Prosodic Minimality and Phonological Rules in Korean

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Lee, Yongsung (1995) Prosodic minimality and phonological rules in Korean. Journal of Language Science 2, 267-283. In this paper, I have applied McCarthy and Prince's (1991) proposal of prosodic minimality to the interface areas of phonology and morphology, and phonology and syntax in Korean. It is argued that there is a fairly strong evidence that the prosodic minimality plays an important role in morphological derivation and in postlexical phonological phenomena in Korean and that the minimal prosodic word can be better captured as a bimoraic foot than as a bisyllabic foot in Korean. It is confirmed that the prosodic minimality works as a rule-blocker as well as a rule-triggerer in word formation processes and in application of lexical and phrasal phonological rules. The examples of i-deletion, postposition deletion, and monomoraic phrase lengthening illustrate the two different roles of prosodic minimality, rule-blocking effect and base augmentation. Thus this paper provides further evidence that the minimality condition may be a universal constraint levied on the morphological and phonological derivation. (Pusan University of Foreign Studies)

1. Introduction

McCarthy and Prince (1986, 1990, 1991), Ito (1990) and others have observed that there is a certain length constraint in stems or words in natural languages. In their proposal, a word or a stem should not be shorter than a specified length. The words or stems which do not violate such minimal length constraint are called "prosodic words." This theory is very interesting in that it can explain unexpected sound changes, or
lack of them, observed in many languages. McCarthy and Prince (1991) noted that the phonological deletion rules may be blocked, if the output results in the violation of the minimality condition of a given language. In other cases, if the result of the phonological derivation falls short of the minimal length of that language, such specific operations as vowel lengthening or vowel insertion take place to make the output conform to the minimality condition. This phenomenon is called "augmentation."

In this paper, I will show that the prosodic minimality also plays an important role in explaining phonological changes in Korean. It will be shown that we can find cases of rule blocking and base augmentation in Korean, which serve to meeting the prosodic minimality condition. First we will begin by defining the prosodic minimality in Korean. It will be shown that the minimal word in Korean is a bimoraic foot. Then we will examine various phonological phenomena such as \-deletion in morphological derivation, postposition deletion and vowel lengthening in monomoraic phrases. It will be argued that the prosodic minimality in Korean is bimoraic and that such minimality is responsible for rule blocking as well as base augmentation.

2. Prosodic minimality

McCarthy and Prince (1991) surveyed various languages and concluded that the minimal length of a prosodic word is a prosodic foot. A prosodic foot is either bisyllabic or bimoraic. There have been suggestions on the minimality condition in Korean. H. Kim (1992) surveyed the Sino-Korean words and argued that the minimal foot is bisyllabic while J. Lee (1991) and Y. Lee (1993) proposed that the minimal length is bimoraic in Korean.

In the majority of cases, the difference between bimoraic and bisyllabic feet is obscured because of the fact that Korean in the majority of cases is considered a quantity insensitive language, i.e., syllable coda consonants in Korean do not contribute to the weight of the syllable. However there are phonological phenomena that seem to suggest that bimoraic foot can better explain the minimal word in Korean. Consider the data given in (1):

(1) Mimetic noun formation

<table>
<thead>
<tr>
<th>Mimetics</th>
<th>Mimetic noun</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. maN - maN</td>
<td>maoNmaoni</td>
<td>'a dog'</td>
</tr>
<tr>
<td>k'ul - k'ul</td>
<td>k'ulk'uri</td>
<td>'a pig'</td>
</tr>
<tr>
<td>b. k'agul - k'agul</td>
<td>k'aguri</td>
<td>'a frog'</td>
</tr>
<tr>
<td>p'ak'uk - p'ak'uk</td>
<td>p'ak'ugi</td>
<td>'a cuckoo'</td>
</tr>
<tr>
<td>c. me:m - me:m</td>
<td>me:mi</td>
<td>'a cicada'</td>
</tr>
<tr>
<td>phe:N - phe:N</td>
<td>phe:Ni</td>
<td>'a top'</td>
</tr>
</tbody>
</table>

In (1), we find that the nouns are formed by adding the mimetic noun suffix /-i/ at the end of the mimetic forms. An interesting observation here is that if the base is monosyllabic and monomoraic, the base is reduplicated before adding the suffix. But if the base is bisyllabic as is the case in (1b), the reduplication is not necessary. These may be explained by setting up either bisyllabic or bimoraic minimal word. However as (1c) shows, there are handful of monosyllabic words that do not undergo reduplication, if the monosyllabic bases contain long vowels. This can only be explained by assuming that the minimal prosodic word is a bimoraic foot. Since the monosyllabic stem is already bimoraic, there is no need to augment the base by reduplication.

(2) Mimetic verb formation

<table>
<thead>
<tr>
<th>Mimetics</th>
<th>Mimetic noun</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. maN-maN + hett'a</td>
<td>*maN + hett'a</td>
<td>'barked'</td>
</tr>
<tr>
<td>k'ul k'ul + hett'a</td>
<td>*k'ul + hett'a</td>
<td>'oinked'</td>
</tr>
<tr>
<td>khuN khuN + hett'a</td>
<td>*khuN + hett'a</td>
<td>'thumped'</td>
</tr>
</tbody>
</table>
We can make a similar observation in the mimetic verb formation given in (2). Again we find that there is a process of reduplication before adding the verb /ha/, ut such process of reduplication is not required if the base contains a long vowel. These examples are left unexplained, if we assume that the minimal prosodic word is a bisyllabic foot, since base vowels in (2b), though they are bimoraic, are still monosyllabic words. Further consider the following examples:

(3) Other morphological processes

a. Hypocoristics Formation (J. Lee (1991))\(^5\)

<table>
<thead>
<tr>
<th>Name</th>
<th>Vocative</th>
<th>Hypocoristic forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>yoNsaN</td>
<td>yoNsaN - a(:)</td>
<td>[sa:Na(:)]</td>
</tr>
<tr>
<td>yujin</td>
<td>yujin - a(:)</td>
<td>[ji:na(:)]</td>
</tr>
<tr>
<td>sunhi</td>
<td>sunhi - ya(:)</td>
<td>[hi:ya(:)]</td>
</tr>
</tbody>
</table>

b. College acronyms

ha'nyaN tehakkyyo ---> [ha'ndae]
wekuka tehakkyyo ---> [we'dae]
toNkuk tehakkyyo ---> [toNdae]
koryo tehakkyyo ---> [ko'dae]

(/tehakkyyo/ means 'university.')

Again in (3a), as J. Lee (1991) suggests, the hypocoristic forms of Korean names are monosyllables, which are lengthened when vocative suffix /-a(:)/ is added. This seems to be another fragmentary evidence that a bimoraic foot, not a bisyllabic foot, constitutes the minimal prosodic word in Korean. Finally in (3b), we observe that the college acronym has a long vowel in the stem regardless whether the base form is long or not. Once we accept that the bimoraic foot is the minimal prosodic word in Korean we can simply formulate the word formation rule as in (4):

(4) Schematic word formation (cf. Íto (1990))

Prosodic Word (PrWd) + suffix (/i/, /a/, /hata/, or /ae/)
Where PrWd \(\geq\) a bimoraic foot

The suffixes have to be added after a prosodic word and the minimal prosodic word in Korean is bimoraic. Therefore the base should be at least bimoraic, and if the base happens to be subminimal (shorter than the minimal prosodic words), the base is augmented by reduplication in ideophones or by vowel lengthening in other cases.

The observations thus far, though admittedly fragmentary, fairly convincingly argue for the bimoraic minimal word for Korean. However we can see that there are problems with this minimality condition because of the presence of such monosyllabic and monomoraic words in Korean as /so/ ('cow'), /mal/ ('horse'), /kæ/ ('dog'), /cuk/ ('soup'), and /nun/ ('eye'). McCarthy and Prince (1991) also make similar observation in the languages they studied, and suggest that there should be a domain where the minimality is satisfied. The recalcitrant problems of monomoraic stems, thus, can be avoided by introducing the concept of derived environment. The main point is that the bimoraic minimality is required only on derived forms and not on underived words in Korean.\(^6\)

In the following sections, the data from various interface areas of phonology with morphology and syntax will be examined to further confirm the importance of bimoraic minimality and prosodic minimality condition in Korean.
3. i-Deletion

In this section, the i-deletion in verb derivation will be examined. This will show that employing prosodic minimality condition can explain some of the exceptional cases of i-deletion rule found in Korean. The verb stem final vowel /i/ is deleted when it is followed by a vowel initial suffix as shown in (5):

(5) Stem final /i/ deletion

null + i [nulli] *[nulli] ‘to be pressed’
tamki + i [tamgi] *[tamgii] ‘to be dipped’
camki + i [camgi] *[camgii] ‘to be locked’

In order to explain the data given in (5), Kim-Renaud (1982: 475) formulated the following rule:

(6) Verb stem final i-deletion

\[ i \rightarrow \emptyset /\_\_\_ & V \]

(The final i of a verb stem is deleted when followed by an affix beginning with a vowel.)

This deletion rule can straightforwardly explain the data given in (5). However we find that the rule does not apply to monomoraic thus monosyllabic words as the data in (7) shows:

(7) Monosyllabic stems and blocking of i-deletion

s’i + i [s’ii] *[si] ‘to be used’
t’i + i [t’ii] *[t’i] ‘to be found’
thi + i [thi] *[thi] ‘to be opened’

Quite unexpectedly, the examples in (7) do not undergo i-deletion rule. Kim-Renaud also observes the deviant behavior of these examples and proposes that these examples be specified for such lexical diacritic mark as [−Verb Stem Final i Deletion]. Sohn (1987: 132-133) also supports Kim-Renaud’s treatment of the exceptional cases by noting that there are just four monomoraic stems that end in /i/ in Korean.

However, it is important to note the generalization that all the monomoraic stems that end in /i/, though there are only four of them, behave uniformly without exception: they do not allow the application of the deletion rule given in (6). We cannot simply say that they are exceptions. Further if bimoraic suffixes or two or more suffixes are added to these monosyllabic stems, we find that the i-deletion applies even to the monosyllabic stems as shown in (8):

(8) Further data

s’i + ato [s’odo] ‘though ... write’
s’i + i + u [s’iu] ‘to let ... be covered’
t’i + i + u [t’iu] ‘to let ... be floated’
thi + i + u [thi] ‘to let ... be opened’

Given the examples in (8), the proposal to specify a diacritic mark to the monomoraic stems in the lexicon does not hold. As can be seen in (8), the exceptional /i/ final verbs can undergo i-deletion rule, if two or more moras are added in the course of morphological derivation. The observation is clear here: the monomoraic stems do not undergo the deletion rule if the output of i-deletion rule is subminimal, i.e., smaller than the minimal prosodic word. By definition, adding affixes creates a derived environment and there is a minimality condition on the derived words as schematized in (9):
(9) Minimality on the derived words

Derived word = PrWd ≥ a bimoraic foot

With (9), the explanation is straightforward: if the derived form is less than the minimal length, the prosodic minimality condition on the derived words blocks the rule application. If the output is not subminimal, the deletion rules will apply. Therefore, even the monomoraic verbs undergo i-deletion rule, if more than two moras are added by affixation processes.

Seen from this point, we can see that it is not the stem-specific idiosyncracy but the general constraint on the minimal length that is responsible for the non-application of the proposed i-deletion rule. Here we can clearly see the active role of rule blocking by the minimality condition on the phonological derivation.

4. Postposition Deletion

In this section, we will observe another phenomenon, the postposition deletion, found in Korean. Consider the following data:

(10) Postposition deletion in Korean

a. Object + Verb

\begin{align*}
\text{cip} & \quad \text{phanta} / \text{cibil phanta} \\
\text{house-OM sel-pres-dec} & \quad \text{‘to sell a house’} \\
\text{day-sleep /sleep sleep-pres-dec.} & \\
\end{align*}

b. Adverbial phrase

\begin{align*}
\text{cip} & \quad \text{e sa-n-ta} \\
\text{house-Loc live-pres-dec} & \\
\text{twit - san} & \\
\text{rear - Mt / Mt. go-pres-dec} & \\
\end{align*}

(10a) shows that the object case marker can be freely deleted from the noun phrases they are attached to. However in adverbial phrases, the deletion may not take place if the noun phrase is monomoraic. In order to explain the differences between verb phrases and adverbial phrases with respect to phrasing, we introduce the postlexical phrase domain formation. I adopt Selkirk’s (1986) phrasing algorithm given in (11):

(11) Selkirk’s Edge based phrasing Parameter

a. $a[ ... , where ... contains no $a$

b. $... ]a$, where $... contains no ]a$

The domain relevant to the present discussion is a phonological phrase (thus a corresponds to Xmax category in syntactic structure). Further out of the two parameters presented in (11), the Korean language makes use of (11a), the left edge parameter. If we follow these assumptions, we find that the very beginning of a syntactic phrase coincides with the beginning of a phonological phrase. With (11a), the differences between (10a) and (10b) can be shown as in (12):

(12) Edge based phrasing of (10a) and (10b)

\begin{align*}
\text{a. Object + Verb} \\
\text{b. Adverbial Phrase + Verb} \\
\end{align*}

(The parentheses represent phonological phrases.)
Now we can see the difference in phrasing of NP-V and PP-VP sequences. The major difference is that the NP in VP does not constitute its own phrase domain since NP is the sister node of the lexical category V. However in an adverbial phrase-verb sequence, we note that the PP, which dominates NP, forms a phonological phrase on its, since a new syntactic phrase VP begins immediately after it. I will take the phonological phrase as a derived domain and propose the following minimality condition:

(3) Minimality on the phonological phrase

Phonological phrase = PrWd ≥ a bimoraic foot

With the prosodic minimality given in (13), we go back to the data given in (10). It is shown that NP-V forms one phonological phrase. Therefore, in the examples given in (10a), the deletion of postposition does not make the phrase subminimal, thanks to the presence of a lexical item under V-node. However in the case of (10b), as illustrated in (12b), NP-P makes one phonological phrase. In this case if the NP has monomoraic noun, the deletion of postposition will make the whole phrase subminimal. Thus I argue that the minimality condition on the phonological phrase has the blocking effect of the postposition deletion rule. Here again we see that there is no consistent explanation of the deviant behavior of the prepositions in the adverbial phrase with respect to the deletion rule without incorporating the prosodic minimality in the theoretical framework.

5. Lengthening of Monomoraic Phrase

So far we have seen how the prosodic minimality blocks the application of the deletion rule in Korean. In this section, I will examine the case of augmentation of subminimal phrase found in Korean. Consider the examples in (14):

(14) Subminimal noun phrase

a. [[na]NP [ka - n - ta]VP]S
   I go-pres-dec
   (na) (kanta)
   'I am going.'

b. [[na]NP [calhæ - as' - ta]VP]S
   you bow - past-dec
   (naganda)
   'you bowed.'

In the examples given in (14) we find that the sentences in (14a) have noun phrases that have one monomoraic noun. In (14b), the minimal pairs of the (14a) examples are given. These sentences have the same phonetic materials as the sentences given in (14a), but they are parsed differently. Again following the phrasing algorithm in line with Selkirk (1986) we see that the phrasing differences as shown in (15) illustrated with the first sentences in (14a) and (14b):

(15) End based phrasing in Korean

a. 

b. 

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(15) End based phrasing in Korean

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(15) End based phrasing in Korean

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(15) End based phrasing in Korean

a. 

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(15) End based phrasing in Korean

a. 

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It is clearly shown in (14) that the monomoraic noun constitutes the subject noun phrase. But being monomoraic, the noun phrases in (14a) are subminimal. The prosodic minimality condition levied upon phonological phrases as given in (13), this time, triggers the lengthening of the stem vowel. It should be noted that we cannot say that the lengthening is not due to the effect of the presence of a boundary. Consider the sentences given in (16):

(16) Non-subminimal noun phrase

a. [[yumi]NP[ka - n - ta]VP]S
   Yumi  go-pres-dec
   (yumi/ℓyumi:) (kanta)
   ‘Yumi is going.’

b. [[[yumi]NP[calha - as' - ta]VP]S
   Yumi  bow - past-dec
   (yumi/ℓyumi:) (calhætt’a)
   ‘Yumi bowed.’

If the lengthening in the examples in (14a) is triggered by the presence of a phrasal boundary, we would expect that the final syllable of any subject noun phrase should be lengthened. However the data given in (16) clearly show that that is not the case. If the boundary lengthening is responsible for the lengthening effect in (14a), we would expect the same kind of lengthening effect in sentences in (16) as well. With these observation consider the further data of monomoraic stem lengthening given in (17):

(17) Subminimal adverbial phrase

a. [[caI]AdvP[a - n - ta]V]VP
   well  know-pres-dec
   [[cham]AdvP [sənhta]VP
   very      good-natured
   (caI) (anda)
   ‘SB knows ST well.’
   (cha:m) (sanhada)
   ‘very good-natured’

b. [cal - n - ta]V
   grow-pres-dec
   (caranda)
   ‘ST is growing.’

Here again we find that the monomoraic adverbs are lengthened when they are the only members of the phrase. The same explanation given for the data in (14) can effectively account for the differences between sentences in (17a) and (17b): if a phonological phrase consists of a monomoraic word, the base is augmented to satisfy the minimality condition.11

Additional observation we can make in this section is that if we assume that the minimal prosodic word is a bisyllabic foot, we are left without any consistent explanation for the examples given in (14) and (17). Note that the result of the base augmentation is still monosyllable, though it has a long vowel. Therefore this may be ruled out as ill-formed by the minimality condition with the specified bisyllabic foot template. As such, this section not only argues for the importance of the prosodic minimality condition in Korean but also for the bimoraic foot, not the bisyllabic foot, as a minimal prosodic word.

6. Conclusion

In this paper, the phonological phenomena that bear relationship to prosodic minimality is discussed in connection with the interface areas of phonology and morphology, and phonology and syntax in Korean. The prosodic minimality as proposed by McCarthy and Prince (1991) imposes certain length, usually bimoraic as represented by foot binarity, on the underlying representation and/or on the output forms of phonological operation. It is argued that the prosodic minimality constraint can effectively explain morphological derivations and
postlexical phonological phenomena. The minimal length as required by Korean phonology and morphology was proven to be bimoraic foot. And it was shown that the assumption on minimality constraint in Korean can deal with unexpected rule application or rule blocking in Korean phonology.

In lexical derivation, reduplication applies only when the stem does not satisfy the minimal length of a word. This constitutes the case of augmentation triggered by the prosodic minimality constraint. In verbal conjugation, /i/ deletes only when the output form does not violate the minimality constraint. In postlexical phonology, postposition deletion and monomoraic phrase lengthening were considered. An objective marker in verb phrase can freely deletes since [V + NP] forms a verb phrase and thus it is always longer than bimoraic (we need at least two words, verb and a noun, thus it cannot be less than bimoraic). But the phrasing algorithm assigns phrasal status to adverbial phrases. Thus an adverbial phrase can be smaller than bimoraic if the postposition deletes. And this is when we see that the postpositions do not delete. In addition we find that monomoraic subject phrase is lengthened to meet the prosodic minimality requirement.

These clearly shows that minimality constraint can sometimes trigger rule application or block it. Thus this paper provides strong evidence that prosodic minimality is one of the important phonological constraints in Korean and that the minimality condition may be universal, which is operative in derivative processes in morphology and phonology of natural languages.

Notes

1) Contrary to the assumption made here, J. Lee (1992) suggested that some coda consonants found in sound symbolic words are moraic. See also Kang (1992) for the moraic status of [-continuant] segment in Korean. Jun (1992) and others argue that the aspirated and tensed consonants are moraic.

2) [N] represents a velar nasal.

3) I limit the discussion to the phonological shape of the words. Possibly, semantic consideration comes into discussion. The repetitive action is realized as duplicated forms while a single movement or sound does not need reduplication. As shown in 'kakuli,' however, not all the repetitive action is realized in reduplicative forms. ('kakulkakuri' is ill-formed.) Therefore we can safely assume that we may analyze the data without referring to semantic consideration.

4) The past form, /hett’a/, of the verb /hata/ is used to make the examples sound more familiar to the native speakers of Korean.

5) In the third example given here, [y] is inserted between two vowels presumably to avoid cowl clashes.

6) I follow Ito (1990) suggestion that the minimality condition operates only on derived words in Japanese. It would also be noted that the minimality condition may be operative in the lexical derivation but suppressed in the post-lexical level as is the case in Rotuman or Classical Arabic as reported by McCarthy and Prince (1991).

7) In Y. Lee (1993), these exceptional cases are explained as a case of augmentation, not blocking, with the assumption that verb stem final /i/ is
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non-moraic in the underlying representation.

8) There are other suggestions about the parsing algorithm such as direct syntactic approach proposed by Kaisse (1985), or relational approach by Nespor and Vogel (1986) and Cho (1990). The detailed differences between these proposals do not concern us here. I adopt Selkirk's edge-based phrasing algorithm simply because it is the simplest.

9) Another difference between (10a) and (10b) is that the postposition in (10a), the objective marker, can be absent in the underlying representation according to some version of syntactic theory, and assigned structurally in the course of derivation. The proposition in (10b), however, being the head of the adverbial phrase should be present underlyingly. (cf. note (9))

10) Note that I assume that subject and object case markers are assigned structurally. Therefore these markers should not be present in the underlying representation.

11) It should be noted that in fast or casual speech, we may not find the lengthening effect of the phrasing. The non-branching phonological phrase, as proposed by Cho (1990) may be incorporated into the adjacent phonological phrase in fast speech.

References


