An Optimality-Theoretic Approach to Full Reduplication in Korean*

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Chung, Chin-Wan. 2003. An Optimality-Theoretic Approach to Full Reduplication in Korean. *The Linguistic Association of Korea Journal, 11*(2), 109-133. This paper sheds light on full reduplication in Korean, especially focusing on non-ideophonic words. We provide an analysis based on Optimality Theory (Prince and Smolensky 1993). The analysis offered in this paper represents a different view of Korean full reduplication, which has been argued as being a type of suffixing affixation (Y. Kim 1984 and J. Kim 1992). This paper, however, uses a prefixing analysis in order to offer a comprehensive analysis for both native Korean and Sino-Korean words. The major argument for using the prefixing analysis comes from a case of overapplication occurring in disyllabic bases of Sino-Korean words. In terms of the suffixing view, it is difficult to prevent bi-directional nasal feature back-copying from the reduplicant to the base, and vice versa, from occurring in overapplication. But from a prefixing perspective, the nasal feature copying can be explained with reference to the constraint ranking schema in terms of the normal application of relevant constraints.

Key Words: reduplication, optimality theory, correspondence theory, reduplicant, base, constraints, ranking, overapplication.

1. Introduction

The main purpose of this paper is to provide an alternative analysis of full reduplication of non-ideophonic words (prosaic words) in Korean within the framework of Correspondence Theory (McCarthy and Prince

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(henceforth M&P) 1995), which is also placed within Optimality Theory (Prince and Smolensky 1993b).[1] Only a few that have been done on Korean full reduplication have generally argued that full reduplication of non-ideophonic words in Korea is a case of suffixing reduplication (Y. Kim 1984 and J. Kim 1992). In this process, the whole base is duplicated and the copied part is affixed rightward. However, this paper argues instead that full reduplication of non-ideophonic words in Korean can best be represented as prefixing reduplication, if we want to analyze both native Korean (NK) prosaic words and Sino-Korean (SK) words in a uniform manner.

In fact, we could account for Korean full reduplication either as prefixation or as suffixation if we consider full reduplication in NK words alone. However, if we take into account the data for SK disyllabic full reduplication, it is clear that SK full reduplication is prefixing rather than suffixing. In addition to this, SK full reduplication shows an interesting case of overapplication, in which the nasal feature of the base is copied back onto the reduplicant, even without any appropriate triggering environment for such nasal feature copying.

The organization of this paper is as follows. In section 2, we will briefly introduce reduplication in the correspondence theoretic model using basic theoretical principles. In section 3, we will present the data for full reduplication of non-ideophonic words in Korean, which are divided into two groups, NK words and SK words. In section 4, we will present the prefixing analysis of Korean full reduplication while pointing out the problems of a suffixing analysis. The conclusion will address the possible implications of the present study.

2. Reduplication in Correspondence Theory

Reduplication is a morphological process whereby a part of or the whole source (base) is copied (reduplicant). The former is referred to as

1) There have been relatively more studies on full reduplication in ideophones in Korean (Y. Kim 1984, J. Kim 1992, H. Kim. 1994, I. Kim 1995, Chung 1999) in comparison with those on full reduplication in non-ideophonic words.

partial reduplication, and the latter as total or full reduplication. The two types of reduplication are schematically illustrated in (1).

(1) a. Partial reduplication: $C_1V_1C_2V_2C_3$ → $\underline{C_1V_1}$-$C_1V_1C_2V_2C_3$
b. Full reduplication: $C_1V_1C_2V_2C_3$ → $\underline{C_1V_1C_2V_2C_3}$-$C_1V_1C_2V_2C_3$

Reduplication is very well represented in Optimality Theory (Prince and Smolensky 1993), especially in the more refined version of it termed Correspondence Theory (M&P 1995). Correspondence Theory is built upon the basic principles of Optimality Theory requiring that there are universal constraints, and each grammar consists of a ranking of those universal constraints. Constraints are violable, and constraints are ranked so that an optimal form fares better than any other candidate with the constraints. A form that satisfies all low-ranking constraints but violates the high-ranking constraints will not be selected as the optimal form, because the violation of the high ranking constraints is considered critical. In addition to these factors, correspondence theory further introduces a notion of one-to-one correspondence relation; it is evaluated by checking corresponding elements. The one-to-one correspondence relation is defined in (2).

(2) Correspondence (M&P 1995)
Given two strings S_1 and S_2, correspondence is a relation $\mathcal{R}$ from the elements of S_1 to those S_2. Elements $\alpha \in S_1$, and $\beta \in S_2$ are referred to as correspondence of one another when $\alpha \mathcal{R} \beta$.

The correspondence relation is not uni-dimensional; rather, it is multi-dimensional, which means there are one-to-one matches between the base and the reduplicant, and between the input and the output. Therefore, we have to monitor all possible corresponding relations simultaneously. The possible corresponding relations in correspondence theory are graphically illustrated in the basic model of reduplication as in (3).

(3) Basic Model (M&P 1995)

Input: /Af_{RED} + Stem/
⇅ I-O Faithfulness
Output: R ⇆ B
B-R Identity

Because every aspect of Correspondence Theory is regulated by constraint ranking, in terms of this theory, full reduplication occurs when the faithfulness constraint such as Max is undominated. On the other hand, partial reduplication results if the Max constraint is forcibly violated due to a higher ranking phonological constraint such as NoCoda. The two basic faithfulness and markedness constraints are explained in (4).

(4) a. Max: Every segment of the input or the base has a correspondent in the output or the reduplicant.
b. NoCoda: Syllables are open.

Thus, partial and full reduplication are the consequence of interaction of those conflicting constraints given in (4). Before an analysis of Korean full reduplication is provided, the data of non-ideophonic words (prosaic words) will be presented and described in the next section.

3. Data and description

The data for full reduplication in Korean non-ideophonic words are divided into two groups: NK words and SK words. The data for full reduplication in NK words are presented in (5). These data are drawn from I. Kim (1984), J. Kim (1992), and Kim et al. (1997). In (5), the reduplicant is underlined and boldfaced.

(5) Full reduplication in non-ideophonic NK words

Base	*Reduplication*	*Gloss*
a. sæ	**sæ**-sæ	'spaces'
b. cip	**cip**-c'ip	'each house'
c. kyəp	**kyəp**-k'yəp	'multiple folds'
d. koɨl	**koɨl**-koɨl	'each village'
e. kolmok	**kolmok**-k'olmok	'each alley'
f. kaci	**kaci**-kaci	'various kinds of'
g. kəli	**kəri**-kəri	'each street'
h. $c^hac^hɨm$	**$c^hac^hɨm$**-$c^hac^hɨm$	'little by little'
i. kupi	**kupi**-kupi	'at every bend'
j. nal	**na**-nal (i)	'everyday'
k. tal	**ta**-tal (i)	'every month'

Full reduplication in non-ideophonic NK words duplicates all the base elements, including any feature of the base consonants, and the reduplicant is affixed leftward. When a plain obstruent in the base is preceded by another obstruent as a result of prefixation, the second obstruent undergoes tensification, as seen in (5c) and (5e). It should be noted that the data in (5j) and (5k) show some different segmental copy from the rest of the data since the base segment /l/ does not appear in the reduplicant.[2] This is explained in section 4.1. In this type of

2) An anonymous reviewer pointed out that the data in (5j) and (5k) are a case of partial reduplication. And the reviewer also argued that this paper did not include full reduplication data such as [**col**-col] and [**sol**-sol].

With respect to the first issue, we regard (5j) and (5k) as examples of full reduplication based on two reasons. First, partial reduplication generally occurs when Max is forcibly violated by a high-ranking phono-constraint. A constraint that triggers the partial reduplication is generally invisible in a language, but it plays an important role in reduplication by restricting the reduplicant to a certain shape. This is a typical example of the Emergence of the Unmarked (M&P 1994). In Korean phonology, however, the *lC constraint is undominated. So in

reduplication, when the base word is copied, the duplicated word has the semantic connotation of plurality or emphasis of the base. For example, when the base word /kyəp/ is fully reduplicated, the output form [**kyəp**-k′yəp] means 'multiple folds'.

The data for SK word full reduplication are grouped into two sets based on the number of syllables in the base. The main reason for this is that while the data consisting of monosyllabic bases exhibit the same reduplication pattern observed in NK words, the data with disyllabic bases display a distinct pattern of reduplication. The data for monosyllabic SK word full reduplication are presented in (6). The reduplicant is indicated by boldface type and underlining.

(6) Monosyllabic bases for SK word full reduplication

a. kak	**kak**-k′ak	'each and every'
b. pʰæ	**pʰæ**-pʰæ	'each group'
c. caŋ	**caŋ**-caŋ	'each chapter'
d. cʰiŋ	**cʰiŋ**-cʰiŋ	'many layers'
e. s′aŋ	**s′aŋ**-s′aŋ	'each pair'

As seen in (6), all the base segments of the monosyllabic SK words are

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(5j) and (5k), all the segments are copied like the typical full reduplication, but because of the undominated *lC constraint, the lateral [l] does not appear in the reduplicant. If the reviewer were to consider it to be a partial reduplication, it is then a case of the Emergence of the Unmarked, which is triggered by the undominated constraint. This would be an unusual case of TETU.

Second, in terms of the semantic meanings between the base and the reduplicated output form, the examples in (5j) and (5k) still maintain the similar meanings observed in other full reduplication data. If it were treated as partial reduplication, there should be a different semantic meaning pattern apart from the semantic connotation pattern in full reduplication.

Concerning the second issue, in this paper, we only consider non-ideophonic words (or prosaic words) in Korean. We regard [col-col] and [sol-sol] as ideophones, which show different phonological and morphological behaviors from non-ideophonic words in Korean. Thus, [col-col] and [sol-sol], which seemingly pose a problem for this paper, are not relevant.

copied and the reduplicant is placed at the left edge of the base. As in NK word full reduplication, output forms of SK full reduplication also carry plural or emphatic meanings of the base words. For example, the base /s′aŋ/ is duplicated, and the resulting form [**s′aŋ**-s′aŋ] denotes 'each pair'.

Now we will have a closer look at the disyllabic bases and their reduplication pattern in SK words. The data are provided in (7).

(7) Disyllabic bases for full reduplication in SK words[3)]

a. kikwe	**ki**-ki **kwe**-kwe	'very strange'
b. cason	**ca**-ca **son**-son	'generation after generation'
c. sipi	**si**-si **pi**-pi	'right and wrong'
d. kucəl	**ku**-ku **cəl**-cəl	'every phrase and sentence'
e. sikak	**si**-si **kak**-k′ak	'hourly'
f. hilak	**hi**-hi **naŋ**-nak	'rejoicing'
g. yulak	**yu**-yu **naŋ**-nak	'quite willingly'
h. ulyaŋ	**u**-u **yaŋ**-nyaŋ	'very lonely'
i. lwelak	**nwe**-rwe **naŋ**-nak	'broad-minded'

The disyllabic bases shown in (7) undergo a different reduplication pattern than monosyllabic bases. They undergo consecutive reduplication in which each syllable in the base serves as the independent base of the reduplicant, and the reduplicant is also attached at the left edge of the base respectively. An interesting observation can be made about the data in (7f), (7g), and (7i): without any reasons, the reduplicant [l] changes to [n] in the output. This phenomenon will be explained in the

3) The data presented in (7d) and (7e) also can undergo normal full reduplication in which the entire input serving as a base is copied and the reduplicant is affixed at the left edge of the base. This is shown by the following data.

(i) kucəl → **kucəl**-kucəl 'every phrase and sentence'
(ii) sikak → **sikak**-s′ikak 'hourly'

next section. Despite the fact that monosyllabic and disyllabic bases experience a slightly different reduplication pattern, the reduplicated forms of both types of bases retain the semantic meaning of the bases. That is, the reduplicated forms superimpose the semantic connotation of plurality, intensity, or emphasis on the original meaning of the bases. In the next section, Korean full reduplication will be analyzed in terms of correspondence theory.

4. Analysis

In this section, the full reduplication in NK words as prefixation will be analyzed. There have been no convincing arguments presented for suffixation as opposed to prefixation. Therefore, it is possible to analyze monosyllabic bases of both NK and SK full reduplication either as a type of prefixation or suffixation. However, valid arguments for a prefixing analysis will be provided in the discussion of SK full reduplication with disyllabic bases in subsection 4.2

4.1 NK word full reduplication

As already explained in section 2, full reduplication occurs when every segment in the base is copied, and the reduplicant is affixed at either the left or right edge of the base. From the optimality-theoretic perspective, such reduplication results when the constraint Max, which is subdivided into Max-IO and Max-BR, ranks very high, consequently maintaining perfect segmental correspondence between the input and the output, and between the base and the reduplicant. The two faithfulness constraints are presented in (8).

(8) Faithfulness constraints (M&P 1995)
   a. Max-IO: Every segment of the input has a correspondent in the output.
   b. Max-BR: Every segment in the base has a correspondent in the reduplicant.

Max-IO and Max-BR militate against any deletion of corresponding segments between the input and the output, and between the base and the reduplicant. They are highly ranked and are also equally ranked in NK word full reduplication.

There is another high-ranking constraint for NK full reduplication that allows tensification of the second obstruent over a syllable boundary. This is a well-known process in Korean phonology. Tensification can be seen in (5b), (5c), and (5e). The Tensification constraint must be ranked higher than Ident-BR (Laryngeal) because it interrupts the perfect featural identity in terms of laryngeal feature between the base and the reduplicant. The two constraints are presented in (9).

(9) a. Tensification: In C_1&C_2 (where C is an obstruent), the second C should be tensified.
b. Ident-BR (Laryngeal): The laryngeal feature (tense or aspiration) is identical in the base and the reduplicant.

The faithfulness constraints in (8) do not have any specific ranking in relation to Tensification and Ident-BR (Laryn). However, since Tensification dominates Ident-BR (Laryn), we rank Max-IO and Max-BR over Ident-BR (Laryn) for the analysis. The ranking relation between the four constraints in (8) and (9) is illustrated in (10).

(10) kolmok → **kolmok**-k'olmok 'each alley'

/RED+kolmok/	Max-IO	Max-BR	Tens	Ident-BR (Lar)
a. **kolmo**-k'olmo	*!			*
b. **kolmo**-kolmok		*!		
c. **kolmok**-kolmok			*!	
d. ☞ **kolmok**-k'olmok				*

Candidates (a), (b), and (c) are not the optimal output forms since they violate the high-ranking Max-IO, Max-BR, and Tensification, respectively. The fact that all three constraints rank higher than Ident-BR (Laryn) indicates that each candidate has a crucial violation, which is indicated by an exclamation mark. Thus, the optimal candidate is (d) which satisfies all three high-ranking constraints, and violates only one low-ranking Ident-BR (Laryn). The optimal candidate is designated by the pointing finger. In the table, unestablished ranking relations are represented by the dotted lines while the clear ranking relation is signaled by the solid line. The constraints that do not play a crucial role in selecting the optimal form are indicated by shaded cells. The constraint ranking revealed in (10) is shown in (11).

(11) Max-IO, Max-BR, Tensification >> Ident-BR (Laryn)

Concerning the direction of the affixation of the reduplicant, the alignment constraint (M&P 1993a) ensures the position of the reduplicant at the left edge of the base. The relevant alignment constraint is given in (12).

(12) Align (RED, R, Stem, L): Align-RED
Align the right edge of the reduplicant with the left edge of the stem.

The constraint table in (13) illustrates the proper locus and the prefixing affixation of the reduplicant in NK word full reduplication.

(13) kaci → **kaci**-kaci 'various kinds of'

/RED+kaci/	Align-RED
a. ☞ **kaci**-kaci	
b. kaci-**kaci**	*!

Candidate (a) represents prefixing reduplication while (b) indicates suffixing reduplication. Since Align-RED requires prefixation, candidate (b) fatally violates the constraint. Thus, candidate (a) emerges as the optimal output form. This study ranks the alignment constraint in (12) high because it should not be violated at all in the full reduplication of non-ideophonic words in Korean. Although the alignment constraint and the other constraints in (11) do not show any particular ranking conflict, we rank the alignment constraint high together with faithfulness constraints and Tensification since they are nearly undominated. Since this is the case, we will combine those constraints into one. The combined constraint ranking is shown in (14).

(14) Align-RED, Max-IO, Max-BR, Tensification >> Ident-BR (Laryn)

The combined constraint ranking can account for most of the data given in (5). However, this ranking constraint is unable to select the optimal output form for the data in (5j) and (5k). For example, the combined ranking in (14) would select [**nal**-nal] as the optimal output for the base word /nal/, but this output is not correct because of the highly prohibited /ln/ and /nl/ sequences over a syllable boundary. There are two ways to circumvent these banned sequences in Korean. One way is through lateralization in which the coronal nasal becomes /l/, resulting in [ll] as seen in (15).

(15) Lateralization (Kim-Renaud 1974/91)

a. cənla	cəlla	'name of a province'
b. c^{h}ənli	c^{h}əlli	'a thousand li (about 400km)'
c. k^{h}alnal	k^{h}allal	'the blade of a knife'
d. pulnæ	pullæ	'smell of grass'

The other way is to delete /l/ before coronal consonants /n, t, s, c/, as shown by the examples in (16)-(19).

(16) /l/ deletion in Korean: /ln/ → [n]

a. pədɨlnamu	pədɨnamu	'a willow'
b. t'alnim	t'anim	'a daughter'

(17) /lt/ → [t]

a. c^haltol	c^hatol	'quartz'
b. yəltaci	yətaci	'opening and shutting'

(18) /ls/ → [s]

a. malso	maso	'horses and catttle'
b. pulson	puson	'a small fire shovel'

(19) /lc/ → [c]

a. panɨlcil	panɨcil	'sewing'
b. s'alcən	s'acən	'a rice store'

The examples in (5j) and (5k) do not undergo lateralization. Instead, they undergo the deletion of /l/ before the coronal consonants illustrated in (16) through (19). Two relevant constraints explain the /l/ deletion in Korean. One constraint prohibits the lateralization of coronals from occurring in the base. The other requires the deletion of /l/ before coronal consonants. These two constraints are shown in (20).

(20) Constraint for the prohibition of /l/+coronal consonants

a. Ident-σ_1 BR (manner): The manner feature of the first syllable of the base is identical with its correspondent in the reduplicant.

b. *lC: The lateral /l/ is not allowed before coronal consonants /n, t, s, c/.

The constraints in (20) are not in conflict with each other, and they do not reflect any ranking relation with Tensification either. However, these two constraints should dominate the faithfulness constraint Max-BR because the lateral /l/ is deleted before /n/ over a syllable boundary breaching Max-BR. This study ranks Max-BR lower than the constraints in (20) but ranks Max-IO higher than Max-BR to eliminate a form where the input is truncated to conform to the shape of the reduplicant.[4] This constraint relation is illustrated in (21).

(21) nal → **na**-nal 'everyday'

/RED+nal/	Ident-σ$_1$ BR (Man)	*lC	Max-IO	Max-BR
a. **nal**-nal		*!		
b. **nal**-lal	*!			
c. ☞ **na**-nal				*
d. **na**-na			*!	

Candidate (a), [**nal**-nal], is eliminated due to the violation of high-ranking *lC. Candidate (b), [**nal**-lal], undergoes lateralization to avoid violating *lC but still loses to (c) because of the violation of Ident-σ$_1$ BR (Man). Candidate (d) also loses to (c) since a segment in the input is deleted to conform to the reduplicant, violating Max-IO. Thus, by ranking Ident-σ$_1$ BR (Man), *lC, and Max-IO over Max-BR, (c) is selected as the optimal output form, which undergoes the /l/ deletion before a coronal consonant /n/. The constraint ranking reflected in (21) is shown in (22).

(22) Ident-σ$_1$ BR (Man), *lC, Max-IO >> Max-BR

The constraint ranking in (22) also can explain the other examples in (5) that begin and end with an obstruent consonant. If the constraint ranking in (22) is applied to these examples, the constraints such as

4) I thank the anonymous reviewer for pointing out this.

Ident-σ_1 BR (Man) and *lC will be satisfied trivially as exemplified in (23).

(23) kyəp → **kyəp**-k′yəp 'multiple folds'

/RED+kyəp/	Tens	Ident-σ_1 BR (Man)	*lC	Max-BR	Ident-BR (Lar)
a. **kyəp**-kyəp	*!				
b. **kyəp**-k′yə				*!	*
c. ☞ **kyəp**-k′yəp					*

As seen in (23), Ident-σ_1 BR (Man) and *lC are satisfied trivially. These are two faithfulness constraints that are not ranked in relation to Tensification. In this analysis, Tensification is ranked higher than Max-BR because Tensification is undominated in Korean phonology. Several constraint tables, each with specific ranking have been provided. However, all the constraints introduced so far can be combined into one ranking which can account for all the examples in (5). The overall constraint ranking for the monosyllabic bases of NK full reduplication is presented in (24).

(24) The overall constraint ranking for NK full reduplication
Ident-σ_1 BR (Man), *lC, Tensification, Align-RED, Max-IO >> Max-BR >> Ident-BR (Laryn)

In the next subsection, full reduplication in SK disyllabic words will be explored with reference to inadequate aspects of suffixing analysis.

4.2 SK word full reduplication

As was explained in section 3, full reduplication in SK words shows a distinct pattern of reduplication than that observed in NK word full reduplication: A disyllabic word undergoes a consecutive type of full

reduplication, while a monosyllabic base word undergoes the normal full reduplication in which the whole base is copied and the reduplicant is affixed leftward. Because monosyllabic bases undergo the normal full reduplication, this analysis will employ the same constraints apart from those in (20) presented in the previous subsection, and the combined ranking that was used for full reduplication in NK words, and one additional constraint will be introduced. The constraints are repeated in (25) together with the newly introduced one (25a).

(25) Constraints for full reduplication of SK words with monosyllabic bases
   a. Afx≤σ: The phonological exponent of an affix is no larger than a syllable.
   b. Max-IO: Every segment of the input has a correspondent in the output.
   c. Max-BR: Every segment in the base has a correspondent in the reduplicant.
   d. Tensification: In C_1&C_2 (where C is an obstruent), the second C should be tensified.
   e. Ident-BR (Laryngeal): The laryngeal feature (tense or aspiration) is identical in the base and the reduplicant.
   f. Align (RED, R, Stem, L): The right edge of the reduplicant is aligned with the left edge of the stem.

Constraint (25a) is used to limit the size of the reduplicant to only one syllable. This is undominated in SK full reduplication. Tensification and Align-RED are also undominated in SK full redupulication. The crucial ranking relation is that at least Ident-BR (Laryn) should be dominated by all the constraints in (25). The reason is that perfect copying is interrupted when a base begins and ends with an obstruent, as in the NK examples (5b), (5c), and (5e), and the same effect applies to the SK examples. The constraint ranking proposed in NK full reduplication, together with the undominated Afx≤σ, can account for all the monosyllabic SK examples. This is illustrated in (26). In this table,

some of the constraints are not included.

(26) kak → **kak**-k′ak 'each and every'

/RED+kak/	Align-RED	Tense	Max-IO	Ident-BR (Laryn)
a. **kak**-k′a			*!	*
b. **kak**-kak		*!		
c. kak-**k′ak**	*!			
d. ☞ **kak**-k′ak				*

The optimal output form (d) satisfies all the high-ranking constraints, violating only the low-ranking Ident-BR (Laryn). The other candidates violate high-ranking Max-IO, Tensification, and Align-RED respectively, which, as a result, loses to candidate (d). The constraint ranking relations observed in (26) are shown in (27).

(27) Afx≤σ, Tensification, Align-RED, Max-IO >> Max-BR >> Ident-BR (Laryn)

The constraint ranking established for monosyllabic bases in SK full reduplication can also be applied to bases with two syllables. The application of this ranking can account for most of the examples given in (7). One of those examples is illustrated in (28).

(28) sikak → **si**-si **kak**-k′ak 'hourly'

/RED+sikak/	Afx≤σ	Tense	Align-RED	Max-BR	Ident-BR (Lar)
a. **sikak**-sikak	*!	*!			
b. **kak**-s′ikak				*!*	
c.☞ **si**-si **kak**-k′ak					*

The vital assumption that has to be made for SK full reduplication with regard to disyllabic bases is that each syllable of the input is regarded as the independent base for the reduplicant. Since this is the case, (a) violates Afx≤σ because the reduplicant consists of two syllables. Example (b) is not the optimal form because it violates Max-BR. Thus, (c) emerges as the optimal form. The only way to satisfy Afx≤σ, Align-RED, and other relevant constraints is to reduplicate each syllable of the base separately and affix the reduplicant consecutively. Thus, we can extend the constraint ranking used for full reduplication with monosyllabic bases to disyllabic bases. That each syllable serves as the separate base reflects the fact that each syllable in SK comprises a morpheme in the base.

However, a problem arises if we apply this ranking to the examples in (7f), (7g), and (7i) because the given constraint ranking cannot select the correct optimal form. For example, if the base word /hilak/ is fully reduplicated, the expected output form is [**hi**-hi **lak**-lak] 'rejoicing', but this is not the correct output form. The correct output form is [**hi**-hi **naŋ**-nak]. Thus, the proposed constraint ranking cannot select the optimal form given the changes that the actual output form undergoes. Therefore, we need to consider other constraints to account for the problematic data.

The examples in (7f), (7g), and (7i) undergo several interesting process in Korean phonology and reduplication in general.[5)]

5) There is another possible way of analyzing SK full reduplication (p.c. Davis). If we adopt Ahn's (1998) view of so-called 'Double Reduplication', each syllable in the input is considered as an independent base, each undergoes independent normal prefixing full reduplication, and each reduplication process is regarded as a separate prosodic word (cf. Kitagawa 1987). This is represented as follows:

[(hi-hi)ω (lak-lak)ω] → [(**hi**-hi)ω (**naŋ**-nak)ω]: Double Reduplication

Then, there will be no overapplication of nasal feature copying onto the reduplicant from the base because the lateral /l/ of the input is in the initial position of the second prosodic word. Consequently, it changes into [n] not because of the nasal feature copying from the base, but because of the prosodic word initial position. The problem of this analysis is that if there are two independent reduplication processes, there should be two independent words

Phonologically, they involve /l/ weakening. That is, the lateral /l/ weakens to [r] between two vowels. With the /l/ weakening, the expected output of the full reduplication is [**hi**-hi **rak**-lak], which is not the correct output. The other process involved is a change from /l/ to [n] in the onset position. That is, in Korean the lateral /l/ changes to [n] word-initially, or when it is preceded by a noncoronal consonant. However, in considering the reduplicaiton of /hilak/, the expected output [**hi**-hi **lak**-nak], in which the lateral /l/ has changed to [n] after /k/, is not yet the optimal form. There are two more processes involved in those examples. First, the coda consonant of the second reduplicant [k] changes to [ŋ]. This is because of the highly prohibited condition in Korean that bans rising sonority over a syllable boundary. Thus, we could implement the Syllable Contact (Syll Con) constraint (Vennemann 1988, Davis 1998, Davis and Shin 1999). The implementation of Syll Con results in the final output [**hi**-hi **laŋ**-nak], which is still not the correct output. The final process involved is the nasal feature copy from the base to the reduplicant through a normal implementation of reduplication. To account for this complicated process, we introduce additional constraints for (7f), (7g), and (7i) and we present them in (29).

(29) Additional constraints for SK full reduplication
  a. Onset Con: /l/ is not allowed in a syllable initial position.
  b. *VlV: /l/ is not allowed between two vowels.
  c. Syll Con: Rising sonority is banned over a syllable boundary.
  d. Ident-BR (nas): The base and the reudplicant are identical in terms of nasal feature.
  e. Ident-IO (nas): The input and the output are identical in terms of nasal feature.

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which can have independent meanings and stand on their own so that these can be used as words. However, neither [hi-hi] nor [naŋ-nak] are independent words in Korean. For this reason, we should regard [**hi**-hi **naŋ**-nak] as consecutive reduplication where we treat two outputs as the result of one simultaneous consecutive reduplication.

Onset Con, *VlV, Syll Con, and Ident-IO (nas) do not show any special ranking among themselves. It should be noted that *VlV is ranked higher than Onset Con because the former is more specific than the latter. According to Prince and Smolensky (1993), intrinsically more specific constraints take precedence over more general constraints. However, they are not ranked in this study because their ranking does not affect the results of the evaluation. The important constraint ranking is between Ident-IO (nas) and Ident-BR (nas). Ident-IO (nas) should be ranked higher than Ident-BR (nas). If the ranking between them is reversed, such reversed ranking cannot select the correct optimal form between [hi-hi naŋ-nak] and *[hi-hi naŋ-naŋ]. The constraint ranking relations discussed reflect typical constraint ranking for overapplication in reduplication as discussed in M&P (1995). In this case of overapplication the phono-constraints primarily target the base, and the alternations in the base are carried over to the reduplicant by a normal reduplication procedure. In this situation, the relevance of B-R Identity to I-O Faithfulness is not very important, because B-R Identity is achieved through the normal application of reduplication. Nonetheless, overapplication is compelled by this normal application of reduplication. This still reflects overapplication in reduplication because the phono-constraints targeting the base and their effects are directly copied onto the reduplicant, which is not the primary target of the phono-constraints; the effects of phono-constraints are present on the reduplicant. This type of overapplication is achieved by the constraint ranking proposed by M&P (1995), which is presented in (30).

(30) Phono-constraint, I-O Faithfulness >> B-R Identity

The ranking relations are illustrated in the following constraint table.

(31) hilak → **hi**-hi **naŋ**-nak 'rejoicing'

/RED+hilak/	Syll Con	Onset Con	*VlV	Ident-IO (nas)	Ident-BR (nas)
a. **hi**-hi**lak**-lak	*!	*!*	*!		
b. **hi**-hi**rak**-nak	*!			*	*
c. **hi**-hi**raŋ**-nak				*	**!
d. **hi**-hi**naŋ**-naŋ				**!	
e. ☞ **hi**-hi**naŋ**-nak				*	*

In (31) there is an interesting comparison between (d) and (e). (31d) is the form that undergoes a different type of overapplication in reduplication in which phono-constraints target the reduplicant, and changes in the reduplicant are carried over to the corresponding segment in the base by means of back-copying. In (31d), the final coda consonant /k/ in the base is changed to [ŋ] by back-copying the nasal feature of the correspondent in the reduplicant. In such a type of overapplication, BR-Identity takes precedence over I-O Faithfulness, causing a non-perfect corresponding relation between the input and the output. However, (31d) loses to (31e) because it violates Ident-IO (nas) to a greater extent than (31e) does. The optimal output (31e) satisfies all the high-ranking constraints, and violates only low-ranking Ident-BR (nas)(cf. M&P 1999). The constraint rankings observed in (31) are shown in (32).

(32) The constraint ranking for SK full reduplication with two syllable
Syll Con, Onset Con, *VlV, Ident-IO (nas) >> Ident-BR (nas)

This ranking can be applied to monosyllabic bases of SK full reduplication. Thus, the rankings established for monosyllabic and disyllabic SK words can be combined into one ranking as shown in (33).

(33) Overall ranking for SK full reduplication

Afx≤σ, Tensification, Align-RED, Max-IO, Syll Con,
Onset Con, *VlV, Ident-IO (nas)
|
Max-BR, Ident-BR (nas)
|
Ident-BR (Laryn)

If we view the full reduplication in SK words as suffixing instead of prefixing, an example such as (7f), [hi-**hi** naŋ-**nak**], involves overapplication in reduplication. That is, in this type of overapplication changes made in the reduplicant are carried over to the correspondents in the base by means of back-copying. The suffixing analysis has several problems from the Optimality Theoretical perspective. First, we have to stipulate some condition in such an analysis. For example, we have to stipulate the direction of the back-copying, which is from the reduplicant to the base, but not vice versa. This is to prevent the back -copying of the nasal feature of the base consonant from occurring onto the correspondent in the reduplicant, as reflected in [hi-**hi** naŋ-**naŋ**]. Without such a requirement, we cannot prevent an output that undergoes bi-directional nasal feature copying. This is illustrated in (34).

(34)

/hilak+RED/	Syll Con	Onset Con	*VlV	Ident-BR (nas)	Ident-IO (nas)
a. ☞ hi-**hi** naŋ-**naŋ**					**
b. ☞ hi-**hi** naŋ-**nak**				*!	*

As seen in (34), the actual output form loses to the incorrect output (a). The other means of solving this problem is to invoke an I-R Identity. The relevant constraint for this type of reduplication is given in (35).

(35) Ident-IR (-voice): The correspondents of input and reduplicant are identical in -voice feature specification.

The Ident-IR (-voice) constraint militates against the overcopying of the nasal feature of the base onto the reduplicant because the constraint stipulates the identical -voice feature specification between the input and the reduplicant. If we use this constraint, we can eliminate the undesirable candidate in (34a). The problem with this constraint is that although it plays a crucial role in eliminating (34a), it is usually unnecessary in reduplication (M&P 1995). Such a critical role for the I-R constraint in reduplication cannot be justified.

If we consider the problems encountered by the suffixing analysis of SK full reduplication, and the analytical adequacies of the prefixing account, it is desirable to analyze SK full reduplication as a case of prefixing rather than suffixing. Furthermore, the data in (7i) seems to provide a good example of uni-directional nasal feature copying. If this were bi-directional nasal feature copying, the first syllable of /lwelak/ would be [nwe-**nwe** naŋ-**naŋ**] because in this suffixing type of reduplication B-R Identity should dominate I-O Faithfulness. However, it is not the correct form; the correct form is [nwe-**rwe** naŋ-**nak**]. This indicates that only one direction of nasal feature copying is licensed in overapplication; otherwise, the incorrect form should be realized as the optimal form. On the other hand, using prefixing analysis, (7i) does not pose any problem because the proposed ranking (33) can readily account for it. These analyses are illustrated in (36).

(36) a. Suffixing analysis

/lwelak+RED/	Syll Con	Onset Con	*VlV	Ident-BR (nas)	Ident-IO (nas)
a. ☹ nwe-**nwe** naŋ-**naŋ**					***
b. ☞ nwe-**rwe** naŋ-**nak**				*!*	***

b. Prefixing analysis

/RED+lwelak/	Syll Con	Onset Con	*VlV	Ident-IO (nas)	Ident-BR (nas)
a. nwe-nwe naŋ-naŋ				**!*	
b.☞ nwe-rwe naŋ-nak				*	**

It is therefore argued that full reduplication of non-ideophonic words in Korean should be viewed and analyzed as prefixing, rather than suffixing type.

In the final section of paper, the implications of this study will be considered.

5. Conclusion

In this study we provided an alternative analysis of Korean full reduplication focusing on non-ideophonic words. This alternative analysis argues in favor of the prefixing analysis rather than the traditional suffixing analysis. It is argued that the prefixing analysis allows for a more comprehensive analysis of full reduplication. Within the optimality theoretic approach, the traditional view of this type of reduplication as suffixation has two serious problems. Firstly, it requires stipulation for the direction of nasal feature copying, which is not allowed in optimality theory, and secondly, it invokes an unimportant I-R faithfulness constraint in reduplication (M&P 1995) as the crucial one. Based on these problems, it is argued that SK full reduplication is a case of prefixing rather than suffixing.

This study has some implications for reduplication in general. The study shows that in the case of overapplication back-copying occurs only uni-directionally, either from the base to the reduplicant, or from the reduplicant to the base. Presumably it is not possible for featural back-copying to occur bi-directionally.

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