

# Focus and Prosodic Structure\*

Mira Oh\*\*

## ABSTRACT

The effects of focus on prosodic phrasing, F<sub>0</sub>, and duration are investigated paying attention not only to the target of focus but also to the constituents that are outside the domain of focus in Korean. We find that the constituents preceding and following the focused word tend to be dephrased. Dephrasing does not always cover up to the Intonation Phrase boundary contrary to Jun's (1993) claim. Dephrasing caused by focus determines F<sub>0</sub> and durational difference between focused and neutral sentences. Syntactic constituency is also shown to play a role in prosodic phrasing.

**Keywords:** focus, prosodic phrasing, dephrasing

## 1. Introduction

Meaning and intonation are closely related (Halliday 1967, Ladd 1980). In particular, that the semantic notion of focus can determine prosodic phrasing is by now well documented, e.g., Poser (1984:107) for Japanese, Inkelas and Leben (1990) for Hausa, Cho (1990) for Korean, Kanerva (1990) for Chichewa, Hayes and Lahiri (1991) for Bengali, and Selkirk and Shen (1990) for Shanghai Chinese. There are several candidates for the constituent that is relevant for focus. Cho (1990) proposes the focus restructuring rule in (1) for Korean, within the relation-based prosodic phonological framework.

- (1) If some word in a sentence bears focus, place a PPh boundary at its left edge, and join the word to the PPh on its right. Any items remaining in a PPh after the item bearing focus has been regrouped retain their PPh status.

On the other hand, Jun (1993) rejects all syntax-based phrasing accounts for Korean and argues for intonational phonology in terms of the notion of "accent". Previous literature on phonological phrasing in Korean has discovered three major effects of focus. First, focus boosts the peak of Intonation Phrase. Second, focus introduces an Accentual Phrasal

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\*\* English Department, Yeoo Institute of Technology

boundary to the left of the focused element. Third, a focused word always initiates an Accentual Phrase and all the following nonfocused words are dephrased up to the Intonation Phrase boundary (Jun 1993, Kenstowicz and Sohn 1997).

This paper investigates the effects of focus on prosodic phrasing, F0, and duration paying attention not only to the target of focus but also to those constituents that are outside the domain of focus. It will examine the degree of dephrasing before and after focus. It will also examine the degree of prominence of the focused word relative to the neutral word with respect to F0 and the durational patterns of each syllable in a focused word, and the duration of the pre- and post-focus sequences. It will show that contrastive focus is one of the factors which yield the mismatch between syntactic representation and prosodic representation and that dephrasing triggered by focus plays a main role in determining F0 and durational difference between focused and neutral sentences.

## 2. Experiment

The data consists of 2 sentences in (2) to examine the prosodic structure, F0 values, and the durational pattern of a focused word and pre- and post-focused constituents.

- (2) a. /nanin/ + /pakmariae/ + /noreril/ + /siløhe/  
 'I (Thematic)' 'Pakmaria's' 'song (Obj)' 'dislike'
- b. /nanin/ + /putfawasemi/ + /noreril/ + /siløhe/  
 'I (Thematic)' 'Puca and Semi's' 'song (Obj)' 'dislike'

Each constituent underlined in (2) is focused in turn and eight test sentences are shown in Table 1.

Table 1. Test sentences differing in the location of focus

Sentence type	Test sentences
1	naninpakmariae <del>norerilsiløhe</del>
2	nanin <u>pakmariae</u> norerilsiløhe
3	naninpakmariae <u>noreril</u> siløhe
4	naninpakmariae <del>noreril</del> <u>siløhe</u>
1'	nanin <u>putfawasemi</u> norerilsiløhe
2'	nanin <u>putfawasemi</u> norerilsiløhe
3'	nanin <u>putfawasemi</u> <u>noreril</u> siløhe
4'	nanin <u>putfawasemi</u> noreril <u>siløhe</u>

The focal constituents are underlined in Table 1. 8 sentences in Table 1 were repeated 5 times by 4 speakers (two males and two females). All the subjects were in their late twenties or early thirties. They were instructed to read the underlined sequence of the sentences in Table 1 as being focused. The recording was made in a quiet recording room. The sentences were digitized using CSL and F0 tracks and duration were analyzed using Multi-speech. Duration was measured by referring to a spectrogram and a waveform. Accentual Phrase boundaries and the location of the peak were labeled based on F0 tracks and audio.

### 3. Results and discussion

The effects of focus will be investigated by examining prosodic phrasings of the 8 test sentences and F0 and durational patterns of pre-, under-, and post-focused sequences.

#### 3.1 Prosodic Phrasing

The first question is what phrasing(s) the subjects choose to use for the 8 sentences in Table 1. Table 2 and 3 show the sentences but with the phrasing information.

Table 2. Phrasings realized by 4 subjects for the model sentences 1-4 in Table 1. In parenthesis is indicated the number of repetitions (out of 20) using this phrasing.

Sentence type	Sentences with phrasing	
1	a. {nanin}{pakmariae noreril}{siløhe}	(18)
	b. {nanin}{pakmariae}{noreril}{siløhe}	(1)
	c. {nanin}{pakmariae}{ noreril siløhe}	(1)
2	a. {nanin} { <b>pakmariae</b> noreril} {siløhe}	(16)
	b. {nanin} { <b>pakmariae</b> noreril siløhe}	(4)
3	a. {nanin}{pakmariae}{ <b>noreril</b> siløhe}	(13)
	b. {nanin} {pakmariae}{ <b>noreril</b> } {siløhe}	(7)
4	a. {nanin} {pakmariae noreril}{ <b>siløhe</b> }	(20)

Table 3. Phrasings realized by 4 subjects for the model sentences 1'-4' in Table 1. In parenthesis is indicated the number of repetitions (out of 20) using this phrasing.

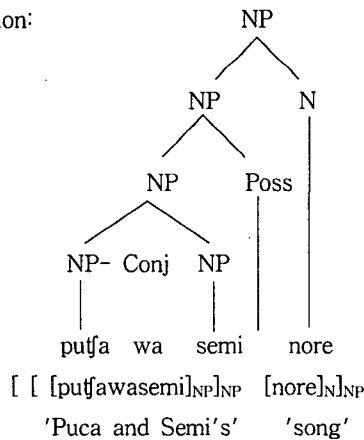
Sentence type	Sentences with phrasing	
1'	a. {nanin} {pu <u>ff</u> awa} {semi noreril} {siløhe}	(13)
	b. {nanin} {pu <u>ff</u> awa semi noreril} {siløhe}	(5)
	c. {nanin} {pu <u>ff</u> awa} {semi noreril siløhe}	(2)
2'	a. {nanin} {pu <u>ff</u> awa <b>semi</b> noreril} {siløhe}	(13)
	b. {nanin} {pu <u>ff</u> awa <b>semi</b> noreril}siløhe}	(4)
	c. {nanin} {pu <u>ff</u> awa} { <b>semi</b> noreril} {siløhe}	(3)
3'	a. {nanin} {pu <u>ff</u> awa semi}{ <b>noreril</b> siløhe}	(7)
	b. {nanin} {pu <u>ff</u> awa} {semi} { <b>noreril</b> siløhe}	(7)
	c. {nanin} {pu <u>ff</u> awa semi} { <b>noreril</b> } {siløhe}	(4)
	d. {nanin} {pu <u>ff</u> awa} {semi} { <b>noreril</b> siløhe}	(2)
4'	a. {nanin} {pu <u>ff</u> awa semi noreril} { <b>siløhe</b> }	(13)
	b. {nanin} {pu <u>ff</u> awa} {semi noreril} { <b>siløhe</b> }	(7)

Since all subjects show similar tonal patterns and do not show consistent differences, pooled data are considered in Tables 2 and 3. Focused constituents are shown in bold. Braces are used to indicate boundaries of accentual phrases. An Accentual Phrase is formed based on the intonational pattern of an utterance rather than on the syntactic structure of a sentence (Jun 1993). An Accentual Phrase can have more than one phonological word and is marked by a phrase-final rising tone in Seoul Korean, LHLH, (Jun 1993). The decision as to whether the phrase was produced in one Accentual Phrase is based on the F0 contour. The most crucial cue in the F0 contour is the slope of the F0 fall from the first H tone. The slope is much steeper when the phrase is produced in two Accentual Phrases than when produced in one Accentual Phrase (Jun 1993, Jun and Oh 1996). According to Jun (1996), aspirated and tensed consonants raise the F0 of the following vowel in Korean. Such a segmentally induced perturbation triggers a tonal difference only in phrase-initial position. That is to say, F0 and EMG pattern show that phonologization of pitch perturbation is only limited to an Accentual Phrase initial position. Thus, /se/ in /semi/ and /si/ in /siløhe/ are counted as Accentual Phrase-initial when their F0s are high.

A few facts are apparent in the realization of prosodic phrasing. First, /nanin/ 'I (thematic)' always constitutes an Accentual Phrase on its own indicating that the thematic suffix, /nin/, is a strong boundary marker. Second, the words preceding and following the focused words tend to be dephrased: when /siløhe/ is focused, the number of Accentual Phrases of the preceding constituents is smaller than in the neutral sentence (compare sentence type 1 (1') with sentence type 4 (4') in Table 2 and 3). /siløhe/ is more likely to be part of a preceding accentual phrase when it is put right after the focused word (compare

sentence types 1 (1') and 2 (2') with sentence type 3 (3') in Tables 2 and 3). Jun (1993:185) claims that the effect of focus is to dephrase all following words within the same Intonation Phrase unless one of those following words itself is focused. However, (2a, 3b) in Table 2 and (2'a, 2'c, 3'c) in Table 3 illustrate that dephrasing does not always cover up to the Intonation Phrase boundary.<sup>1)</sup> This fact is rather congruent with Silva's (1992) contention that a minor phrase has some limitation in length. Finally, syntactic constituency also plays a role in prosodic structuring. When /*noreril*/ is focused, the preceding phrases are of two types: One is a single NP and the other is a branched NP. /*pakmariae*/ and /*puʃawasemi*/ have the same number of syllables but they are different from each other in terms of syntactic constituency: /*pakmariae*/ is the concatenated form of a noun and a possessor but /*puʃawasemi*/ has a coordinated structure consisting of NP and NP. As Ladd (1996:237) suggests, there exists some essential difference between syntax and prosodic structure which gives rise to mismatch between prosody and syntax. The coordinated structure of /*pakmariae*/ may show incongruent phrasing between syntactic and prosodic phrasings as illustrated in (3).

(3) a. Syntactic representation:



b. Prosodic Phrasing: {puʃawa}<sub>AP</sub> {seminore}<sub>AP</sub>

For example, /*seminore*/ in (3) neither constitutes any syntactic constituent nor is a sense unit (Selkirk 1984:291), although it comprises an Accentual Phrase on its own. Such a mismatch between syntactic representation and prosodic representation asks for more information in determining prosodic phrasing. The former is <sub>NP</sub>[*pakmariae*]<sub>NP</sub> and the latter is <sub>NP</sub>[<sub>NP</sub>[<sub>NP</sub>[*puʃa*-*Conj*]<sub>NP</sub> <sub>NP</sub>[*semi*]<sub>NP</sub>]<sub>NP</sub>]. As Vogel and Kenesei (1993) argue, when some word bears focus, the remaining phrases are restructured depending on their branchingness. As can be

1) Jun and Lee (1998) suggest that dephrasing in a post-focused phrase has to do with the length of the phrase and the type of a boundary tone. They also point out that the expansion of pitch range between a focused word and the following words gives the effect of dephrasing.

seen in the sentence type 3 and 3' of Tables 2 and 3, the branched NP is produced more variously than a single NP. It suggests that syntactic information also affects accentual phrasing (Silva 1992:83).

In sum, the prosodic phrasings for the 8 sentences indicate that the constituents in pre- and post-focus positions tend to be dephrased. However, it turns out that dephrasing does not always cover up to the Intonation Phrase boundary. Morphosyntactic constituency also plays a role in prosodic phrasing: Phrases in pre-focus position are restructured depending on their morphosyntactic branchingness.

### 3.2 F0

Jun, E. (1991:39) reports that the F0 value for the focused word is higher than that for the nonfocused word but the difference between them is not significant in Korean. Cooper et al. (1985) also point out that the F0 value of the focused word itself is not significantly different from that of the corresponding neutral word in English. In this experiment, we measured the F0 value of the first and the second syllables in focused and corresponding neutral focused words when the focused word is not Intonation Phrase-final. The F0 value is only taken out of the first syllable, /si/, when contrastive focus is given to the last word of the final Intonation Phrase, /siløhe/. The Intonation Phrase is demarcated by a boundary tone which strongly affects the tonal pattern of the last Accentual Phrase. Thus the second syllable of /siløhe/ was not included for the comparison of F0. Table 4 shows the measurement results.

Table 4. The averaged values (Hz) of F0 produced by 4 speakers in focused and neutral positions and t-test results

	1st syllable				2nd syllable		
	pak	pu	no	si	ma	ʈa	re
focused	195.049	225.583	177.382	199.770	218.299	235.520	218.690
neutral	175.558	186.097	151.284	170.341	203.62	226.647	153.353
t-test(P)	0.2151	0.068	0.018	0.020	0.3305	0.3724	2.16E-06

The results of the experiment regarding F0 values reveal that F0 value is a function of prosodic structure. The F0 values of the first and second syllables in the focused words are higher than but not significantly different from those corresponding syllables in neutral words,  $p > 0.05$ , when both focused words and corresponding neutral words are Accentual Phrase-initial. For instance, /nanin/ always forms an Accentual Phrase on its own. It means that /pakmariae/ and /putʈawasemi/ always initiate a new Accentual Phrase. Thus, the F0 values of the focused /pakma/ and /putʈa/ are not significantly different from corresponding neutral words. On the other hand, /nore/ and /si/ are in Accentual Phrase-initial position when focus is given to them but they may be located in Accentual

Phrase-medial position in the neutral sentence. The F0 values of the focused words are significantly higher than those of neutral words when focus is given to the later position in a sentence, /nore/ and /si/. Thus, the difference in F0 values between focused and neutral words in utterance-initial position and in utterance-later position results from different prosodic structure. Due to accentual phrase initial strengthening, F0 values of both focused and neutral words in accentual phrase-initial position are relatively high but they are not significantly different from each other. However, F0 values of focused words in Accentual Phrase-initial position and neutral words in Accentual Phrase-noninitial position are significantly different from each other. Thus, prosodic phrasing should be considered when comparing F0 values of focused and neutral words since phrase-initial position is stronger than phrase-medial position (Fougeron and Keating 1996).

### 3.3 Duration

There have been two approaches with regard to the effects of focus on the duration of adjacent words. Unidirectional approach presumes that focus affects the duration of sequences following the focused constituent (Pierrehumbert and Beckman 1988) or preceding the focused constituent (Jun, E. 1991).<sup>2)</sup> The other is bidirectional approach whereby focus is claimed to affect the duration of constituents in pre-focus and post-focus positions (Maekawa 1996, Jun and Lee 1998).

In this study, I measured the duration of phrases in the pre-focus, under-focus, and post-focus positions to find out which approach is suitable for the effect of focus on duration.

Four results were achieved through the experiment with respect to duration. Firstly, all focused constituents are significantly longer than analogous non-focused constituents at the  $p < 0.005$  level of confidence. Table 5 shows the duration ratio of each constituent between focused and neutral sequences averaged over 4 speakers as a function of focal conditions.

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2) Jun, E. (1991: 53) claims that durational difference is the most prominent element which distinguishes focused and neutral words in Korean. F0 and amplitude are not said to play such a crucial role as duration. She measures the duration of words preceding and following focused words as well as that of focused words. Her findings are that words preceding focused words are significantly longer than the words preceding analogous neutral words (1991:25), while focus has been shown to take no effect on the duration of words in post-focus position (1991:28).

Table 5. Duration of an under-focus sequence (in percentage relative to Neutral) in the model sentences in (2a) and (2b): \*=significant at <.005.

	<b>pakmariae</b>	<b>noreil</b>	<b>siløhe</b>
(2a)	*121%	*146%	*114%
	putʃawasemi	noreil	siløhe
(2b)	*114%	*123%	*113%

Secondly, shortening of constituents adjacent to focused constituents is due to dephrasing rather than any other reason. It is important to note that the effect of focus on duration is not localized upon the focused constituent, but spreads over the pre-focused and post-focused phrases. Maekawa (1996) reports that when a target phrase is focused, durations of the preceding and/or following phrases are reduced and contribute to the decrease in the overall utterance durations in Japanese. However, Tables 6 and 7 illustrate that shortening of constituents adjacent to focused constituent results from dephrasing.

Table 6. Duration of a post-focus sequence (in percentage relative Neutral) in the model sentences in (2a) and (2b), for two different number of syllables

Sentence in Table 2	post-focus #syllable	3 syllables	6 syllables
	(2a)		101%
(2b)		116%	95%

Table 7. Duration of a pre-focus sequence (in percentage relative to Neutral) in the model sentences in (2a) and (2b), for three different number of syllables

Sentence in Table 2	pre-focus # syllables	2 syllables	7 syllables	10 syllables
	(2a)		103%	114%
(2b)		105%	103%	99%

When the sequence in pre- and post-focus positions is not long enough, it may not be shortened. However, when dephrasing occurs in post-focus and pre-focus positions, the duration is shortened. The reduction rate tends to increase as the number of syllables increases. If dephrasing does not occur, duration shortening of the pre-focus is not observed. For example, the duration of /nanin/ in pre-focus position is rather longer than that in a neutral condition (2 syllables in Table 7). Likewise, different phrasing strongly affects the duration of sequences adjacent to a focused constituent. Constituents adjacent to a focused constituent are shortened only when they are dephrased. These results suggest that prosodic phrasing difference resulting from dephrasing should be taken into consideration



when comparing durations of constituents. The results of this experiment support neither the Unidirectional Approach nor the Bidirectional Approach. Rather, they suggest that duration of the constituent in pre-focus and post-focus position depends on dephrasing.

Thirdly, different morphosyntactic structure also affects durational difference. For instance, the constituents in both types of sentences are longer when they are preceded by the focused constituent, /*noreril*/. However, their length is different in degree; /*Nani npakmariae*/ is significantly longer at the 0.001 level when /*noreril*/ is focused, while /*nani nputfawasemi*/ is not significantly longer compared to the correspondent in the neutral sentence. Such a difference results from different morphosyntactic structure between them. /*Pakmariae*/ is a single syntactic constituent, while /*putfawasemi*/ is a branched constituent. /*Pakmariae*/ is placed in Accentual Phrase-final position when /*noreril*/ is focused as given in (3a, b) in Table 2 since a focused word always initiates a new Accentual Phrase but it is almost always put Accentual Phrase-medial position in the neutral sentence as given in (1a) in Table 2. That is why such a significant durational difference in the pre-focused constituent is made when /*noreril*/ is focused as for the sentence with /*pakmariae*/. On the other hand, as for the sentence containing /*putfawasemi*/, /*semi*/ is always put Accentual Phrase-finally when followed by a focused phrase but it is always put Accentual Phrase-medially in the neutral sentences as shown in (1'a, b, c) in Table 3. /*Putfawasemi*/ may constitute 2 Accentual Phrases when pre-focused as given in (3'b, d) in Table 3. Thus, the constituents preceding the focused constituents are not significantly longer than those in the neutral sentence. Likewise, when pre-focused, different morphosyntactic structure gives rise to different realization of prosodic phrasing which in turn results in durational difference.

Fourthly, the durational comparison between focused word-initial syllables and the word-initial syllable in a neutral condition shown in Table 8 supports Jun and Lee's (1998) finding that an Accentual Phrase-initial syllable is always significantly longer than the word-initial syllable in a neutral condition.

Table 8. Duration of a syllable (in percentage relative to Neutral) in the model sentences in (2). \*=significant at <.05.

	<b>pak</b>	<b>ma</b>	<b>no</b>	<b>re</b>
(2a)	*171%	104%	*222%	105%
	pu	tʃa	no	re
(2b)	*159%	98%	*173%	103%

Jun and Lee (1998) contend that the lengthening of the focused accentual phrase-initial syllable is due to the lengthening of the initial consonant as opposed to the initial vowel. We measured the duration of the initial consonant of /*siløhe*/ in the model sentences in (2a) and (2b). The result shown in Table 9 supports Jun and Lee (1998).

Table 9. Duration of /s/ (in percentage relative to Neutral) in the model sentences in (2a) and (2b). \*=significant at <.01.

	s
(2a)	*132%
(2b)	*127%

To summarize, the prosodic structure rather than a simple location of constituents with respect to focused words plays a crucial role in the duration of constituents adjacent to focused constituents. Constituents adjacent to focused constituents are shortened only when they are dephrased. Thus, higher-level prosodic organization determines segmental duration.

#### 4. Conclusion

This paper has examined the effects of focus on prosodic phrasing, F0, and duration focusing not only on the target of focus but also on those constituents that are outside the domain of focus. A variety of prosodic phrasings indicates that the constituents preceding and following the focused word tend to be dephrased. However, it turns out that dephrasing does not always cover up to the Intonational Phrase boundary. It was found that the duration of a pre-focused sequence or a post-focused sequence is often shorter than that in a neutral sentence only when the sequence is dephrased before or after focus. The F0 values of a focused word are higher than those of a corresponding neutral word. However, different prosodic phrasing was shown to determine the degree of difference in F0. Dephrasing caused by focus is a main factor to determine F0 and durational difference between focused and neutral sentences. It was also shown that syntactic constituency plays a role in prosodic structuring in pre-focused position: When some word bears focus, the pre-focused phrase is restructured depending on their branchingness as argued by Kenesei and Vogel (1993).

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▲ Mira Oh

English Department, Yeojoo Institute of Technology  
469-800, Kyori, Yeojoo-gun, Kyunggido, KOREA  
Tel: +82-31-880-5311 (O)  
E-mail: mroh@mail.yeojoo.ac.kr