into two groups (15 speakers each, with 8 females and 7 males): NSkim (no-skimming) and YSkim (yes-skimming).

2.2 Material

Four types of sentences were created by varying the length of the relative clause (RC) in the target phrase "RC NP1 NP2" and by varying the location of the target phrase. The target phrase was located at the beginning of a sentence in three types (DEFAULT, LONG, SHORT), and in the middle of a sentence for one type (DEFAULT-MEDIAL). The sentence-initial types differed in the length of the RCs: 6-7 syllables in DEFAULT, 9-10 syllables in LONG, and 3-4 syllables in SHORT. The sentence medial type (DEFAULT-MEDIAL) had the same target phrases as in the DEFAULT sentence initial type, but differed from the DEFAULT type by locating the target phrase sentence medially. There were eight sentences in each of the four types, creating thirty-two target sentences (these target sentences were chosen after a pretest where 30 speakers in Seoul, Korea rated the degree of bias for NP1 or NP2 in 60 sentences, 15 in each of the four types). The length of the target NP1 and NP2 did not vary across the types: NP1 had 2-3 syllables and NP2 had 3-5 syllables. Twenty four filler sentences were added to the production data, and 32 fillers were added to the perception data. The fillers were made to balance the direction of bias (NP1 or NP2) for perception, and to balance the length and the location of RC for production.

2.2. Procedures

2.2.1. Production

The 32 target sentences were pseudo-randomized together with 24 filler sentences. Subjects in the Yskim (Yes-skim) group were instructed to read each sentence after briefly skimming the whole list of sentences. Subjects in the Nskim (No-skim) group were instructed to read each sentence without skimming first. Speakers read each sentence at a normal rate two times in the sound booth at the UCLA Phonetics Lab.

As in the experiment on Japanese data, we varied the option of skimming vs. non-skimming in order to match closely the default prosody employed by native speakers in their silent reading during the off-line and on-line sentence processing experiments, respectively. Allowing time to skim the sentences before reading and asking subjects to repeat each sentence two times allowed us to investigate how stable the default prosody was, given the different amounts of semantic information available to them before reading. All utterances were digitized using *PitchWorks* (*Scicon*), and the prosodic phrasing was determined by the intonation pattern of the utterance and the degree of juncture between words, following the conventions described in Korean ToBI [14, 15]

2.2.2. Perception

The subjects who participated in the production experiment also participated in the perception experiment, an off-line questionnaire experiment. The perception experiment was done right after the production experiment. The questionnaire consisted of the 32 target sentences used in the production experiment. The target sentences were pseudo-randomized with 32 filler sentences. A comprehension question about each sentence was added below the sentence (e.g., who was on the balcony?) and two choices were given as a possible answer (e.g. the actress, the servant). The order of NP1 and NP2 was randomized but balanced so that half of the questionnaire started with NP1 and the other half started with NP2. Subjects were asked to mark an answer on a paper. The production and the perception experiments together took about an hour, and subjects were paid for their participation.

3. Results

3.1. Production

The RC, NP1, and NP2 sequence was phrased in several ways but grouped into three types depending on the sub-grouping among the three components. The first type was RC//NP1-NP2 (a larger prosodic boundary between RC and NP1 than that between NP1 and NP2), called 'early' boundary. This includes when the prosodic boundary after RC is either an Intonation Phrase (IP) (i.e. $\{RC\}_{IP}\{NP1\text{-}NP2\}$) or an Accentual Phrase (AP), defined by a final rising tone (LH) (i.e. $\{RC\}_{AP}\{NP1\text{-}NP2\}$) [14]. An example pitch track of this category is shown in Figure 1. The target phrase shown in the figure is from a sentence "*the wife of the department chief who won the lottery* has decided to travel to Europe next year" (the target phrase is italicized): poGkwEne 'lottery', taQcEMtweN 'win-modifier', kwajaQnime 'department chief's', puinIN 'wife-TOP'. Here, the RC is marked by an IP boundary tone (HL%), and NP1 is marked by an AP boundary tone (Ha).

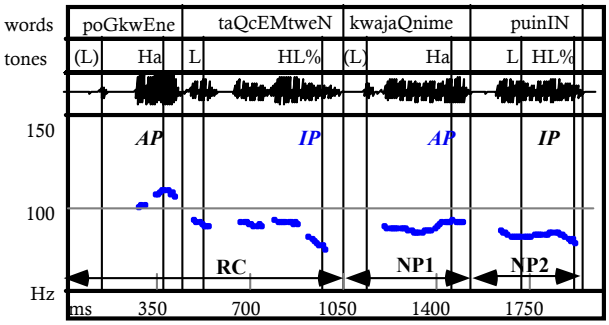

Figure 1: *Example of 'early' boundary -- RC//NP1-NP2*

The second type was RC-NP1//NP2 (a larger boundary between NP1 and NP2 than that between RC and NP1), called

'late' boundary. Again, the big prosodic boundary can be an IP or an AP. Finally, the third type was RC/NP1/NP2 (AP boundary between each word, i.e., no sub-grouping among the three), called 'neutral' boundary. A pitch track example of the same phrase shown in Fig. 1 but produced in the neutral boundary is shown in Figure 2. Here, every word except for the last word (NP2) is marked by an AP final tone (Ha).

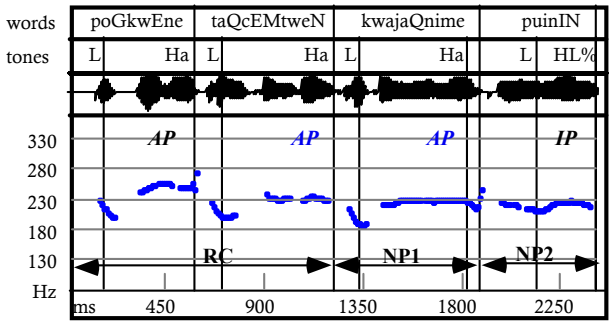

Figure 2: *Example f0 contour of 'neutral' boundary (RC/NP1/NP2); the same sentence as in Fig.1.*

Table 1 shows the frequency (percentage) of each type of phrasing for each of the four length/location types: DEFAULT, LONG, SHORT, and DEFAULT-MEDIAL in each subject group. The data is from the first repetition only, but the data from the second repetition yielded similar results. Subjects in each group sometimes changed the phrasing across repetitions (17.1% in the Nskim group and 14.6% in the Yskim group), and most of the alternations were between early and neutral boundaries. The percentage of change in phrasing was slightly lower than that in the Japanese data (20.8% Nskim vs. 17.8% Yskim).

As shown in Table 1, most of the target phrases were produced with 'neutral' phrasing (88.1% by the Nskim group and 84.4% by the Yskim group). 'Early' boundary was produced only 10-13% of the time, and 'late' boundary was produced a little over 2%. Logistic Regression analysis shows that there is no main effect of Group (Nskim vs. Yskim) (chi-square= 3.086, p=.2137), no main effect of Length (DEFAULT vs. LONG vs. SHORT,) (chi-square =1.947, p=.3778), nor the effect of Location (DEFAULT vs. DEFAULT-MEDIAL) (chi-square =4.878, p=.0873). This suggests that native speakers of Korean produce a similar prosodic phrasing of 'RC NP1 NP2' whether they have time to skim or not, whether the RC is long or not, and whether the target phrase is sentence-initial or medial.

Group	Length/Loc	Early	Late	Neutral
Nskim	Default	9	4	107
	Long	17	2	101
	Short	10	2	108
	Def-Mid	10	3	107
	Sum	46 (9.6%)	11 (2.3%)	423 (88.1%)
Yskim	Default	18	0	102
	Long	19	4	97
	Short	11	4	105
	Def-Mid	15	4	101
	Sum	63 (13.1%)	12 (2.5%)	405 (84.4%)

Table 1: *Frequency (percentage) of each boundary type of the target phrase for the four length/location categories in each group (480 tokens each).*

3.2. Perception

Results show that native speakers of Korean prefer high attachment. Table 2 shows the frequency (percentage) of Low and High attachment for each of the four types: DEFAULT, LONG, SHORT, and DEFAULT-MEDIAL in each Group.

Group	Length/Loc	Low	High
Nskim	Default	41 (34.16%)	79 (65.83%)
	Long	41 (34.16%)	79 (65.83%)
	Short	66 (55.0%)	54 (45.0%)
	Def-Mid	61 (50.83%)	59 (49.16%)
	Sum	209 (43.54%)	271 (56.45%)
Yskim	Default	35 (29.16%)	85 (70.83%)
	Long	31 (25.83%)	89 (74.16%)
	Short	59 (49.16%)	61 (50.83%)
	Def-Mid	50 (41.66%)	70 (58.33%)
	Sum	175 (36.45%)	305 (63.54%)
Group sum		384 (40%)	576 (60%)

Table 2: *Frequency (percentage) of Low & High attachment for Length/Location types in each Group. Total 480 tokens in each Group (= 32 sentences x 15 subjects).*

As shown in Table 2, speakers chose high attachment more often than low attachment, and this difference was significant (chi-square (1) = 5.017, p = .0251). In general, the Yskim group chose high attachment more often than the Nskim group. Repeated ANOVA based on the raw number of NP2 answers shows that this difference in Group was not significant by subject ($F(1, 28)=1.248$, $p=.273$), but significant by item ($F(1, 28)= 7.136$, $p=.012$). The same pattern was observed for the effect of Length/Location factors. Repeated ANOVA also shows that there is a significant main effect of Length for both by subject ($F(2, 56) = 16.427$, $p<.001$) and by item ($F(2, 21)=4.538$, $p=.023$) but a significant effect of Location only by subject ($F(1, 28)=16.028$, $p<.001$). In both the Nskim and Yskim groups, Short RCs were attached low significantly more often than were Default RCs and Long RCs, but there was no difference between Default and Long RCs. Default RC, when it was located in the middle of a sentence, however, was attached low significantly more often than when it was at the beginning of a sentence.

4. Discussion and Conclusion

Unlike Japanese data, the data from default phrasing and attachment preference by Korean subjects did not support the IPH hypothesis. Native speakers of Korean preferred high attachment, but their common default phrasing of RC NP1 NP2 was not an 'early' boundary, but a 'neutral' boundary. That is, both boundaries were produced with the same degree of juncture, i.e., AP. Producing a neutral boundary as the default phrasing by Korean speakers is not surprising. Schafer and Jun [12] found that native speakers of Korean produced the 'Adjective NP1 NP2' structure in a neutral boundary even when the phrase has an internal grouping due to the pragmatic meaning (e.g., wise baby's daddy vs. wise baby's instrument).

The fact that speakers preferred high attachment even when prosody does not provide any cue for a grouping suggests that the Late Closure Hypothesis [16] does not work. Instead, the data could be explained by Frazier's Relativized Relevance Principle. The topic/head of the complex NP, i.e.,

NP2 in RC NP1's NP2, would be modified by the RC because it is 'relevant' in the discourse. A similar phenomenon was found in Japanese data; when the phrase was produced with a neutral boundary (24% of the time), two third of them were interpreted as high attachment.

Korean perception data, however, still show some relevance or sensitivity to prosody. Though the effect of length or the location of RC was not significant in production, it was significant in perception. Short RCs were interpreted as low attachment more often than the default or Long RCs, and sentence medial RCs were interpreted as low attachment more often than sentence initial RCs. This suggests that Korean speakers' internal prosody, if this indeed guides the RC attachment as proposed by the IPH, does not match the default phrasing collected in the production experiment. It is possible that the intonation model adopted in Jun's studies [14, 15] does not capture the subtle prosodic cues intended by the speaker. It is sometimes noticed that the grouping of APs is marked by *pitch range* or the contour shape of an AP. Though the degree of juncture was the same, some APs ended with a higher H tone (Ha) or started with a lower initial L tone to mark a larger prosodic unit (though still smaller than IP). The current model, however, does not consider the pitch range as a criterion in defining a prosodic unit. This is because pitch range expansion is also triggered by the AP initial segment. A Korean AP begins with a large pitch range if the AP begins with an aspirated or tense obstruent [14, 15]. Further study is needed to investigate the role of pitch range in defining a prosodic unit in Korean.

The current results also bear on the importance of the data collection methodology in the perception experiment. It was found that subjects who skimmed the sentence list before recording preferred high attachment significantly more than those who did not skim. This indicates that subjects' interpretation of RC attachment tends to shift from low to high as they have more time to decide and interpret the meaning. This seems to be parallel to the difference between the on-line self-paced reading task and the off-line questionnaire task for the perception test. Fernández [2] found that Spanish speakers who prefer high attachment in an off-line questionnaire experiment showed a preference for low attachment in an on-line perception task, thus not different from the attachment preference by English subjects.

In sum, though Korean attachment data show some sensitivity to prosody, they do not fully support the IPH. In order to test the validity of the IPH, the prosody of low attachment languages should be examined in a similar way.

5. References

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