

Prosodic Structure in North Kyungsang Korean Based on Tone Realization*

Woohyeok Chang
(Dankook University)

Chang, Woohyeok. 2009. Prosodic Structure in North Kyungsang Korean Based on Tone Realization. *Linguistic Research* 26(1), 1-18. This paper examines the tone system of North Kyungsnag Korean (NKK) to figure out whether the prosodic domain in segmental phonology is consistent with the one in suprasegmental phonology or not. As in segmental phonology, NKK tone system can be analyzed by employing prosodic domains, such as phonological words and phrases. According to segmental phonology, a phonological word in Korean is defined as the constituent that encompasses a prefix as well as a lexical word. This study of NKK tonal behavior also confirmed this phonological word boundary, showing that both prefixes and lexical words equally have two kinds of stems: unaccented vs. accented stems. However, it is suggested that the domain of phonological word is less important than that of phonological phrase because the placement of high tone in NKK is very much involved with the domain of phonological phrase. In order to satisfy the regulation that every phrase in NKK must have a high tone in the surface representation, a default tone should be inserted at the final syllable of the whole phrase that has no underlying tone. (Dankook University)

Keywords North Kyungsang Korean, tone system, prosodic word, phonological phrase

1. Introduction

Many studies in the last decade on the relation between the phonetic representation and the surface syntax have proposed there is indeed an intermediate level: the prosodic structure (see Selkirk, 1984, 1986; Nespor & Vogel, 1986; among many others). The proposal of such a structure was motivated by observations that the domain of various phonological rules is not isomorphic to syntactic structure, but in fact only corresponds to the syntax in an

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indirect manner. Based on this idea, it is generally accepted now that a “phonological word” level in Korean is necessary to explain various phonological rules properly (see Han, 1993; Kang, 1991). The definition of a phonological word in Korean holds that a prefix as well as a bare stem plus an adjacent suffix can serve as a phonological word.

The main purpose of this study is to examine whether the prosodic domain defined in segmental phonology is also consistently applied in suprasegmental phonology or not, based on the tone system of North Kyungsang Korean (henceforth NKK). In this study we found that in terms of the tonal pattern, there are two types of phonological words in NKK, unaccented stems and accented stems. Furthermore, determining the placement of a high tone in NKK is very much involved with the domain of a phonological phrase rather than that of a phonological word in that if there is a underlying high tone in a phonological phrase, it gets a high tone in the surface representation whereas if there is no underlying high tone within a phonological phrase, a default tone should be inserted at the final syllable of the entire phrase. This argument will be supported by the tonal pattern in compounds and phrases.

The remainder of this paper is structured as follows. First, I will discuss the Korean prosodic word domain in segmental phonology in section 2. Second, I will introduce the observations of the NKK tone system to figure out how the prosodic word domain works in the tone patterns of NKK in section 3. Next, the main empirical results reached in this paper are summarized in section 4. Finally, a theoretical problem raised in the preceding sections is discussed in section 5.

2. Review of the Prosodic Domain in Korean

Previous literature (Kang, 1991; Han, 1993) has argued for the existence of a prosodic word in Korean by suggesting that the domain of some phonological rules is not isomorphic to any morpho syntactic constituent. In this section, I will review some of the phonological rules, such as Coda Neutralization, Consonant Cluster Simplification, and l-deletion¹⁾.

1) Stray Erasure and l-deletion can be put together as Consonant Cluster Simplification.

2.1 Coda Neutralization (CN)

Let us begin with examining what the domain of Neutralization is. Coda Neutralization in Korean is a rule that changes all labial and velar stops²⁾ to corresponding plain stops, /p/ and /k/ respectively, in the coda position, as shown in (1a) and (1c). Furthermore, when all coronal obstruents are placed in the coda position, they are changed to a coronal plain stop, /t/, illustrated in (1b).

- (1) a. p, p', p^h → [p] e.g. /sup^h/ → [sup] 'forest'
 b. t, t', t^h e.g. /mit^h/ → [mit] 'bottom',
 s, s'  [t] /pis/ → [pit] 'comb'
 c, c', c^h /pic/ → [pit] 'debt'
 c. k, k', k^h → [k] e.g. /pak'/ → [pak] 'outside'

Now, let us consider the main issue of what the domain of this rule is. Since the domain of Coda Neutralization is a limited boundary in which the rule applies, it can be determined by examining what happens when bare nominal stems³⁾ are attached by inflectional suffixes. This is illustrated in (2).

- (2) a. N[N[sup^h] i] → (su.p^hi)_ω
 'forest' -Nom
 b. N[N[k'oc^h] i] → (k'o.c^hi)_ω
 'flower' -Nom
 c. N[N[pak'] eseo] → (pa.k'eseo)_ω
 'outside' 'in' 'in the outside'

According to these examples, Coda Neutralization (CN) does not apply to stem final consonants of nouns when they are combined with derivational or postpositional suffixes. Thus, Coda Neutralization does not seem to apply in the domain of stems, rather it should be bounded by the domain of the prosodic word (ω), as shown in (3).

2) As is well known, Korean has three way contrasts in stops: plain, tensed, and aspirated stops.

3) This represents the stems without suffixes, enclitics and prefixes.

- (3) a. /sup^h + i/ → su.p^{hi} → NA → [su.p^{hi}]_ω
 └─ syllabification └─ CN
- b. /k'oc^h + i/ → k'o.c^{hi} → NA → [k'o.c^{hi}]_ω
 └─ syllabification └─ CN
- c. /pak' +eseo/ → pa.k'e.seo → NA → [pa.k'e.seo]_ω
 └─ syllabification └─ CN

In (3), all the stem final consonants, /p^h, c^h, k'/, are syllabified to the onset of the vowel-initial suffixes. In other words, the stem final consonants surface as the onset of the following vowel initial suffixes. As a result of Syllabification, the environment where Coda Neutralization is applied to is removed. Accordingly, a stem plus a suffix can be considered as a prosodic word domain, and Syllabification and Coda Neutralization should be applied in the domain of this prosodic word rather than that of the stem. Contrary to (3a)-(3c), the following example shows that in a case-inflected compound, the final consonant of the first stem undergoes Coda Neutralization whereas that of the second stem does not.

- (4) Adv[N[N[ap^h]_N[ap^hi]]] → (ap)_ω (ap^{hi})_ω

This fact indicates that there are two domains of prosodic words in compound such that one domain consists of the stem itself, and the other domain consists of the stem plus the following case marker suffix. Therefore, each member of a compound forms a separate prosodic word for the domain of Coda Neutralization.

2.2 Consonant Cluster Simplification (CCS)

Let us now turn to another phonological rule, Consonant Cluster Simplification. Since the syllable structure allows only one consonant in the coda position in Korean, consonant clusters are simplified in the surface representation, as shown in (5).

- (5) a. lm → m e.g. /salm/ → [sam] 'life'

- b. lk → k e.g. /talk/ → [tak] 'chicken'
 c. ps → p e.g. /kaps/ → [kap] 'price'

Again, we need to determine the domain by which the application of this rule is bounded. To do so, we have to examine what happens when inflectional suffixes or other stems are attached to bare nominal stems. This is represented in (6).

- (6) a. $N[N[salm] i]$ → (salmi)_ω
 'life' -Nom
 b. $N[N[heulk] eseo]$ → (heulkeseo)_ω
 'sand' 'in' 'in the sand'
 c. $N[N[kaps] coc^h a]$ → (kapcoc^ha)_ω
 'price' 'even' 'even price'

As in Coda Neutralization (CN), Consonant Cluster Simplification (CCS) does not apply to stem final consonants of nouns when they are combined with vowel initial derivational or postpositional suffixes, as shown in (6a) and (6b). However, this rule applies when the stem is followed by consonant initial suffixes because the stem final consonant cannot be syllabified as an onset of the following syllable. Thus, based on the fact that Consonant Cluster Simplification (CCS) is not applied to the stem final consonant when it is followed by vowel initial suffixes, it appears that CCS is bounded by the domain of prosodic word rather than the domain of the stem itself. This phenomenon was analyzed in (7).

- (7) a. $[salm + i]_{\omega}$ → $[sal.mi]_{\omega}$ → NA → $[sal.mi]_{\omega} / *[sa.mi]$
 └─ syllabification └─ CCS
 b. $[hulk+eseo]_{\omega}$ → $[hul.keseo]_{\omega}$ → NA → $[hul.keseo]_{\omega} / *[hu.keseo]$
 └─ syllabification └─ CCS
 c. $[kaps + cocha]_{\omega}$ → $[kap.s.cocha]_{\omega}$ → $[kap.cocha]_{\omega}$
 └─ syllabification └─ CCS

When consonant cluster (C_iC_j) is followed by a vowel initial suffix in (7a) and (7b), C_i is placed in the coda position of the preceding syllable, and C_j

becomes the onset of the following syllable by the syllabification rule. In contrast, when C_iC_j is followed by a consonant initial suffix in (7c), C_j is deleted as in the case of an isolated stem. Accordingly, a stem plus a suffix can be considered as a prosodic word domain, and Consonant Cluster Simplification should also be applied in the domain of this prosodic word rather than that of a stem. Now let us examine another case where a stem is combined with another stem, which means a compound.

$$(8) \text{ }_N[\text{N}[\text{kaps}] \text{ }_N[\text{eoci}]] \rightarrow (\text{kap})_\omega (\text{eoci})_\omega / *(\text{kapseoci})_\omega$$

Contrary to (7), (8) shows that in compounds the first stem ends with the cluster ps , and the final s cannot be syllabified onto the onset of the following syllable because of the existence of the prosodic word boundary. This indicates that the application of Consonant Cluster Simplification within compound in (8) also supports the claim that each member of a compound constitutes a prosodic word.

2.3 Prefixes

So far, we have examined the case in which a stem is combined with suffixes. In this section, we will consider whether prefixes should be considered the same as the suffixes or not in terms of prosodic domain. According to Kang (1991), prefixes are an independent phonological word (ω) in Korean as shown in (9).

$$(9) (\text{tus})_\omega (\text{os})_\omega \rightarrow (\text{tus})_\omega (\text{os})_\omega \rightarrow (\text{tut})_\omega (\text{ot})_\omega \rightarrow (\text{tu.tot})_\phi \rightarrow (\text{tu.dot})_\phi$$

‘outer’ ‘clothes’ $\downarrow$ syllabification $\downarrow$ CN $\downarrow$ resyllabification $\downarrow$ voicing

Since the prefix *tus* is an independent prosodic word, the coda of the prefix cannot be syllabified as an onset of the following syllable. It rather stays in the syllable final position of the prefix. Thus, this syllable final consonant of the prefix meets the condition in which Coda Neutralization applies. Since the prefix constitutes a prosodic word, Coda Neutralization can be applied within the prefix. Then, Resyllabification changes the coda of the prefix to the onset of the following stem in the domain of a phonological phrase (ϕ). Finally, it is contextually voiced in between two vowels.

In sum, we have shown that a stem or a stem plus any suffixes can be a

prosodic word in Korean. Furthermore, even if suffixes or enclitics cannot serve as prosodic words by themselves, prefixes alone can represent the domain of a single prosodic word in Korean. Therefore, as claimed by Kang (1991, 1993), prosodic words in Korean can be derived based on Selkirk's (1986, 1988) " $X^0[\dots]$ " setting as shown in (10).

(10) Korean Prosodic Word Rule (KPWR: lexical)

$$X^0[\rightarrow \omega[\quad (X \text{ is a lexical category})$$

Note that only lexical categories (N, V, Adv, Adj, etc.) can constitute a prosodic word. The boundary of prosodic words can be defined as the left edge of stems. Other elements such as derivational suffixes and enclitics should be incorporated into a preceding prosodic word. However, in Korean prefixes do not behave like suffixes or enclitics in that the prosodic word in Korean coincides with either the left end of a stem or the left end of a prefix.

3. Prosodic Phonology in the NKK Tone Pattern

We now proceed to the analysis of the NKK tone system in terms of prosodic phonology. The purpose of this section is to diagnose the effect of prosodic domain examined in segmental phonology on the rich tonal phonology in NKK. In this section, the NKK tone system can be analyzed by using some prosodic domains, such as phonological words and phrases. We found that the domain of phonological phrase is more important than that of phonological word in the analysis of the NKK tone system. Let us begin with some background on NKK tone and then examine the tonal pattern of encliticized words, prefixes, and compounds.

3.1 Background on NKK Tone

The tone in NKK has attracted a great deal of interest because of its intricate system (see K. Chung, 1980; G. R. Kim, 1988; Y. H. Chung, 1991; N. J. Kim, 1997; S. H. Kim, 1999, etc.). NKK has a pitch accent system similar to Tokyo Japanese (Haraguchi, 1977; Pierrehumbert & Beckman, 1988) in that phonological words have a single high tone. It has been reported that there are two different tone patterns in NKK when the two contrasting classes of lexical items are combined

other enclitics, illustrated in (11).

- | | |
|--|---|
| (11) <i>Type I</i> (final) | <i>Type II</i> (non final) |
| a. satalí 'ladder' | apúci 'father' |
| b. satalí-eseo 'on a ladder' | apúci-eke 'to a father' |
| satalí- euy 'of a ladder' | apúci-euy 'of a father' |
| c. satali-cócha 'even a ladder' | apúci-cocha 'even a father' |
| satali-menk ^h úlo 'like a ladder' | apúci-menk ^h ulo 'like a father' |

Notice that accent marks represent the placement of a high tone; (11a) shows two different locations of a high tone (final and non final) in a single lexical item. *Type I* (final) is characterized by a peak (high tone) on a final syllable of the stem. *Type II* (non-final) has the peak on the penult syllable of the stem. Moreover, it has been noticed that when enclitics are attached to the stems, the location of high tone in *Type I* and *Type II* is different from each other. That is, while stems in *Type II* have stem-penult high tone in the encliticized forms as well as in the stem isolated forms, the high tone in *Type I* stems shifts to the penult position of the entire form when some enclitics are attached to the stem as in (11c).⁴⁾

3.2 Encliticized Words

In this section, I will introduce the detailed data of the tonal patterns of encliticized words to find a general pattern of this tonal difference according to *Type I* and *Type II*. As mentioned above, the data are classified into two groups; i.e., one is *Type I* (final) stem which has a high tone on the final syllable of the word, and the other is *Type II* (non-final) stem in which a high tone is placed on the penult syllable of the word. The tone pattern of each type of stem is illustrated as it is followed by various kinds of suffixes. (12) and (13) represent how the placement of high tone changes when stems are disyllabic words or trisyllabic words, respectively .

4) As pointed out by an anonymous reviewer, there are other types of tone in NKK, such as word-initial tone in three-syllabled words (e.g., kámani, kámuc^hi) and double tones (e.g., múcíke, kúléum). In terms of markedness of tone, these tones have not been controversial because they were analyzed as marked tones in NKK by previous literature. Hence, these tones are not included in this study.

(12) Disyllabic words

Suffixes	Type I	Type II
Accusative: -leul/-eul	namú (tree): namú-leul	íut (neighbor): íut-eul
Genitive: -euy	namú-euy	íut-euy
Nominative: -i/-ka	namú-ka	íut-i
Topic: (-n) eun	namú-neun	íut-eun
Conjunction Markers: -oa/-koa, -hako, -ko 'and'	namú-oa namu-háko	íut-koa íut-hako
Delimiters: -to 'also' -man 'only' -c <u>o</u> cha, -m <u>a</u> ceo 'even'	namú-to namú-man namu-cócha namu-máceo	íut-to íut-man íut-c <u>o</u> cha
Comparative: -(k)oa, -hako,	namú-oa	íut-koa
Locative: -(e)seo, -p <u>u</u> teo, -lo	namú-eseo namu-púteo namú-lo	íut-eseo
Dative: -ekey	namú-ekey	íut-ekey
Instrumental: -lo/-eulo	namú-lo	

(13) Trisyllabic words

Suffixes	Type I	Type II
Accusative: -leul/-eul	satalí (ladder): satalí-leul	apúci (father): apúci-leul
Genitive: -euy	satalí-euy	apúci-euy
Nominative: -i/ -ka	satalí-ka	apúci-ka
Topic: (-n) eun	satalí-neun	apúci-neun
Conjunction Markers -oa/-koa, -hako, -ko	satalí-oa satali-háko	apúci-oa apúci-hako
Delimiters -to 'also' -man 'only' -c <u>o</u> cha, -m <u>a</u> ceo 'even'	satalí-to satalí-man satali-cócha satali-máceo	apúci-to apúci-man apúci-c <u>o</u> cha
Comparative: -(k)oa, -hako	satalí-oa	apúci-oa
Locative: -(e)seo, -p <u>u</u> teo, -lo	satalí-eseo satali-púteo satalí-lo	apúci-puteo
Dative: -ekey	satalí-ekey	apúci-ekey
Instrumental: -lo/-eulo	satalí-lo	

The main finding from the data in (12) and (13) is that suffixes that cause a stress shift in *Type I* stems are consonant initial disyllabic suffixes; i.e., *-hako*, *-cocha*, *-maceo*, *-putea*. In other words, monosyllabic and vowel initial disyllabic suffixes do not cause stress shift in both *Type I* and *II*.

Based on this finding, let me now suggest an analysis of tone patterns of isolated lexical words and encliticized words in NKK in terms of prosodic phonology. Since the tone patterns of encliticized words are different between *Type I* and *Type II* when they are followed by consonant initial disyllabic suffixes, they should be analyzed phonologically that the stem in *Type I* is metrically unaccented⁵⁾ in the underlying representation whereas the stem in *Type II* is metrically accented in the underlying representation as in (14).

(14) Isolation (a lexical word)

a. Type I				b. Type II		
x	x	x	Underlying Representation		H 	
sa	ta	li		x	x	x
				a	pu	ci
(default) H 			Surface Representation		H 	
x	x	x		x	x	x
{(sa	ta	li) _{pw} jpph		{(a	pu	ci) _{pw} jpph

In *Type I*, there is no high tone in the underlying representation. However, it gets high tone as a default high tone because every word in NKK should have a high tone in a surface level, as in the surface representation of (14a). In contrast, the stem in *Type II* has a high tone in the underlying representation, and it is also realized as a high tone in the surface form, as shown in (13b).

Let us now consider the encliticized words in which the enclitics begin with a consonant. (15) gives the derivation of the two different types of stems when they are combined with a consonant initial suffix, *-cocha*.

As suggested before, the basic presupposition is that the stem in *Type I* does

5) Most previous literature (Kenstowicz and Sohn, 1997; Kim, 1997) proposed that the stem in *Type I* which has final high tone, was found to have an underlying high tone in the final syllable of the stem. However, following Kim (1999), it was analyzed as an unaccented stem in the underlying representation. The existence of the unmarked stem-final tone was supported by Chans (2005) experimental study, which showed that the pitch value of the final high tone was significantly lower than that of the penultimate high tone

not have a high tone in the underlying representation whereas the stem in *Type II* has it underlyingly. According to Alderete (1999) and Kim (1999), since the accent of accented stems metrically wins over the accent of enclitics as in (15b), the accent of accented enclitics only surfaces when the stems are unaccented as in (15a). Thus, while (15a) shows that a high tone is realized in the enclitics in the surface representation, in (15b) the high tone of the accented stem surfaces rather than that of the enclitics. Moreover, it also meets a constraint that every word in NKK must have a high tone in the surface representation in (15a) by being combined with enclitics. Accordingly, the crucial part which make it possible to differentiate the tonal pattern of *Type I* from that of *Type II* is that there are two different underlying representations, namely unaccented and accented stems in NKK.

(15) Consonant initial suffixes

a. Type I		b. Type II
$\begin{array}{ccccc} & & & H & \\ & & & & \\ x & x & x & + x & x \\ sa & ta & li & co & cha \end{array}$	Underlying Representation	$\begin{array}{ccccc} & & & H & \\ & & & & \\ x & x & x & + x & x \\ a & pu & ci & co & cha \end{array}$
$\begin{array}{ccccc} & & & H & \\ & & & & \\ x & x & x & x & x \\ (sa & ta & li & co & cha)_{pw} \end{array}$	Surface Representation	$\begin{array}{ccccc} & & & H & \\ & & & & \\ x & x & x & x & x \\ (a & pu & ci & co & cha)_{pw} \end{array}$ (1st accent > 2nd accent)

The next question is why the high tone is on the final syllable of the stem in *Type I* when it is combined with vowel initial enclitics. To account for this, vowel initial enclitics should be pre-accenting morphemes⁶⁾ which assign a metrical accent to the preceding unaccented stems, as illustrated in (16).

(16) Vowel initial suffixes

a. Type I		b. Type II
$\begin{array}{ccccc} x & x & x & + & x & x \\ sa & ta & li & & e & seo \end{array}$	Underlying Representation	$\begin{array}{ccccc} & & & H & \\ & & & & \\ x & x & x & + & x & x \\ a & pu & ci & & e & key \end{array}$
	pre-accenting ←	

6) Kim (1999) originally proposed the existence of pre-accenting morphemes in NKK.

$\begin{array}{ccccc} & & \text{H} & & \\ & & & & \\ \text{x} & \text{x} & \text{x} & \text{x} & \text{x} \\ (\text{sa} & \text{ta} & \text{li} & \text{e} & \text{seo})_{\text{pw}} \end{array}$	Surface Representation	Pre-accenting: NA $\begin{array}{ccccc} & & \text{H} & & \\ & & & & \\ \text{x} & \text{x} & \text{x} & \text{x} & \text{x} \\ (\text{a} & \text{pu} & \text{ci} & \text{e} & \text{key})_{\text{pw}} \end{array}$
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Given that stems in *Type I* are underlyingly unaccented, they can be assigned a high tone by pre-accenting morphemes, vowel initial enclitics, as in (16a). As a result, the final syllable of the stem gets a high tone in the surface representation of (16a). However, vowel initial enclitics have no impact on the forms containing accented stems, *type II* stems, as shown in (16b) because the function of the pre-accenting property is to assign the metrical accent only to unaccented stems. Thus, the underlying high tone of the stem in *Type II* surfaces as the high tone of the whole encliticized word, as in (16b).

3.3 Procliticized Words

So far, we have examined the tone patterns of encliticized words which consisted of a stem plus enclitics or suffixes. In this section, we will consider the tone patterns of procliticized words in which prefixes are attached to stems. We should note that there is a smaller number of prefixes in Korean compared with enclitics, and that their tone pattern has not been studied extensively.

As in enclitics, the data are classified into two groups; i.e., one is a *Type I* (final) stem which has a high tone in the final syllable of the word, and the other is a *Type II* (non final) stem in which a high tone is placed at the penult syllable of the word. The tone pattern of each type of stem is illustrated in (17) when some prefixes are attached to it.

(17) The tonal aspects of procliticized words

Prefixes	Type I	Type II
a. phut- 'young'	phún-namul 'young herbs'	phút-koksik 'new crop'
b. hot- 'single-layered'	hot- ^h imá 'an unlined skirt'	hot-ípul 'a single-layer quilt' hot-sóli 'a monosyllabic sound'
c. hol- 'single'		hol-apúci 'a single father'
d. cheot- 'first'	chéot-salang 'first love'	chéot-kyeoul 'the first winter'

Different from the case of encliticized words, there is no general pattern in the placement of a high tone. The only thing we can say is that when a prefix such as *put-* or *cheot-* attaches to any type of stem, it gets a high tone without the appearance of a high tone in stems, as shown in (17a) and (17d). However, when prefixes are *hot-* or *ho-*, a high tone is placed on the stem, not on the prefix, as shown in (17b) and (17c). Based on this fact, I will suggest that as in lexical words, there are two kinds of prefixes: one is an unaccented prefix and the other is an accented prefix. This is illustrated in (18) and (19).

(18) Unaccented prefixes

a. hot/hol + Type I		b. hot/hol + Type II
x + x x	Underlying Representation	x + $\begin{array}{c} H \\ \\ x \end{array}$ x
$\{(x)_{pw} (x \begin{array}{c} H \\ \\ x \end{array})_{pw}\}_{pph}$	Surface Representation	$\{(x)_{pw} (x \begin{array}{c} H \\ \\ x \end{array})_{pw}\}_{pph}$

(18a) shows that both a prefix and a stem do not have a high tone in the underlying representation because they all are unaccented items. Thus, a default high tone which assigns a high tone at the end of the whole procliticized word should be inserted in the surface representation. In the case of (18b), given that a stem is underlyingly accented whereas a prefix is unaccented, the underlying high tone of the stem surfaces as the high tone of the entire word.

(19) Accented prefixes

a. put/cheot + Type I		b. put/cheot + Type II
$\begin{array}{c} H \\ \\ x \end{array}$ + x x	Underlying Representation	$\begin{array}{c} H \\ \\ x \end{array}$ + $\begin{array}{c} H \\ \\ x \end{array}$ x
$\begin{array}{c} H \\ \\ \{(x)_{pw} (x \quad x)_{pw}\}_{pph} \end{array}$	Surface Representation	(1 st accent > 2 nd accent) $\begin{array}{c} H \\ \\ \{(x)_{pw} (x \quad x)_{pw}\}_{pph} \end{array}$

Contrary to (18), prefixes in (19) are underlyingly accented. Thus, when these accented prefixes are attached to an unaccented stem, the underlying high tone of the prefixes is realized as a high tone of the entire word in the surface

representation, as in (19a). In the case of (19b), both prefixes and a stem are underlyingly accented, and the high tone of the prefix is realized as a high tone in the surface representation instead of that of the following stem. This is because when two accents are combined together, the first accent universally tends to win over the second accent.

Accordingly, we can find that the tone behavior of prefixes is similar to that of lexical words in that both of them have two kinds of stems, such as unaccented and accented stems. Furthermore, as we noticed in the segmental phonology, prefixes should be also considered as an independent prosodic word in terms of tonal behavior in NKK.

3.3 Compounds and Phrases

Finally, let us consider the tone pattern of compounds and phrases to examine how the analyses done so far work even in compounds and phrases. The tone pattern of compounds in which stems in both *Type I* and *II* are combined with each other is shown in (20).

(20) Compounds

- a. Type I + **Type I**: simcáng 'heart' + mapí 'paralysis' → simcangmapí
(final) (final) nampí 'pan' + utóng 'a kind of noodle' → nampiutóng
- b. Type I + **Type II**: inkú 'population' + ítong 'movement' → inkuítong
(final) (non final) yeonán 'shore' + éoeop 'fishery' → yeonanéoeop
- c. **Type II** + Type I: út 'neighborhood' + maúl 'village' → útmaul
éunheng 'ginko' + namú 'tree' → éunhengnamu
- d. **Type II** + Type II: háneul 'sky' + nála 'country' → háneulnala (Heaven)
nápi 'butterfly' + nekhái 'necktie' → nápinekhái (bow tie)

Notice that the bold letters represent the placement of a high tone when two stems were combined together. We can find that when a stem in *Type I* is combined with a stem in *Type II*, the latter always gets a high tone, as in (20b) and (20c). In addition, when a stem in *Type I* is combined with the same type of stem, a high tone appears at the last syllable of the second stem as in (20a). In contrast, if both of the combined stems belong to *Type II*, the high tone is placed on the first stem, as in (20d).

This tonal pattern examined in compounds can be also detected in the case of phrases, as shown in (21).

(21) Phrases

- a. Type I+ **Type I**: numú ‘very’ + sinkihán ‘strange’ → numusinkihán
 uahán ‘beautiful’ + áne ‘wife’ → uahanáne
- b. Type I + **Type II**: nolán ‘yellow’ + nápi ‘butterfly’ → nolannápi
 sinsunhán ‘fresh’ + kóki ‘meat’ → sinsunhankóki
- c. **Type II** + Type I: méu ‘very’ + ppalún ‘fast’ → méuppalun
 písan ‘expensive’ + cimá ‘skirt’ → písancima
- d. **Type II** + Type II: púlun ‘blue’ + háneul ‘sky’ → púlunhaneul
 méu ‘very’ + núlin ‘slow’ → méunulin

Based on these findings, let me propose a prosodic analysis on the tone pattern of compounds and phrases in NKK. This is illustrated in (22).

(22) Derivation of two word compounds and phrases

a. Type I + Type I		b. Type I + Type II	
x x x + x x	Underlying Representation	x x x + $\begin{matrix} H \\ \\ x \end{matrix}$ x	
(default) H {(x x x) _{pw} (x $\begin{matrix} H \\ \\ x \end{matrix}$) _{pw} } _{pph}	Surface Representation	{(x x x) _{pw} ($\begin{matrix} H \\ \\ x \end{matrix}$ x) _{pw} } _{pph}	
c. Type II + Type I		d. Type II + Type II	
$\begin{matrix} H \\ \\ x \end{matrix}$ x + x x	Underlying Representation	$\begin{matrix} H \\ \\ x \end{matrix}$ x + $\begin{matrix} H \\ \\ x \end{matrix}$ x	
$\begin{matrix} H \\ \\ \{ (x x)_{pw} (x x)_{pw} \}_{pph} \end{matrix}$	Surface Representation	(1 st accent > 2 nd accent) $\begin{matrix} H \\ \\ \{ (x x)_{pw} (x x)_{pw} \}_{pph} \end{matrix}$	

Given that there is underlyingly no high tone in (22a), a default high tone is inserted in the phonological phrase level. From this result, we need to modify the claim we assumed before. Before we examined the case where there were more than two prosodic words, we assumed that a default high tone is inserted at the phonological word level. However, if we examine the tone pattern of compounds or phrases in (22a), we can find that a default high tone should be

inserted when there is no high tone in the domain of phonological phrase. In other cases, if there is an underlying high tone in either of the words, it surfaces as a high tone in compounds or phrases, as in (22b) and (22c). In addition, if there are two competing high tones in the underlying representation, the first accent wins over the second accent. Thus, the high tone of the first word is realized as a high tone of the compound or phrase instead of that of the second word, as in (22d).

Moreover, if more than two stems are combined, we can find a similar tone pattern with what we found in two word compounds and phrases, as in (23).

(23) Three word phrases.

- a. Type I + Type I + Type I: acu-ppalkan-satalí (very red ladder)
- b. Type II + Type I + Type I: méu-ppalkan-satali (very red ladder)
- c. Type I + Type II + Type I: numu-núlin-pihengki (very slow plane)
- d. Type I + Type I + Type II: numu-sinkihan-hósu (very strange lake)

As in the two word compounds and phrases, (23a) shows that if all the words belong to a *Type I* stem, a high tone appears at the final syllable of the last word. However, whenever a *Type II* stem appears and the other words belong to a *Type I* stem, it always gets a high tone in the entire three word phrases, as in (23b), (23c), and (23d). Therefore, we can claim that only the phonological phrase boundary plays a crucial role in determining the placement of high tone in NKK rather than the phonological word boundary in that if there is one underlying high tone in the phrasal level, it surfaces as a high tone in the entire phrase. However, if there is no high tone in the phrasal level, a default high tone is inserted at the final syllable of the phrase, as in (23a). This is because every phrase in NKK should have a high tone in the surface representation. Finally, if there are more than two high tones in the underlying representation, only the first high tone surfaces as a high tone of the entire phrase, which is also correspondent with universal grammar.

4. Conclusion

After providing an in depth discussion of Korean prosodic word domain in segmental phonology, I have introduced the observations of the NKK tone

system. As in segmental phonology, the phonological word examined in the tone system of NKK consists of a stem plus any adjacent suffixes. In addition, since the tonal behavior of prefixes is similar to that of lexical words, the findings in segmental phonology that prefixes can constitute a prosodic word seem to also make sense in NKK tone systems. However, in terms of tonal pattern, there are two types of phonological words, such as unaccented stems and accented stems, and the phonological phrase is more important than the phonological word in determining the place of high tone. In other words, the phonological word domain does not play any role in explaining the tonal difference in NKK.

5. Discussion

Finally, let me provide a remaining problem in this study. Notice that for some adjoined members consonant initial suffixes have a high tone in the underlying representation, whereas an unaccented stem does not have a high tone in the underlying representation even if it can constitute a prosodic word. We may ask the following question. What is the definition of prosodic word in terms of lexical tone in NKK? Based on the present findings so far, we can suggest that we cannot define prosodic word in terms of the placement of high tone. Rather, determining the placement of high tone in NKK is very much involved with the domain of the phonological phrase in that if there is an underlying high tone in a phonological phrase, it gets a high tone in the surface representation; however, if there is no high tone in the underlying representation, a default tone should be inserted at the final syllable of the whole phrase.

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Chang, Woohyeok

Dankook University
 Department of English
 Anseo-dong, Dongnam-gu, Cheonan-si
 Chungnam 330-714, Korea
 E-mail: woohyeok@dankook.ac.kr

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