SYNTAX OVER FOCUS

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ABSTRACT

This paper compares three factors affecting prosodic phrasing in Korean: syntax, focus and speech rate. The Syntax and Focus constraints have been claimed to be stronger than the Speech Rate constraint, but it is not known which of these -- the syntactic constraint (SYNTAX) or the focus constraint (FOCUS) – is stronger. Based on production and perception data, it is found that SYNTAX is stronger than FOCUS, both at normal and fast speech rates, though less so at fast rate.

1. INTRODUCTION

Prosodic phrasing has been known to be influenced by several factors such as syntax, focus, old/new information, phrase length and speech rate [2, 3, 9]. Among these, syntax has been claimed to be the most influential factor affecting prosodic phrasing. Prosodic phonologists [6, 7, 11] have tried to predict prosodic phrasing based on the syntactic structure of a sentence: the edge of a maximal projection, head-complement relationship, and c-command in the rule-based framework, or constraints such as ALIGN-XP or WRAP-XP in the recent constraint-based framework. However, these proposals have attempted to predict default prosodic phrasing, and in order to explain phrasing triggered by focus, they either proposed a reanalysis rule, which optionally changes the phrasing originally defined by the syntactic condition, or ranked WRAP-XP lower than the ALIGN-FOC(US) constraint. This was reflecting the fact that, in most languages, a focused word either begins a new prosodic phrase (e.g., Korean, French) or ends a prosodic phrase (e.g., Chichewa, Chimwiini) without overriding the default phrasing in the language.

In Korean, it was also found that prosodic phrasing triggered by focus overrides the default phrasing predicted by the left edge of an XP or head-complement relationship [1, 10]. Recently, Jun & Lee [5] found experimentally that the prosodic phrasing triggered by focus is phonetically different from the default phrasing, and there are two ways of realizing focus in Korean. One way, which was shown in [3], is that the focused word begins a new Accentual Phrase (=AP, the same level as Phonological Phrase but defined by intonation pattern; see [3, 4] for more detail) and includes in the same AP all the following words up to the end of an Intonation Phrase (IP). In this case, the focused word is lengthened and its pitch range is expanded. However, when the post-focus string is long, speakers sometimes do not dephrase (i.e., delete a phrase boundary) after focus, especially towards the end of the post-focus string. That is, they dephrase one or two words right after the focused word, but maintain a phrase boundary thereafter in a reduced pitch range.

The other way to produce focus is to keep the accentual phrasing the same as the default case but manipulate the pitch range. As in the first case, the pitch range of the focused word is expanded but the pitch range of the post-focused words is significantly reduced, providing the impression of dephrasing. The phrasing of the post-focus words is audible by native speakers, but due to the substantially reduced pitch range, the phrase boundary is not always easily recognizable in the pitch track. In either way, the focused word in Korean is made prominent both phonetically and phonologically, by manipulating pitch, amplitude and duration, or also by changing the prosodic phrasing.

Jun [3] claims that even though there are many possible prosodic phrasings of the same sentence due to the factors mentioned above, prosodic groupings are not random. Some phrasings are judged to be awkward by native speakers if they violate the syntactic constraint described in (1).

(1) Right Branching Integrity: Part of a branching element should not form a prosodic phrase with the preceding element. That is, given that B and C are the words belonging to a branching structure, the words A and B would not form one prosodic phrase.

A B   C => *(… A B) (C …
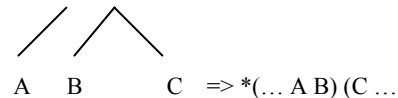
An example sentence violating this constraint would be [Younginun iroborin kudulul chajatta] 'Youngi-Topic, lost-modifier, shoe-acc., found' -> 'Youngi found the shoe which was lost'. Here, the modifier, [iroborin] 'lost', forms a branching structure with the following head noun, [kudulul] 'shoe-acc.', and separating the modifier from the head noun and forming one phrase with the preceding topic noun makes unacceptable phrasing. This constraint also applies to English data. For example, the sentence 'A child with asthma outgrew the condition last year' can be phrased in several ways but a phrasing such as '(The child with)(asthma outgrew)(the condition last year)' is not acceptable because 'asthma' and 'outgrew' are in the same phrase. However, it is fine to combine the last element of a branching structure and the following word in the same phrase. For example, in the first example sentence, the object 'shoe' and the main verb 'found' often form one phrase.

In sum, with the FOCUS constraint (Dephrase After Focus) speakers try to combine the focused word and the following word(s) in the same phrase, while with the SYNTAX constraint (Left Branching Integrity) speakers try not to combine two

words in the same phrase if the second word belongs to the left element of a branching structure.

Given these constraints, it would be interesting to see whether speakers combine two words in one phrase if the first word is focused while the second word belongs to the left element of a branching structure. If speakers do form the two words in one phrase, the FOCUS constraint would be stronger than the SYNTAX constraint, but if they do not, the ranking would be the opposite. To investigate the ranking between these two constraints, production and perception experiments were run. Since phrasing is also influenced by the length of a phrase and speech rate, the experiments also included data testing these two constraints. However, in this paper, only the effect of three factors, syntax, focus and speech rate, will be reported.

2. PRODUCTION

2.1. Experiment Method

Subjects: 20 native speakers of the Seoul dialect participated in the experiment. (But, data from only 14 speakers are reported in this paper). They were in their 20s and 30s and were students at UCLA. They were told to read the data in four different prosodic conditions: neutral, focus, fast, and fast focus.

Materials: Two data sets were prepared. One set was a short paragraph about bamboo, containing 17 long, complex sentences (the 'story' set), and the other set was 18 short, isolated sentences (the 'sentence' set). Among the 17 bamboo sentences, 13 sentences included double foci, and 8 of the 13 sentences contained structure (1) above, which could violate the syntactic constraint (1) especially when focusing the word before the left element of a branching structure ('A' in (1)) and focusing the right element of the branching structure ('C' in (1)). The other 5 sentences contained double foci whose effect on phrasing would not violate the SYNTAX constraint.

Of the 18 sentences in isolation, 4 sentences contained structure (1) above. Of the other 14 sentences, 5 sentences contained double objects (an Indirect Object and a Direct Object). This structure was added to test if the SYNTAX constraint would be weakened if the branching was not binary, i.e., the two objects and the verb being in the same Verb Phrase. In this paper, the structure shown in (1) will be called 'Structure I' and the double object structure will be called 'Structure II'. The rest of the isolated sentences were included as filler items where FOCUS and SYNTAX would predict the same prosodic phrasing.

Procedures: Subjects read the two data sets in the sound booth of Phonetics Lab, UCLA. The order between the sentence set and the story set was randomized across subjects. The focus condition had two subsets: one where only one word in a sentence was focused and the other where two words were focused. Sentences with double foci were the target sentences to test the ranking between FOCUS and SYNTAX. The focused item was circled in red pen, and subjects were told to imagine a situation where someone produced the same sentence except for the one word that differed from the word in the red circle. This was to trigger speaker production of contrastive focus on the target word.

2.2. Results

In the neutral condition, each word formed one Accentual Phrase about 75% of the time. But, when a word was focused, subjects often put an Intonation Phrase (IP) boundary either before or after the focused word. At fast rate, an AP tends to include more than one word, increasing the number of '(Prosodic) Word' boundaries after each word compared to the neutral condition. Phrasing data from the 'sentence' condition are shown in Figure 1. The percentage is based on 868 tokens in each prosodic condition (62 sentence medial word boundaries X 14 speakers).
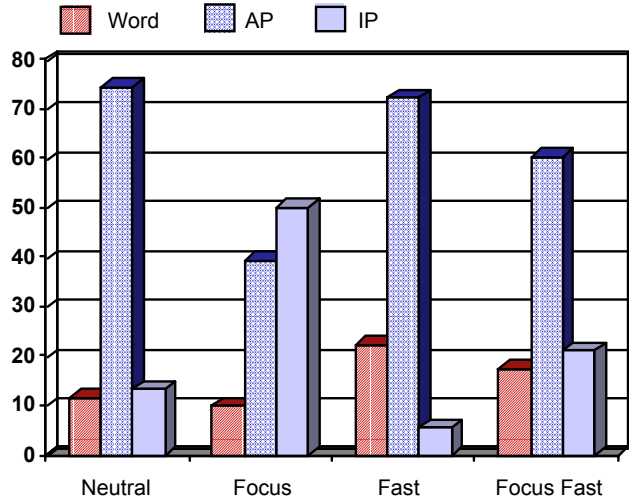

Figure 1: Percentage (%) of prosodic boundary types (IP, AP, Word) after each word within each prosodic condition (out of 868 sentence-medial word boundaries).

In this dataset, IP boundaries were inserted *after* the focused word 34.2% of the time (168 out of 490 cases) at normal rate and 10.6% of the time at fast rate. IP boundaries were inserted *before* the focused word 46.8% of the time (151 out of 322 cases) at normal rate and 25.1% at fast rate.

In general, speakers ranked SYNTAX higher than FOCUS. That is, they did not include the left element of a branching structure together with the preceding word even when the preceding word was contrastively focused. However, speakers violated SYNTAX more often for sentences containing Structure II (i.e., double objects) than Structure I. Violation of SYNTAX is shown in Table 1. For sentences containing Structure II, SYNTAX was violated 6 times at neutral condition and 10 times at fast condition (out of 70 cases: 5 sentences X 14 speakers), but it was never violated for sentences containing Structure I. This suggests that elements within a binary branching structure are less likely to be split into separate phrases than elements within a multiple branching structure.

	Neutral	Focus	Fast	Focus Fast
Structure I (56)	0	13	0	14
Structure II (70)	6	18	10	18
Sum (126 cases)	6	31	10	32

Table 1: In 'sentence' set: the number of sentences violating SYNTAX in sentences containing Structure I (out of 56) and Structure II (out of 70).

For the 'story' set, there were 112 target sentences (8 sentences X 14 speakers) containing Structure I, and only 18 sentences violated SYNTAX. Among these, 6 were found in the normal rate condition and 12 were found in the fast rate condition. This suggests that SYNTAX is violated more often in the 'sentence' condition than in the 'story' condition, and more often at a fast rate than a normal rate. Table 2 shows the summary of cases where SYNTAX was violated for each sentence in the 'story' condition at both normal and fast rates.

Sentence #	Speech rate	# of * SYNTAX	Speakers (initials)
1	Normal	2	OM, KT
	Fast	3	HE, LN, KM
2	Normal	1	LO
	Fast	1	HE
3	Normal	0	
	Fast	1	HE
4	Normal	2	KC, CI
	Fast	4	KM, CI, KT, LN
5	Normal	1	KS
	Fast	1	CI
6	Normal	0	
	Fast	1	HE
7	Normal	0	
	Fast	0	
8	Normal	0	
	Fast	1	LO
Sum	Normal	6	
	Fast	12	

Table 2: In the 'story' set (total 112 target sentences): the number of cases violating SYNTAX (=*SYNTAX) at normal and fast rates. The speakers who produced those phrasings are indicated. (All sentences in this set contain Structure I.)

As shown in Table 2, the violations are not speaker specific. Speaker HE violated 4 cases (all in the fast rate condition), CI 3 cases, 7 speakers violated either 1 or 2 cases and 5 speakers violated none. The sentence that violated SYNTAX the most was #4: [tenamunun saramdurege juksuniranun masinun mogulkorirul junda] 'bamboo-topic, people-Dative, bamboo shoots-called, delicious, something to eat-acc., give' → 'Bamboo gives people something to eat which is delicious and known as bamboo shoots'. Here, the two words, [juksuniranun] and [mogulkorirul], were focused. In this sentence, both [juksuniranun] and [masinun] are modifying the head noun [mogulkori] 'something to eat'. Therefore, combining these two modifiers in the same phrase might not be as unnatural as in the cases where there are more layers of an embedded clause boundary or a stronger boundary such as 'S(entence)' between the two words, i.e., when the two words do not share the same head.

Sentences #3, 6, 7 and 8, where one or no violation of SYNTAX was made, have an embedded clause boundary or a sentence boundary between the two words. In sentence #3, the first focused word is a sentential adverb and the following word is the first word of an embedded relative clause. In sentence #6, the first word is a time adverb 'these days,' and the following word is the first word of a binary branching phrase ([sogume joyoso] 'pickled with salt'). In sentence #8, the two target words are from two different clauses. The first focused word belongs to a clause stating a cause and the second focused word belongs to a clause stating the result. Thus, it would be unlikely to combine the first focused word (which ends with a clause-connecting morpheme [-hayo] 'so or therefore') and the following word, i.e., the first word of the second clause. Finally, sentence #7 also contains a clause-connecting morpheme [-kona] between the two focused words. Here, each word belongs to different relative clauses which modify the same head noun: [karena pulsunmurul sakhyoso nebonegona togul opsenun hyonungul kajigoitta] 'phlegm-or, impurities-acc., remove-and, discharge-or, poison-acc., remove-modifier, special effect-acc. has' -> '(Bamboo) has the special effect of removing and discharging phlegm or impurities in food, or removing poison.' Here, the two focused words were [neponegona] and [opsenun]. Therefore, in terms of syntactic structure, this sentence is very similar to sentence #4, which violated SYNTAX most often. But the first focused word and the immediately following word in #4 were sometimes grouped together violating SYNTAX while those in #7 were never grouped together. The difference between sentences #4 and #7 in terms of prosodic phrasing must be due to the phrase length. In #4, the first focused word forms a relative clause by itself and the following word, as an adjective, directly modifies the head noun, which was focused. On the other hand, in #7, the first word is the last word of a 4-word relative clause and the following word is the left element of a binary branching relative clause, [togul opsenun] 'poison-acc. remove-mod.'. This suggests that there is an interaction between focus, syntax and the length of a phrase. The effect of phrase length on prosodic phrasing will be discussed in a separate paper.

In sum, results from the production experiment show that SYNTAX is stronger than FOCUS in prosodic phrasing in Korean. Sentences violated FOCUS more often than SYNTAX. But more violations of SYNTAX were found in the 'sentence' condition than in the 'story' condition, and more often at fast rate than normal rate. Finally, more violations were found in Structure II (multiple branching structure) than Structure I (binary branching structure).

3. PERCEPTION

3.1. Experiment Method

Subjects: The same 20 subjects who participated in the production experiment participated in the perception experiment.

Materials: 50 sentences were produced by a native speaker of Seoul Korean (male) who could intentionally manipulate the accentual phrasing and intonational phrasing of a sentence. Sentences were produced either with no focus, single focus or double foci, similar to the data used in the production experiment. For some sentences with double foci, phrasing was intentionally made so that SYNTAX was violated due to FOCUS. In this case, the prosodic phrasing was marked by two types of boundaries: an Intonation Phrase (having phrase final lengthening, boundary tones and an optional pause) and an

Accentual Phrase (having boundary tones, but no lengthening and no pause). There were 36 test sentences and 14 filler sentences. Each sentence was digitized, and recorded onto a tape using *Multispeech* (KAY Elemetrics Co.). The order of sentences was pseudo-randomized so that the same type of a sentence was not heard consecutively. A beep sound was inserted before each sentence.

Procedures: Subjects were asked to listen to a tape and to rate the naturalness of the sentence on a scale of 1 (very natural) to 4 (very unnatural). The tape began with instructions in Korean explaining the task. It was mentioned in the instructions that some words were focused and some were not and that the focused words were underlined on the paper. (The instructions were also given orally by the experimenter.) Five seconds were given after each sentence so that they could provide their rating. They were given a 3-page paper where each sentence was typed in Korean font. Below each sentence was written '(very natural) 1, 2, 3, 4 (very unnatural)' on the same line.

3.2. Results

Sentences with single focus did not differ in their ratings from the sentences with no focus or double foci if the phrasing did not violate SYNTAX. As shown in Figure 2, the subjects rated sentences violating SYNTAX worse than those that did not. Among those violating SYNTAX, the subjects rated the sentences violating Structure I (binary branching) worse than those violating Structure II (multiple branching). In addition, they rated sentences violating SYNTAX using an Intonation Phrase boundary (i.e., IP separating B and C words in (1)) worse than those using an Accentual Phrase boundary. Finally, the sentences violating Structure II were in fact no worse than the filler sentences where no violation of SYNTAX was produced.
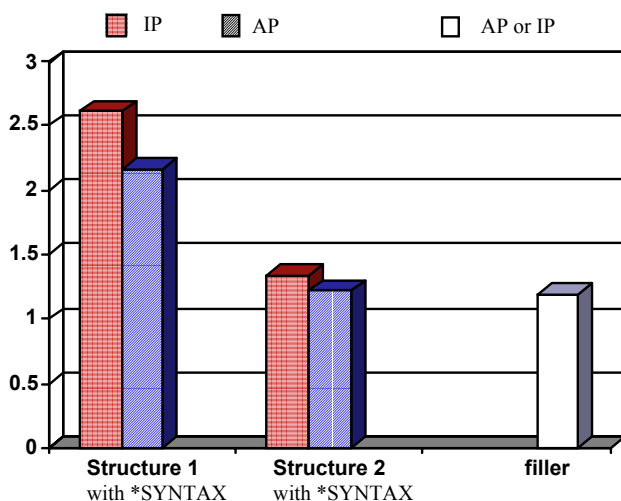

Figure 2: Rating of sentences in terms of naturalness. 1 for very natural and 4 for very unnatural. Sentences violating SYNTAX by producing an IP boundary and an AP boundary are shown in each 'Structure'.

4. DISCUSSION AND CONCLUSION

Results from the production and perception experiments suggest that SYNTAX is stronger than FOCUS in Korean. Native speakers of Korean do not group two words in the same prosodic phrase if that grouping violates SYNTAX, and listeners' ratings reflect this difference.

It is found that the frequency of SYNTAX violation reflects the degree of syntactic complexity and the degree of closeness between elements within a syntactic constituent. Words within a binary branching structure are less likely to be phrased separately compared to those within a multiple branching structure. Words belonging to different constituents are more resistant to forming one prosodic phrase, and the resistance is stronger when the syntactic boundary between the two constituents is higher in the syntactic hierarchy (e.g., S vs. NP) or when there are more maximal projections intervening between these two words. Thus, when the strength of the syntactic condition is weak, FOCUS can override SYNTAX. Furthermore, SYNTAX can also be overridden by other factors such as the length of a phrase and speech rate. SYNTAX is more likely to be violated if the syntactic constituent is short and/or produced at fast rate. In general, SYNTAX is stronger than Focus, and these two are more influential in phrasing than other gradient constraints, but the ranking is not fixed in all situations. Rather, the rankings are determined by considering the degree of strength within each constraint. For example, a medium-length phrase will not override SYNTAX but an extra-long phrase will.

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