

# A Study on /h/-deletion in Korean

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**Seo, Hong-Won. (2014). A Study on /h/-deletion in Korean.** *The Linguistic Association of Korea Journal*. 22(2). 95-112. The goal of this paper is to investigate some aspects of /h/-deletion in Korean within the framework of Optimality Theory. Although many studies have been conducted regarding /h/-deletion in Korean phonology, some problems have not been satisfactorily solved until now. In particular, /h/ can be optionally deleted intervocalically in *h*-regular stems, while /h/ must be deleted obligatorily in *h*-irregular stems. For instance, only [noramyən], rather than \*[norahimyən] is a possible form irrespective of any speech rate; however in case of *h*-regular stems, three forms such as [cohimyən], [coimyən], and [co:myən] can be attested depending on the speech rate. In order to account for two different asymmetries, we approach the analysis for /h/-deletion by positing two different underlying structures and by ranking combinations of constraints. This study has more explanatory advantages than the previous analyses, in that a few alternants of *h*-regular verbs can be dealt with by the proper constraint ranking hierarchy within the framework of OT and the limitations of the constraint, \*vhv governing the fact that intervocalic /h/ is not allowed, can be overcome by positing the different underlying structures.

**Key Words:** /h/-deletion, *h*-regular stem, *h*-irregular stem, CV-tier, variations,

## 1. Introduction

Until now, many studies have been conducted concerning the stem-final /h/, which is frequently deleted in the intervocalic position in Korean (Kim-Renaud, 1975; Ahn, 1985; Kim, G-A 1998; Lee, 2002; Suh & Pak, 2005; Kim, 2008; and others). That is, even though the deletion of /h/ in the word initial position is prohibited in Korean, it could be deleted or weakly pronounced between two

vowels. As shown in Kim-Renaud's study (1975: 45), /h/, which is among the weakest of non-vowels, is further weakened in order to lose its articulation entirely between a voiced segment and a vowel or a glide. She adds that the optional deletion of /h/ tends to be governed by degree of formality and speed. In similar to Kim-Renaud's assumption (1975), Lombardi (2002) also states that pharyngeal features should be classified as the least marked place. If pharyngeals are the least marked segments, one of them, /h/ can be more easily deleted than other segments.

The deletion of /h/, however, cannot be easily discerned because /h/ must be obligatorily dropped in certain cases, whereas others can be optionally deleted between two vowels. That is, /h/-deletion can be optional or obligatory according to the type of the preceding *h*-final stems: *h*-regular and *h*-irregular.

In this paper, we will reanalyze the phonological processes with respect to /h/-deletion, which can be optional or obligatory within the framework of Optimality Theory (henceforth OT) (Prince & Smolensky, 1993; McCarthy & Prince, 1995).

The structure of this paper is organized as follows. In section 2, we will present the data of the deletion or phonological phenomena related to /h/. Next, section 3 will show how /h/-deletion analyses have been dealt with based on the rule-based approach (Kim-Renaud, 1975; Ahn, 1985) and on the constraint-based approach (Kim, 2008). In section 4, an alternative analysis concerning /h/-deletion will be provided within OT. In section 5, we'll provide some of the implications of this study.

## 2. Data

In Korean, /h/ is a little differently realized or deleted in the intervocalic position, being affected by various phonological processes. But, they all apparently have the same motivation in common, in that /h/, the most unmarked consonant in Korean, is weakly pronounced, or loses its articulation. Let us first consider the examples in (1-3), all of which are chosen from Kim-Renaud (1975) and Kang (1993). As shown in the data, /h/ in casual speech is optionally deleted between two sonorants as well as in the

intervocalic position, which can be applicable to native Korean vocabulary, to Sino-Korean, and even to loanwords.

(1) Native Korean		Careful Speech	Casual Speech
a. ahop	'nine'	[a.hop]	~ [a.op]
b. mahin	'forty'	[ma.hin]	~ {ma.in}
c. kamanhi	'quietly'	[ka.man.hi]	~ [ka.ma.ni]
(2) Sino-Korean		Careful Speech	Casual Speech
a. wihəm	'danger'	[wi.həm]	~ [wi.əm]
b. kyohwan	'exchange'	[kyo.hwan]	~ [kyo.wan]
c. kyəŋhəm	'experience'	[kyəŋ.həm]	~ [kyəŋ.əm]
(3) Loanword		Careful Speech	Casual Speech
a. sahala	'Sahara'	[sa.ha.ra]	~ [sa.a.ra]
b. lihəsəl	'rehearsal'	[ri.hə.səl]	~ [ri.ə.səl]

However, /h/-deletion does not apply across word boundaries to form phrases or compounds, as given in (4). In addition, when it is followed by an obstruent consonant as given in (5), /h/ triggers aspiration, rather than its deletion. On the other hand, when it precedes /n/ as shown in (6), the phoneme /h/ assimilates to the following nasal, resulting in unreleased [t] or [n] (Kim, K-H, 1998: 484).

(4)			
a. cə hanil	'that sky'	[cə. ha.nil]	*[cə. a.nil]
b. hai hil	'high heel'	[ha.i. hil]	*[ha.i. il]
(5)			
a. pəphak	'law'	[pə.p <sup>h</sup> ak]	*[pəbak]
b. mathyəŋ	'eldest brother'	[ma.t <sup>h</sup> yəŋ]	*[madyəŋ]
(6)			
a. noh nin	'putting down'	[not.nin][non.nin]	*[no.nin]
b. s'ah ne	'piling up'	[s'an.ne]	*[s'a.ne]

When it comes to the final segment in a verb stem, /h/-deletion, however, shows a different pattern from what we expect. As Kim-Renaud (1975: 50) indicates, there are two groups of stems, whose final /h/ is either obligatorily or optionally deleted when attached by vowel initial affixes. These verb patterns have been called *h*-irregular and *h*-regular, respectively. The examples are presented below.

(7) a. *h*-irregular

nolahta	'is yellow'	/nolah-ta/	[norat <sup>h</sup> a]
nolamyən	'if it is yellow'	/nolah-imyən/	[noramyən] *[norahimyən]
nolana	'is yellow but'	/nolah-ina/	*[noraimyən] [norana] *[norahina] *[noraina]

b. *h*-regular

cohta	'is good'	/coh-ta/	[cot <sup>h</sup> a]
cohimyən	'if it is good'	/coh-imyən/	[cohimyən] [coimyən]
cohina	'is good but'	/coh-ina/	[co:myən] [cohina] [coina] [co:na]

The most crucial difference between *h*-regular and *h*-irregular verbs in (7) is that the intervocalic /h/ can be deleted optionally in *h*-regular verbs, but must be deleted obligatorily in *h*-irregular verbs. Thus, though [norahimyən] is not attested in any speech, [cohimyən], [coimyən], and [co:myən] are all possible depending on the speech rate. Accordingly, this disparity between two types of stems should be explained. In the next section, we will consider how the previous analyses have dealt with this problem and will investigate which problems each analysis has.

### 3. Previous Analyses

#### 3.1 A Rule-Based Approach of /h/-Deletion

Kim-Renaud (1975) states that /h/ is optionally deleted between a voiced segment and a vowel or a glide based on the degree of formality or speed, via the process such as /h/→[ɦ] and [h]→∅. These data were given in (1)-(3). The rule she suggests is as follows:

- (8) Ordinary /h/-deletion (optional) (Kim-Renaud, 1975: 47)  
 $h \rightarrow \emptyset / [+voice] \text{ \_\_\_\_ } [-cons]$

However, when /h/ is the final segment of a verb stem, it behaves totally differently from that case presented above. That is, it is obligatorily deleted between a voiced segment and a vowel when it is preceded or followed by /a/ or /ə/. For example, /h/ is obligatorily deleted in [coado] (\*[cohado]) ‘is good but’ because it is followed by /a/, but /h/-deletion is optionally applied to as in [cohini] or [coini] ‘as it is good’.

- (9) Verb stem final /h/-deletion (Kim-Renaud, 1975: 49)  
 $h \rightarrow \emptyset / [+voice] \text{ \_\_\_\_ } \&V$   
 (Condition: A verb stem final /h/ is deleted between a voiced segment and a vowel, obligatorily if it is preceded by /a/ or /ə/, optionally otherwise.)

Although there are two rules given in (8) and (9), it is not possible or sufficient to generalize /h/-deletion. According to Kim-Renaud (1975), there exists another case of verbs, called irregular, whose stem final /h/ is categorically deleted, when it is followed by vowel initial affixes<sup>1)</sup>. The crucial difference between *h*-regular and *h*-irregular verbs is that /h/ is optionally

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1) *h*-irregular verbs have usually two characteristics presented below. (Choi, 1971)

(i) Affixes show alternants that usually occur after vowel final stems.

(e.g., [-myən] instead of [-imyən])

(ii) The stem final *h* is obligatorily deleted before affixes beginning with *m*, *n*, *l*.

deleted in regular verbs, but obligatorily deleted in irregular verbs in the intervocalic position. For the convenience of the explanation, the data are presented in (7'), again.

(7') a. *h*-irregular

nolahta	'is yellow'	/nolah-ta/	[norat <sup>h</sup> a]
nolamyən	'if it is yellow'	/nolah-imyən/	[noramyən] *[norahimyən]
nolana	'is yellow but'	/nolah-ina/	*[nora <sup>i</sup> imyən] [norana] *[norahina] *[noraina]

b. *h*-regular

cohta	'is good'	/coh-ta/	[cot <sup>h</sup> a]
cohimyən	'if it is good'	/coh-imyən/	[cohimyən] [coimyən] [co:myən]
cohina	'is good but'	/coh-ina/	[cohina] [coina] [co:na]

For the analysis, Kim-Renaud (1975) supposes the additional rules as follows:

## (10) Affix final /h/-deletion (minor) (Kim-Renaud, 1975: 52)

$h \rightarrow \emptyset$  / [+voice] \_\_\_\_\_ & [-cons]

(A verb stem final /h/ is deleted intervocalically.)

She indicates that Affix final /h/-deletion is a minor rule, in that the obligatory /h/-deletion is only applied to adjectival affixes attached to adjectives such as *-əh/ah* 'gives the impression of being' and *-taləh* 'rather'.

However there still remains a problem to solve. While [nora<sup>i</sup>imyən] is not allowed in the surface form, [co<sup>i</sup>imyən] and [co:myən] are all possible. Being the most unmarked of all vowels in Korean, the vowel /i/ is easily deleted in fast and casual speech when it is in contact with another vowel. After

/i/-deletion, the remaining vowel undertakes compensatory lengthening, resulting in changing it into a long vowel. Kim-Renaud (1975) summarizes this phenomenon as follows:

- (11) Casual /i/-deletion (optional) (Kim-Renaud, 1975: 54)

X	V	i	Y	→				
1	2	3	4		1	2	∅	4
								+long

(/i/ is truncated when meeting another vowel, and the remaining vowel is lengthened.)

- (12) Affix Boundary /i/-Deletion (Kim-Renaud, 1975: 57)

i → ∅ % V+ \_\_\_\_

(Condition: not applicable if i is the final segment of a monosyllabic stem followed by passive- causative -i. /i/ is deleted when preceded of followed by a vowel across an affix boundary.)

Considering two kinds of /h/-deletion and /i/-deletion, Kim-Renaud (1975: 59) tries to analyze each derivation process of regular and irregular verbs, as shown in (13). The derivations below show why only [noramyən] for /nolah+imyən/ is possible as a surface form, while there are three possible forms [cohımyən] ~ [coımyən] ~ [cɔ:myən] for /cohımyən/. That is, in the latter case, verb stem final /h/-deletion rule and casual /i/-deletion rule are optional, but in the former case, verb stem final /h/-deletion rule and affix boundary /i/-deletion rule are all obligatory. Thus, as being presented in (13a), only [noramyən] becomes a possible surface form. Compare the following derivations.

- (13) a. /nolah+imyən/ 'if it is yellow'
- |            |   |
|------------|---|
| nolaimyən  | Verb Stem Final /h/-Deletion (obligatory) |
| nolamyən   | Affix Boundary /i/-Deletion (obligatory)  |
| [noramyən] | l-weakening                               |
- b. /coh+imyən/ 'if it is good'
- |            |  |
|------------|--|
| N.A        | Affix Final /h/-Deletion (obligatory)    |
| N.A        | Affix Boundary /i/-Deletion (obligatory) |
| [cohimyən] | No Rule                                  |
| [coimyən]  | Verb Stem Final /h/-Deletion(optional)   |
| [co:myən]  | Casual /i/-Deletion (optional)           |

However, Kim-Renaud's proposal has some drawbacks, as Ahn (1985) points out. First, two rules should be applied in order to one lexical affixational /h/-deletion. Secondly, even though Kim-Renaud's underlying representations can be supported diachronically, they are not perceived on the surface form synchronically. From this perspective, Ahn (1985: 144) suggests that the underlying forms of two types of stems be represented non-linearly as follows:

- (14) a. Verbs: /coh/ 'to be good'
- |   |   |   |  |
|---|---|---|--|
| C | V | C |  |
|   |   |   |  |
| c | o | h |  |
- b. Adjectives: /nolah/ 'to be yellow'
- |   |   |   |   |   |
|---|---|---|---|---|
| C | V | C | V |   |
|   |   |   |   |   |
| n | o | l | a | h |

His suggestion has the following explanatory advantages. As given above, adjectives and verbs have different underlying representations in the CV tier. First, as only /h/ in adjectives is floating, it should be obligatorily deleted, while /h/ is optionally deleted in verbs. Secondly, as /i/-deletion rule applies to the CV tier rather than to the segmental tier, the obligatory and optional /i/-deletion can be explained as well.

In the next sub-section, we will consider how /h/-deletion could be analyzed from the perspective of OT, focusing on Kim (2008) adopting Tubid



analysis by Goldrick (2000).

### 3.2 A constraint-Based Approach of /h/-Deletion

Kim (2008) tries to analyze an OT account of *h*-final stems based on the Tubid analysis by Goldrick (2000). She assumes that the tiers remain in the surface form so that the structural differences in the underlying forms can be preserved in the output forms. The constraints she uses and their constraint hierarchy are as follows:

(15) Constraints<sup>2)</sup>

- a. Max-C: An input C slot in the skeletal tier has a correspondent in the output.
- b. \*vhv: Intervocalic /h/ is not allowed in the melody tier.
- c. \*VV: A sequence of V slot across a morpheme boundary is not allowed in the skeletal tier.
- d. Max-R: An input root has a correspondent in the output.

(16) Ranking: Max-C, \*vhv, \*VV ≫ Max-R

Let us consider how each optimal output can be chosen in regular and irregular stems, respectively, according to the constraints and ranking hierarchy that Kim (2008) suggested. As shown in two tableaux below, the basic difference between two stems is that \*VV plays a crucial role in *h*-regular verb stem, while it does not in *h*-irregular stem. \*VV, which only functions in the CV tier, can have the suffix-initial vowel survive as an optimal form without being deleted in *h*-regular verbs, even though stem final /h/ is deleted.

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2) Kim (2008) is using each letter as follows: a small letter 'v' refers to a vowel in the melody tier, whereas capital letters 'C', 'V' and 'R' indicates each slot in the CV tier.

Tableau 1. *h*-regular: /nəh-ini/ →[nə.i.ni]

CVC VCV           n ə h i n i	Max-C	*vhv	*VV	Max-R
a. CVC VCV           n ə h i n i		*!		
b. CVC VCV           n ə i n i				*
c. CVC CV           n ə n i				**!
d. CV VCV           n ə i n i	*!		*!	*

Tableau 2. *h*-irregular: /nolah-ini/ →[no.ra.ni]

CVCV VCV               n o l a h i n i	*vhv	*VV	Max-R
a. CV CV VCV               n o l a h i n i	*!	*!	
b. CV CV VCV               n o l a i n i		*!	*
c. CV CV CV               n o l a n i			**

Kim’s suggestion (2008) that two tiers should be considered simultaneously, has explanatory advantages regarding the difference between *h*-regular and *h*-irregular stems related to /i/-deletion, compared with the previous analyses depending on only \*vhv. However, her suggestion still has some problems. First, she does not provide concrete grounds about why each different

underlying structure should be posited. Considering Ahn's proposal (1985), we can draw a potential conclusion that the different underlying forms stem from each different grammatical category such as adjectives and verbs. Second, she does not tackle some alternants of *h*-regular stems such as [cohimɯən], [coimɯən], and [co:myən]. However, considering the merits of OT that we can explain some variations by the reranking or unranking of the constraints, we can solve this problem.

In the next section, we will present how /h/-deletion can be appropriately explained within the framework of OT.

#### 4. An Alternative Analysis

In this section, we'll show how /h/-deletion in Korean could be dealt with. In order to account for /h/-deletion in Korean, the following constraints will come into play crucial roles.

##### (17) Constraints

- a. Anchoring-L: Any segment at the left edge of the input has a correspondent at the left edge of the output.
- b. Max: Input segments must have output correspondents.
- c. \*vhv<sup>3)</sup>: /h/ is not allowed between two vowels.

When analyzing /h/-deletion, we need the constraint, Anchoring-L, which prevents the /h/-sound from being deleted at the left edge of a grammatical word. On the contrary, when /h/ is underlyingly represented in the intervocalic position, it could be deleted either optionally or obligatorily depending on the circumstances. Thus, the constraint, \*vhv plays the role in triggering the deletion of /h/ between two vowels. The constraint ranking for the analysis is as follows:

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3) Strictly speaking, \*vhv should be changed into \*shs, in that /h/ is frequently deleted between two sonorants. However, for the convenience of the analysis, we will use \*vhv instead of \*shs.

## (18) The constraint ranking for /h/-deletion

Anchoring-L  $\gg$  \*vhv  $\gg$  Max

The following tableau (3) briefly demonstrates the case that /h/-deletion doesn't occur at the word's initial position in Korean. In tableau (3), since candidate (3b) violates the undominated constraint, Anchoring-L, it should be eliminated.

Tableau 3. /h/-deletion at word initial: /ha.nil/

/ha.nil/	Anchoring-L	*vhv	Max
a. $\dashv$ ha.nil			
b. a.nil	*!		*

When it comes to the /h/-deletion between two vowels, tableau 4 illustrates how an optimal form could be selected.

Tableau 4. /h/-deletion at word media<sup>4</sup>): /ahop/

/a.hop/	Anchoring-L	*vhv	Max
a. $\dashv$ a.op			*
b. a.hop		*!	

Next, let us now consider /h/-deletion of *h*-regular and irregular verbs within the framework of OT. As given in Kim-Renaud's generalization (1975), the crucial difference between *h*-regular verbs and irregular verbs is that /h/ is obligatorily deleted in irregular verbs, but optionally in regular verbs. In addition, she also states that *h*-irregular verbs have a peculiar nature in common, shown in examples such as /nol+ah/ (to be yellow), /nop<sup>h</sup>+talaha/ (to be quite high). That is, affixes like /-ah/ and /-talaha/ are attached to morphemes which are already adjectives. On the other hand, in case of *h*-regular verbs such as /nah/ (to produce) and /coh/ (to like), each /h/

4) We can also explain the case where /h/ is not deleted in the careful speech with the help of reranking of Max and \*vhv, which are relatively lower ranked. Thus, if we reverse the ranking of the constraints, two optimal outputs can be generated; those ones where either the /h/ deletion happens or does not.

underlyingly belongs to the verb stem. If two cases have the different underlying representations, respectively, we need to note how the disparity of the /h/-deletion happens depending on the difference between affixes and stems. Provided that Beckman's statement (1998) that roots are in the privileged position while affixes are in the non-privileged position, we can attest that the preservation of stem segments has a higher priority than that of affix segments. Thus, from this suggestion, we can draw some potential assumption that the segments of the stem tends to be kept more often than those of the affix, as much as possible.

Additional constraints for the analysis of /h/-deletion of the verbs and the ranking of the constraints are as follows:

(19) Constraints

- a. \*VV: A sequence of vowels is not allowed in the CV tier.
- b. Uniformity: No element of the output has multiple correspondents in the input.
- c. Onset: Syllables must have onsets.

(20) The constraint ranking for /h/-deletion

Anchoring-L  $\gg$  \*vhv, \*VV  $\gg$  Max  $\gg$  Uniformity, Onset

The constraint, \*VV accounts for the fact that syllables should not begin with a vowel within a word for the purpose of preventing the vowel hiatus, triggering either consonant insertion or vowel deletion. This constraint will be applied to the CV tier, based on Ahn (1985)'s suggestion.

As Kim (2008) indicates, all *h*-regular verb stems are monosyllabic, whereas all *h*-irregular verb stems are polysyllabic. From such a perspective, we can draw some language universal generalization concerning the size of truncated forms. That is, when deriving the truncated forms from original words, there generally exists a minimum requirement about the size for the purpose of improving the recoverability. Considering that *h*-regular verb stems generally consist of a monosyllable, even though /h/-deletion optionally happens in the intervocalic position, /i/-deletion is prohibited or a remaining vowel should undergo compensatory lengthening. The compensatory vowel lengthening

inevitably violates the correspondence constraint Uniformity, banning multiple correspondence between the input and the output, although it does not incur the violation of Max.

As stated earlier, *h*-irregular verbs obligatorily delete /h/ in stem final, and tableau (5) shows how ranking schema leaves out any wrong candidates which violate the constraints. As given below, candidate (a) fatally violates \*vhv and \*VV more severely than other competitors. Candidate (b) is also removed by permitting a sequence of vowels in the CV tier. Accordingly, candidate (c) is selected as the optimal form.

Tableau 5. /h/-deletion of irregular stems: /nolah+iɰyən/

C V CV V C G V C	Anchor	*vhv	*VV	Max	Uniformity	Onset
 n o l a h i m y ə n	-L					
a. C VCV V CG VC                 n o r a h i m y ə n		*!	*!			
b. CV CV V CG VC                 n o r a i m y ə n			*!	*		*
c. CV CV C G VC                 n o r a m y ə n				**		

The schema presented in (20) could be very properly applied to *h*-regular verbs as well as *h*-irregular verbs. In tableau 6, candidate (a) is ruled out since it didn't delete input segment /h/, fatally violating \*vhv. Next, candidate (c) is also eliminated by permitting a sequence of vowels in the CV tier. The constraint, Max, requiring for every output segment there is some input segment corresponding to it, can rule out candidate (d) which incurs two violation. Finally, remaining candidates (b) and (e), which incur only one violation of Max, can be chosen as the optimal output, although they violate the lowest ranking faithfulness constraints, Onset and Uniformity, respectively. Note that candidate (b) satisfies \*VV by positing vacuous C in the CV tier.

Tableau 6. /h/-deletion of regular stems: /coh+imɯən/

	C V C	V C G V C	Anchor	*v <sub>h</sub> v	*VV	Max	Uniformity	Onset
			-L					
	c o <sub>1</sub> h	i <sub>2</sub> m y ə n						
a.	C V C V C G V C			*!				
	c o <sub>1</sub> h	i <sub>2</sub> m y ə n						
b.	C V C V C G V C					*		*
	c o <sub>1</sub>	i <sub>2</sub> m y ə n						
c.	C V	V C G V C			*!	*		*
	c o <sub>1</sub>	i <sub>2</sub> m y ə n						
d.	C V	C G V C				**!		
	c o <sub>1</sub>	m y ə n						
e.	C V	C G V C				*	*	
	c	o <sub>1,2</sub> m y ə n						

The constraints and ranking we suggest in this analysis has some advantages over other previous analyses. Adopting Ahn’s suggestion (1985) that there exist different underlying structures according to grammatical categories, we established the different structures in the input. That is, /h/ in regular stems occupies C-position in the CV tier, while /h/ in irregular stems does not. This assumption can play an important role in accounting for a vowel hiatus in the output. In addition, we can explain some variations of *h*-regular stems such as [coimɯən] and [co:myən]. Another possible output, [co.hi.myən] used in the formal speech, can also be explained by rearranging constraints ranking. In the next section, we will summarize the analyses of this study.

### 5. Conclusion

In this study, we have analyzed /h/-deletion, which frequently happens between two vowels in Korean. Now that /h/ is the most unmarked consonant, it can be much more easily deleted than any other consonant in

Korean. In particular, in *h*-regular verbs, /h/ can be optionally deleted in the intervocalic position, while /h/ must be deleted obligatorily in *h*-irregular verbs. For this reason, although [noramyən] \*[norahimyəŋ] is a possible form in any speech, [cohimyəŋ], [coimyəŋ], and [co:myəŋ] are all possible depending on the speech rate. Accordingly, this asymmetry between the two types of stems should be explained.

The constraints and their ranking are as follows:

(21) Constraints

- a. Anchoring-L: Any segment at the left edge of the input has a correspondent at the left edge of the output.
- b. Max: Input segments must have output correspondents.
- c. \*vhv: /h/ is not allowed between two vowels.
- d. \*VV: A sequence of vowels is not allowed in the CV tier.
- e. Uniformity: No element of the output has multiple correspondents in the input.
- f. Onset: Syllables must have onsets.

(22) The constraint ranking for /h/-deletion

Anchoring-L  $\gg$  \*vhv, \*VV  $\gg$  Max  $\gg$  Uniformity, Onset

For this analysis, we adopted Ahn's structures (1985), which are underlyingly different based on grammatical categories. That is, /h/ in adjective stems does not occupy a C-position in the CV tier, while /h/ in verb stems does. The former is called *h*-irregular stems and the latter *h*-regular stems, respectively. This posited assumption can explain /i/-deletion without any difficulties, which cannot be accounted for only by the constraint, \*vhv in the previous analyses. The variations of *h*-regular stems can be dealt with by not ranking two constraints, Uniformity and Onset.

In sum, this study has some advantages over the previous analyses in that some alternants of *h*-regular verbs can be handled within the framework of OT and the limitation of the constraint \*vhv can be overcome by positing the different underlying structures.



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