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An OT Analysis of Vowel Hiatus in the Jeju Dialect

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Lee, Eunmi & Ko, Hoonjoo. (2022). An OT analysis of vowel hiatus in the Jeju dialect. *The Linguistic Association of Korea Journal, 30*(4), 211-236. This study is about the vowel hiatus resolutions resulting from suffixation in the Jeju dialect. To avoid the vowel hiatus, glide formation, glide insertion, and vowel deletion are adopted in the Jeju dialect. Glide insertion occurs at the morpheme boundary to break up the vowel sequence. The inserted segment is chosen depending on the feature of the stem final vowel. Glide insertion is not typical in standard Korean and other dialects in Korea but it is often spoken in a formal speech in the Jeju dialect. Glide formation also takes place in casual speech. Glide formation is the process where one of the vowels is substituted for the corresponding glide - the high vowel becomes [y] and the back round vowel becomes [w] at the morpheme boundary. This is where it is suppressed due to the Obligatory Contour Principle (Leben, 1973) related to the Consonant Glide (CG) cluster, and the lack of a high feature, required for glide formation. In each case, a deletion strategy is adopted, but which vowel is deleted between V_1 and V_2 is determined by both the sonority of the vowel and morphological factors such as the stem or suffix. We adopt constraints and their ranking for the analysis within the framework of Optimality Theory (OT). As all of the strategies are for the one goal - to avoid vowel hiatus, we provide a single constraint ranking that can explain various cases of vowel hiatus resolutions in the Jeju dialect.

Key Words: verbal suffixation, vowel harmony, vowel hiatus, glide formation, glide insertion, vowel deletion, Optimality Theory

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1. Introduction

Vowel hiatus frequently occurs over the morpheme boundary when the suffix starting with a vowel is added to the base ending with a vowel. As vowel hiatus is regarded as an ill-formed structure cross-linguistically, various strategies are adopted to avoid it, such as vowel deletion, glide formation, and glide insertion. In the Jeju dialect, vowel hiatus occurs in the process of verbal suffixation. The verbal suffix {-əŋ}, meaning 'and,' causes a vowel hiatus when added to a base ending with a vowel. In order to fix the ill-formed structure, various strategies are used, which makes the analysis more complicated. In some examples, glide formation takes place, where a high vowel in the base is changed into the corresponding glide–/i/ becomes [y] or /o/ becomes [w]. In other cases, glide insertion or vowel deletion is adopted. Glide insertion occurs between the vowels to break up the sequence. The segment that is added is based on the feature of the vowel that came before it. If the vowel is high, glide [y] is inserted, and if it is round back, [w] is inserted. Especially, vowel deletion is so complex that we need to pay more attention to the analysis. In the V_1+V_2 situation where one of the vowels must undergo deletion, which vowel will be deleted is not just determined by the morphological factor such as stem vowel vs. suffix vowel but also by the feature of vowel such as sonority.

As we briefly see the outline of vowel hiatus resolutions in the Jeju dialect, its analysis is not quite simple. Therefore, we need to examine this issue in detail. In this study, we will provide the constraint-based analysis to show that all the different strategies aim for one goal–avoiding vowel hiatus, which the rule-based analysis cannot do.

This paper will be organized according to the following. Section 2 will present the relevant data in the Jeju dialect and their analysis will be given. In section 3, a study on this issue will be briefly introduced. Section 4 will suggest the alternate analysis on the vowel hiatus in the Jeju dialect in OT. Lastly, the conclusion and the implications on the vowel hiatus resolutions in the Jeju dialect will be followed in section 5.

2. Data Presentation

2.1. Affixation of {–ə ŋ} in the Jeju Dialect

This section presents suffixing {-əŋ} which means 'and' in the Jeju dialect. In the suffixation process where this morpheme is added to a base ending with a vowel, the

vowel hiatus occurs across the morpheme boundary. In order to avoid the ill-formed structure, different strategies are observed in the Jeju dialect.

(1) the related data in Jeju dialect

a.	/ana+əŋ/ → [a.naŋ]	'to hug'
	/apʰa+əŋ/ → [a.pʰaŋ]	'to be sick'
	/tatɨma+əŋ/ → [ta.dɨ.maŋ]	'to trim'
	/manna+əŋ/ → [man.naŋ]	'to meet'
b.	/ətə+əŋ/ → [ə.dəŋ]	'to get'
	/sɨlpʰə+əŋ/ → [sɨl.pʰəŋ]	'to be sad'
	/kəcʰilə+əŋ/ → [kə.cʰi.rəŋ]	'to be rough'
	/tətɨmə+əŋ/ → [tə.dɨ.məŋ]	'to grope'

As shown in (1), vowel hiatus seems to be resolved by deleting a suffix-initial vowel. An interesting aspect observed from the data in (1) is that the output vowel across the morpheme boundary is either [a] in (1a) or [ə] in (1b) which is identical to the base-final vowel. This vowel alternation is the typical case of vowel harmony in Korean through which an unspecified suffix-initial vowel becomes harmonized with the base-final vowel. Before we move on to the main subject-vowel hiatus, we will deal with this process briefly in the next section.

2.2. Vowel Harmony

In this section, we will just generalize the vowel harmony in the Jeju dialect. Vowel harmony (henceforth VH) is the phenomenon where two vowels become identical in the form or certain features within the morpheme or over the morpheme boundary. As seen in (1), the suffix vowel is alternated into [a] or [ə] depending on the vowel in the base. This is due to the VH in affixation. It can be assumed that the final vowel of the base triggers VH, causing /ə/ to alternate between [a] and [ə]. The same vowel harmony in verbal affixation can also be observed in standard Korean.

(2) Vowel Harmony in Suffixation in Standard Korean (Lee, 1993, p. 263)

infinitive	*past*	
cip-ə	cip-əs′	'to pick'
pe-ə	pe-əs′	'to cut'

kæ-ə	kæ-əs′	'to fold'
cuk-ə	cuk-əs′	'to die'
mək-ə	mək-əs′	'to eat'
k′op-ə	k′op-as′	'to insert'
mak-ə	mak-as′	'to block'

As we see in (2), the vowel of the past verbal suffix, /ə/, is realized as [a] in the case that the stem has the vowel /a/ or /o/ in it; /ə/ is [ə], elsewhere. It can be assumed that only if the base has the vowel /a/ or /o/, the suffix vowel is realized as [a]. The Jeju dialect can also be explained in the same way as standard Korean.

(3) Vowel Harmony in the Jeju dialect[1)]

Infinitive	*and*	
cip-ə	cip-əŋ	'to pick'
pe-ə	pe-əŋ	'to cut'
kæ-ə	kæ-əŋ	'to fold'
cuk-ə	cuk-əŋ	'to die'
mək-ə	mək-əŋ	'to eat'
k′op-ə	k′op-aŋ	'to insert'
mak-ə	mak-aŋ	'to block'

The data in (3) show that the Jeju dialect behaves in the same way as the standard Korean in terms of VH. It can be generalized that the suffix vowel /ə/ is realized into [ə] when it follows the base whose last vowel is one of /i/, /e/, /æ/, /ɨ/, /u/, or /ə/, while [a] appears when the vowel is /o/ or /a/.

In the analysis of VH, various analyses are suggested. One of them is traditionally by dark vowels (u, ɨ, ə) versus light vowels (o, ʌ, a). The other is [RTR] or [-ATR] (Lee, 1993, p. 264). As this paper mainly deals with vowel hiatus resolutions, we will leave this issue for further study later.

1) This examples are modified from (2). Some of the examples in this paper are from Kim (1998) and Kang (2009). As we are the native speakers of the Jeju dialect, the other examples are collected by ourselves.

In this VH system, we can assume that the basic form of the suffix vowel is /ə/ not /a/. There are two reasons /ə/ should be a basic form. First of all, the suffix /ə/ frequently appears in VH, compared to the other vowel. As we see, only [a] appears when the preceding vowel is /a/ or /o/, on the other hand, [ə] appears in a wider range. Secondly, assuming /ə/ to be a base form is more economic. The data in (4) apparently reveal that /ə/ is a base form.

(4) The data showing the default vowel

/kʰɨ+əŋ/	→ [kʰəŋ] 'to grow'
/sˊi+əŋ/	→ [sˊəŋ] 'to write'
/tˊi+əŋ/	→ [tˊəŋ] 'to rise'

These examples are realized [ə] not [a] when the base final vowel is the neutral vowel /ɨ/ in Korean. This vowel, as the most unmarked sound, can be easily targeted for any phonological process. In the derivation, /ɨ/ is deleted, leading to the realization of the suffix vowel /ə/. If we assume the base is /a/, the realization of /a/ to [ə] needs to be explained. Therefore, it is reasonable to assume [ə] is default vowel for the above reasons.

The following subsection will deal with the vowel hiatus in the morphological process of vowel affixation in standard Korean before moving on to the Jeju dialect case.

2.3. Korean Vowel Hiatus Resolution

In standard Korean, glide formation and vowel deletion are mainly adopted to avoid vowel hiatus in verbal suffixation. Unlike vowel deletion, glide formation is either obligatory or optional in standard Korean. The relevant data are presented in (5).

(5) Resolving Hiatus in Korean

1. Glide Formation (Lee, 1993, p. 206)

a. Optional

/po+ə/	[poa]	[pwa]	'to see'
/ki+ə/	[kiə]	[kyə]	'to crawl'
/kˊu+ə/	[kˊuə]	[kˊwə]	'to dream'

b. Obligatory

/o+ə/	*[oa]	[wa]	'to come'

/keu+ə/	*[keuə]	[kewə]	'to vomit'
/moi+ə/	*[moiə]	[moyə]	'to gather'

2. Vowel Deletion

/ka+ə/	*[kaa]	[ka]	'to go'
/sa+ə/	*[saa]	[sa]	'to buy'
/sə+ə/	*[səə]	[sə]	'to stop'
/kənnə+ə/	*[kənnəə]	[kənnə]	'to cross'

Regarding the glide formation, vowel hiatus is either tolerated or it is fixed by glide formation in one environment as in (5-1a) and (5-1b), respectively. Specifically, obligatory glide formation occurs when the base consists of a single vowel or a base contains two vowels in series. Another strategy is vowel deletion, where a sequence of identical vowels appears across the morpheme boundary.

Until now, we have looked over the standard Koran vowel hiatus resolutions briefly. In the following sub-section, the vowel hiatus in the Jeju dialect will be dealt with in detail.

2.4. Vowel hiatus in the Jeju Dialect

As mentioned above, glide formation and vowel deletion are the main strategies in Standard Korean to fix the vowel hiatus structure. However, the Jeju dialect employs an additional strategy called glide insertion. In this section, we will discuss different ways of avoiding vowel hiatus in the Jeju dialect: Glide formation, Glide insertion, and Vowel deletion.

2.4.1. Glide Formation in the Jeju Dialect

Glide formation is one of the strategies for resolving vowel hiatus in the Jeju dialect. There are two different cases, one of which is obligatory glide formation and the other is optional glide formation. Glide formation occurs usually in the informal speech mode, but in obligatory cases, it is considered formal speech. The examples of the obligatory case are listed in (6) and the optional ones are in (7).

(6) Obligatory Glide Formation

a.	/seu+əŋ/	[se.waŋ]	'to build up'
	/peu+əŋ/	[pe.waŋ]	'to learn'
	/k^hiu+əŋ/	[k^hi.waŋ]	'to raise'
	/moi+əŋ/	[mo.yəŋ]	'to gather'
	/poi+əŋ/	[po.yəŋ]	'to be seen'
	/nui+əŋ/	[nu.yəŋ]	'to be laid'
b.	/o+əŋ/[2]	[waŋ]	'to come'

In (6a), three vowels appear in a row across the morpheme boundary. The two vowels belong to the base and the final one to the suffix. In this environment, V_2 is substituted for its corresponding glide to form onset: the front-high vowel /i/[3] turns into the palatal [y], and the high-back, round vowel /u/ into the bilabial [w]. Under Clements and Hume's (1995) model which describes the vowels relating to the place feature of consonants, round vowels are labial, back vowels are dorsal, and front vowels are coronal. Therefore, we can assume that high vowels are replaced with the glide /y/ and the round back vowels the glide /w/ in accordance with the place feature.

In (6b), when the initial syllable begins without its onset segment and is followed by a vowel-initial suffix, the round back vowel turns into its corresponding glide [w]. This

2) /i+əŋ/ "to put something on one's head" has the same environment with /o+əŋ/. However, this example shows a different realization with it. This is realized not [yəŋ] but [i.yəŋ]. In this case, glide insertion is obligatory. In my opinion, the realization [yəŋ] has different meaning, which means "this way". That is why this case has a different realization with the case of /o+əŋ/. This example is obligatory glide formation case in standard Korean, which is realized into [yə.sə].
There is one more thing to mention the realization of /o+əŋ/. Actually, the realization of this example is not obligatory in the Jeju dialect. There is another realization. The optional one is [o.raŋ]. Retroflex is inserted between the two vowels. There is another example related to it.
(i) /se+əŋ/ → [se.raŋ] "to leak and" ((물ㅇ|)새서)
These cases are limited and there are few data on this. So in this paper, the case of retroflex insertion will not be dealt with.

3) The vowel chart of Jeju dialect (Kim, 1998, p. 109)

	-back,-round	+back,-round	+back,+round
+high	i	ɨ	u
-high,-low	e	ə	o
+low	æ	a	ɒ

glide formation obligatorily occurs in the environment '(C)VV.Vŋ' or 'V.Vŋ' in the Jeju dialect. These newly formed glides now become the onset of the second syllable. This is explained by the Itô's onset principle (1989, p. 223). We may consider those vowel hiatus resolutions for minimizing the onsetless syllables.

However, there are other examples in which vowel hiatus is resolved not only by glide formation but also by insertion of a glide as demonstrated by the examples in (7).

(7) Optional Glide insertion or Glide formation

	formal speech	*casual speech*	
/kʻi+əŋ/	[kʻi.yəŋ]	[kʻyəŋ]	'to join'
/pi+əŋ/	[pi.yəŋ]	[pyəŋ]	'to be cut'
/kʻu+əŋ/	[kʻu.wəŋ]	[kʻwəŋ]	'to borrow'
/nu+əŋ/	[nu.wəŋ]	[nwəŋ]	'to lie down'
/kətu+əŋ/	[kə.tu.wəŋ]	[kə.twəŋ]	'to collect'

Glide formation is typically adopted in standard Korean and other dialects in other provinces to solve vowel hiatus. Noticeable is the frequent use of glide insertion in the Jeju dialect, which is rarely applied to standard Korean. Either glide insertion or glide formation is adopted to avoid the vowel hiatus in the environment where the final segment of the base is a high front or a high back round vowel in the Jeju dialect. In the formal speech, the palatal glide /y/ is inserted before a base-final vowel featured by high and front. The round back glide /w/, on the other hand, is epenthesized when a base finishes with a round vowel. The quality of the epenthetic glide depends on the feature specifications of a base-final vowel. And the inserted glide serves as the onset of a vowel-initial syllable of the affix. We here observe a type of featural co-relation between an epenthetic glide and its following nucleus.

2.4.2 Glide Insertion and Deletion

Another case to resolve vowel hiatus can also be witnessed in the Jeju dialect. The environment is seemingly identical to the examples in (7), but in this case, glide insertion or vowel deletion occurs instead of glide formation. The examples are presented in (8).

(8) Optional Glide Insertion or Vowel Deletion

		formal speech	*casual speech*		
a.	/ci+əŋ/	[ci.yəŋ]	[cəŋ]	*[cyəŋ]	'to lose'
	/chi+əŋ/	[chi.yəŋ]	[chəŋ]	*[chyəŋ]	'to hit'
	/po+əŋ/	[po.waŋ]	[paŋ]	*[pwaŋ]	'to see'
b.	/k'æ+əŋ/	[k'æ.yəŋ]	[k'æŋ]	*[k'yəŋ]	'to break'
	/mæ+əŋ/	[mæ.yəŋ]	[mæŋ]	*[myəŋ]	'to weed out'
	/t'e+əŋ/	[t'e.yəŋ]	[t'eŋ]	*[t'yəŋ]	'to build a fire'
	/pe+əŋ/	[pe.yəŋ]	[peŋ]	*[pyəŋ]	'to cut'

In (8), there are two ways to avoid the vowel hiatus; one of them is glide insertion in formal speech and the other is vowel deletion in casual speech.

Glide formation is allowed in (7) while it is not in (8), even though they have the same environment. There are two different motivations of why glide formation is not applied in (8). The first motivation is Obligatory Contour Principle (henceforth OCP). OCP disfavors the appearance of the sequence of identical or similar segments or features within a specific domain (Leven 1973; Goldsmith 1976; McCarthy 1981, 1986). In the data in (8a), Glide formation creates the environment where the sequence of onset cluster, which consists of palatal+palatal /y/ or labial+labial /w/. This cluster is not favored by OCP, which blocks glide formation to suppress the occurrence of onset clusters with similar feature specifications (Kang, 2009, p. 30). Instead of glide formation, deletion strategy is adopted to avoid the vowel hiatus.

However, the examples in (8b) are different from the ones in (8a). The data in (8b) do not create any OCP violation from glide formation. There is another motivation that prevents glide formation from occurring. Unlike (8a), the vowels of the base in (8b) are mid or low vowels which cannot become potential glides. Glide insertion does not require the high feature of the vowel, while glide formation does. Therefore, glide formation cannot be created in (8b) due to the lack of the requirement in vowel feature in the base; instead, vowel deletion occurs.

Another issue regarding the vowel deletion lies in which vowel would be deleted. In the given data above, the base vowel is deleted in (8a), while the suffix vowel is deleted in (8b). In order to explain the difference, we need to identify what motivates vowel deletion. Kang (2010, p. 176) argues that sonority, rather than position (V_1 vs. V_2), plays a

crucial role in the deletion in Korean. The higher the sonority is, the more likely the vowel is to be retained, and vice versa. The sonority scale is presented in (9)[4)]

(9) Sonority Scale (Hogg & McCully, 1987)

Sounds	Sonority Index
Low vowels	10
Mid vowels	9
High vowels	8
Flaps	7
Laterals	6
Nasals	5
Voiced fricatives	4
Voiceless fricatives	3
Voiced stops	2
Voiceless stops	1

As shown in (9), the sonority of the low vowels is the highest and the mid vowels are higher than the high vowels. On the ground that the sonority can affect the deletion of a vowel in the environment of the vowel hiatus, it can be assumed that the high vowel in the base in (8a), with low sonority, undergoes deletion.

On the other hand, all the vowels in the base in (8b) are mid or low. Since the suffix vowel /ə/ is also mid, the deletion of the affix vowel cannot be sufficiently explained by the sonority difference between the two vowels. In this situation, we suggest another motivation for the deletion process: morphological factor of the vowels. Since there is a status difference between segments in stem and ones in affixes (McCarthy & Prince, 1995), the priority of preserving a vowel is the one in the stem or base. Thus, we need to consider both sonority and morphology of the vowel simultaneously for the clearer explanation. There is another vowel deletion which we should consider in (10) as follows:

4) The sonority scale in (9) is the revised version of Hogg and McCully (1987). Regarding the sonority of schwa, even though it is mid vowel, it has lower in sonority than high vowel /i/ (Kenstowicz, 1997; de Lacy, 2002, 2004). However, if we consider intensity of the vowel, /ə/ is greater than /i/ (Lehiste & Peterson, 1959). Therefore, in this paper, sonority scale in (9) will be presented as a way to explain the deletion in the Jeju dialect.

(10) Obligatory Vowel Deletion

/ka+əŋ/	[kaŋ]	*[kaaŋ]	'to go'
/sa+əŋ/	[saŋ]	*[saaŋ]	'to buy'
/sə+əŋ/	[səŋ]	*[səəŋ]	'to stop'
/kənnə+əŋ/	[kənnəŋ]	*[kənnəəŋ]	'to cross'

The examples in (10) show the realization would be the identical vowel sequence across the morpheme boundary as a result of vowel harmony such as [aa] or [əə]. Under the circumstance where the two identical vowels appear, deletion is obligatorily applied. Regarding the deleted vowel, it seems that V_2 is deleted as seen in the previous case in (8b). The following is the summery of vowel deletion in the Jeju dialect.

(11) Vowel Deletion in the Jeju Dialect

a. In the sequence of the identical mid vowels (a.a or ə.ə) at the morpheme boundary, the suffix vowel is obligatorily deleted.
b. If glide formation creates the environment where OCP is violated such as *[chyəŋ] or *[pwaŋ], glide formation is not applied. Instead, the vowel in the base is deleted because of the sonority difference.
c. When the base has a non-high vowel, glide formation is not adopted, since it lacks the high feature for glide formation. In this case, the suffix vowel is deleted due to the morphological factor.

So far, we have observed various strategies applied to fix the vowel hiatus in the process of verbal suffixation in the Jeju dialect. Compared to the standard Korean, the Jeju dialect shows various, complicated strategies in order to resolve vowel hiatus. Keeping the analysis in mind in section 2, we will review the other study on the vowel hiatus resolutions in the Jeju dialect in section 3.

3. Previous Analysis

This section reviews one previous study on the vowel hiatus resolutions in the Jeju dialect. The analysis conducted by Kang (2009) is based on constraints and their ranking framed in Optimality Theory (Prince & Smolensky, 1993; McCarthy & Prince 1995). In

Kang's study, the data of suffixation in the Jeju dialect are divided into three types: one is obligatory glide formation, another is either insertion or formation of glide, and the other is either glide insertion or vowel deletion.

The obligatory glide formation occurs in the environment where in the sequence of (C)V_1V_2. V_1 is a stem-final vowel and V_2 is a conjugational suffix vowel. In this case, the vowel hiatus is fixed by the change of V_1 into its corresponding glide. The relevant ranking of the constraints is as follows:

(12) The Ranking of Relevant Constraints
Onset ≫ Max-IO ≫ Dep-IO

(13) /seu + Aŋ/ → [sewaŋ] 'erect'

/seu + Aŋ/	Onset	Max-IO	Dep-IO
☞ a. se.waŋ			
b. se.u.aŋ	*!*		
c. se.△u.aŋ	*!		*
d. se.aŋ	*!	*	

As shown in (12) and (13), the candidate (a) where the stem-final vowel converts into a glide is chosen as an optimal one which does not violate any constraints.

There is the case where formal and casual speeches are different, such as [oraŋ] 'to come' in formal speech and [waŋ] in casual speech. In this case, the casual speech output is analyzed based on output-to-output constraints. In order to explain a casual speech morpheme, the following constraint is suggested.

(14) A Morpheme Constraint
*Struc(σ): The fewer syllables the output has, the better it is.

The constraint is positioned above Max-OO in casual speech and the ranking of the constraints is presented in (15).

(15) Onset ≫ *Struc(σ) ≫ Max-OO ≫ Dep-OO

The evaluation of this case presented in (16). The input of the casual speech is the output of the formal speech.

(16) [o.raŋ](formal speech output) → [waŋ](casual speech output)

[o.ra ŋ]	Onset	*Struc(σ)	Max-OO	Dep-OO
a. o.ra ŋ	*!	*		
b. o.a ŋ	*!*	*	*	
☞ c. wa ŋ			*	

With the ranking of the constraints, (c) is chosen optimal as seen in (16).

There is another case where either glide insertion or formation is optionally applied. The examples are listed in (17):

(17) Optional Glide insertion or Glide Formation

/k'i+Aŋ/	[k'i.yəŋ]	[k'yəŋ]	'to join'
/k'u+Aŋ/	[k'u.wəŋ]	[k'wəŋ]	'to borrow'

Although compensatory lengthening is not applied in the Jeju dialect, it should be considered to explain (17) since it is usually observed in glide formation in standard Korean. The relative constraint is presented as follows:

(18) Max(μ)-IO/Max(μ)-OO: Moraic weights in an input (or in a formal speech form) has a correspondent in an output (or in casual speech form).

The relevant ranking is given in (19), and the tables for evaluation are in (20) and (21).

(19) Onset ≫ Max-IO/Max-OO, $Max_{(\mu)}$-IO/$Max_{(\mu)}$-OO ≫ Dep-IO/Dep-OO

(20) /k'i+Aŋ/ → [k'i.yəŋ] 'to join'

/k'i_{μ}+A_{μ} ŋ/	Onset	Max-IO	$Max_{(\mu)}$-IO	Dep-IO
a. k'i_{μ}.ə$_{\mu}$ ŋ	*!			
☞ b. k'i_{μ}.y ə$_{\mu}$ ŋ				*
c. k'i_{μ} ŋ		*!	*	
d. k'y ə$_{\mu}$ ŋ			*!	

(21) [kʼi.yəŋ](formal speech output → [kʼyəŋ](casual speech output)

[kʼi$_{\mu}$.yə$_{\mu}$ŋ]	Onset	*Struc(σ)	Max-OO	Max$_{(\mu)}$-OO	Dep-OO
a. kʼi$_{\mu}$.ə$_{\mu}$ŋ	*!	*	*		
b. kʼi$_{\mu}$.yə$_{\mu}$ŋ		*!			
c. kʼə$_{\mu}$ŋ			**!	*	
☞ d. kʼyə$_{\mu}$ŋ			*	*	

(20) and (21) show the selection of the optimal candidate in the formal speech and the casual speech, respectively.

For either glide insertion or vowel deletion OCP plays a crucial role as in (22):

(22) /ci + Aŋ/ → [ciyəŋ]/[cəŋ] *[cyəŋ] 'to lose'
/po + Aŋ/ → [powaŋ]/[paŋ] *[pwaŋ] 'to see'

To explain the data above, the onset cluster created by the glide formation violates OCP. Therefore the related constraint is needed and the relevant constraint and the ranking are presented in (23) and (24) each.

(23) OCP: No onset should include the sequence of either [labial][labial] or [alveopalatal][palatal] in the feature level.

(24) Onset ≫ OCP ≫ Max-IO, Max$_{(\mu)}$-IO ≫ Dep-IO

(25) /ci + Aŋ/ → [ciyəŋ] 'to lose'

/ci$_{\mu}$+A$_{\mu}$ŋ/	Onset	OCP	Max-IO	Max$_{(\mu)}$-IO	Dep-IO
a. ci$_{\mu}$.ə$_{\mu}$ŋ	*!				
☞ b. ci$_{\mu}$.yə$_{\mu}$ŋ					*
c. cə$_{\mu}$ŋ			*!	*	
d. cyə$_{\mu}$ŋ		*!		*	

(26) [ciyəŋ](formal speech output) → [cəŋ](casual speech output)

[ci$_{\mu}$.yə$_{\mu}$ŋ]	Onset	OCP	*Struc(σ)	Max-OO	Max$_{(\mu)}$-OO	Dep-OO
a. ci$_{\mu}$.ə$_{\mu}$ŋ	*!		*	*		
b. ci$_{\mu}$.yə$_{\mu}$ŋ			*!			
☞ c. cə$_{\mu}$ŋ				**	*	
d. cyə$_{\mu}$ŋ		*!			*	

Tables (25) and (26) show that the optimal candidate is successfully selected with the constraints and the ranking. In the analysis of the vowel hiatus in the Jeju dialect in this study, all the data are analyzed with the constraints proposed and the ranking order. However, there are some limitations in this analysis.

Firstly, the division of the constraints for the formal speech and casual speech makes the analysis much more complicated. It is simpler to deal with this issue with just input and output relation rather than output to output corresponding relation.

Secondly, he mentioned that even though compensatory lengthening is an important issue in standard Korean, this is not the case with the Jeju dialect in this paper. However, It make the evaluation more complex to regard the compensatory lengthening. The constraint for the compensatory lengthening is not necessary in the Jeju dialect.

Thirdly, glide formation is blocked due to the OCP, but there is another case as previously seen in (8b). In this case, glide formation does not occur because of the lack of the high feature of the vowel in the base, not because of OCP. Thus, it is not sufficient to clarify the glide formation process in the Jeju dialect.

Finally, regarding the vowel deletion, the account does not provide an analysis to the motivation of vowel deletion. In order to clearly explain the complexity of the vowel deletion process in the Jeju dialect, we need to provide more evidence for which vowel is engaged in the deletion process.

In the following section, we aim to suggest an alternative analysis to resolve vowel hiatus in the Jeju dialect based on the constraint-based theory.

4. An Alternative Analysis

This section provides an alternative analysis for the vowel hiatus resolutions in the Jeju dialect based on the Optimality Theory (Prince & Smolensky, 1993) and Correspondence Theory (McCarthy & Prince 1995).

4.1. Vowel Hiatus Resolution: Glide Formation

There are two different cases for glide formation: one is obligatory and the other is optional. We need three constraints to deal with the analysis of glide formation. The primary constraint for the vowel hiatus is *V.V, which prevents vowel hiatus across the morpheme boundary. This is the trigger constraint so it should be ranked in the highest

position. Ident-IO(place) is also considered for glide formation, because which glide between /y/ or /w/ is chosen to replace the target vowel depends on the place feature of the final vowel in the base. We need *Complex-onset because glide formation results in the onset cluster. The glide substituted or inserted is analyzed as a consonant (Lee, 1982; Gim, 1987; Kim, 1990; Cheon, 2002[5]). Since *Complex-onset should be violated to allow the glide formation, it should be ranked in the lowest position. The definitions of the relevant constraints are presented in (27), and the constraint ranking is presented in (28).

(27) The Constraints for the Glide Formation

a. *V.V

A vowel sequence over a morpheme or the syllable boundary is prohibited.

b. Ident-IO(place)

Correspondents in input and output have identical place features (Kager, 2007: 132).

c. *Complex-onset

Do not have complex onset. (No Cw or Cy)

(28) Ranking for the Glide Formation in the Jeju Dialect

*V.V ≫ Ident-IO (place) ≫ *Complex-onset

(29) /pi+əŋ/ → [pyəŋ] 'to be cut'

/pi+əŋ/	*V.V	Ident-IO (place)	*Com-ons
a. pi.əŋ	*!		
b. pwəŋ		*!	*
☞ c. pyəŋ			*

The evaluation in the table (29) selects the candidate (c) as optimal though it only violates *Complex-onset, which is ranked lowest. The optimal output indicates that a newly formed glide and the onset consonant create an onset cluster, and the post-consonantal glide before a nucleus belongs to the onset.

5) In standard Korean, glides were treated as vowels-onglide or off glide. However, it is currently argues that glides in verbal suffixation are adopted to avoid an onsetless syllable by many. This means that the glides are treated as a consonant. Therefore, we will see the glide inserted or formed as a consonant in the onset position not a vowel as a part of the nucleus.

4.2. Vowel Hiatus Resolution: Glide Insertion

Glide insertion is the way of formal speech. This strategy is inserting a glide to break up the sequence of vowels across the morpheme boundary. To explain the glide insertion, we need two more constraints along with *V.V. One of them is Agree-VG(place) which controls the quality of a glide inserted, and reflects similar feature specifications between a stem-final vowel and an epenthetic glide. This markedness constraint dominates the faithfulness constraint, Dep-IO. This constraint ensures the insertion of glide so this constrains should be placed in the lowest position. The definition of these constraints and the ranking are presented as in (30) and (31):

(30) Constraints for Glide Insertion

a. Dep-IO
   Output segments or features must have input correspondents.
   ('No epenthesis')

b. Agree-VG(place)
   A glide and a preceding vowel have similar place feature specifications.

(31) Ranking for the Glide Formation and Insertion for the Jeju Dialect
*V.V ≫ Agree-VG(place) ≫ Dep-IO

(32) /kʻi+əŋ/ → [kʻi.yəŋ] 'to join'

/kʻi+ə ŋ/	*V.V	Ag-VG(place)	Dep-IO
a. kʻi.ə ŋ	*!		
☞ b. kʻi.yə ŋ			*
c. kʻi.wə ŋ		*!	*

As we see in (32), candidate (b) is optimal. The candidate satisfies the high-ranked constrains *V.V and Ag-VG(place), in which palatal glide /y/ and high front vowel /i/ have the same place feature, and only violates the lowest ranked constraint Dep-IO.

4.3. Vowel Hiatus Resolution – Vowel Deletion

There are three different cases for vowel deletion. One is the case where the identical vowels appear at the morpheme boundary such as /a.a/ or /ə.ə/. In this environment, only deletion strategy is applied; thus, Max-IO, Max-Stem, and *V.V are suggested. In this

scenario, Max-IO should be ranked lowest due to the deletion of suffix vowels, and the interaction between Max-IO and Max-Stem plays an important role.

In the second case, glide formation creates the OCP violation. Thus, glide formation does not occur. Instead, one of the two vowels undergoes deletion. Vowel deletion of this type is motivated by sonority difference. A vowel with a higher sonority is preferred to the one with a lower sonority. To reflect this case, *Low-Son(vowel) is suggested. It should dominate Max-IO to ensure the deletion of a vowel with a lower sonority than the other. OCP(CG) should be ranked higher than *Low-Son(vowel). There is no ranking order between *V.V and OCP(CG), because both of them have different roles, and those roles are exclusive to each other.

The third case of deletion is as follows: if the base has a mid or low vowel, the suffix vowel is deleted because of the different status between stem and suffix. In this case, Max-Stem and Ident-IO(height) will be used. Ident-IO(height) should be ranked higher than Max-Stem to choose the vowel to be deleted as well as to suppress glide formation of the mid-low vowel. The definitions of the constraints for the vowel deletion are listed in (33) and the relevant rankings are in (34).

(33) The Constraints for the Vowel Deletion in the Jeju Dialect

a. Max-IO
   Every segment in the input has its correspondent in the output.
b. OCP(CG)
   Consecutive segments with (similar) features are not allowed.
c. *Low-Son(vowel)
   The vowel with lower sonority is deleted across the morpheme boundary.
d. Ident-IO(height)
   Input and output correspondents are identical in their height feature specifications.
e. Max-Stem
   Every segment of the stem in the input has its correspondent in the output.

(34) Ranking for the Deletion in the Jeju Dialect

a. *V.V ≫ Max-Stem ≫ Max-IO
b. *V.V, OCP(CG) ≫ *Low-Son(vowel) ≫ Max-IO
c. *V.V ≫ Ident-IO(Height) ≫ Max-Stem ≫ Max-IO

(35) /ci+əŋ/ → [cəŋ] 'to lose'

/ci+əŋ/	*V.V	OCP(CG)	*Low-Son(v)	Max-IO
a. ci.əŋ	*!		*	
b. cyəŋ		*!		
c. ciŋ			*!(j)	*
☞ d. cəŋ				*

The candidate (d) is chosen as optimal, as it only violates Max-IO which is ranked lowest. Candidate (c) violates *Low-Son(v) because of the high vowel /i/ with low sonority, even though it does not violates OCP(CG) or *V.V. This shows that which vowel is deleted is affected by the sonority value. The sonority of the high vowel /i/ is lower than mid vowel /ə/. That's why (d) is chosen as optimal. *Low-Son(v) plays a crucial role in this analysis.

(36) /mæ+əŋ/ → [mæŋ] 'to weed out'

/mæ+əŋ/	*V.V	Ident-IO(h)	Max-Stem	Max-IO
a. mæ.əŋ	*!			
b. myəŋ		*!		
c. məŋ			*!	*
☞ d. mæŋ				*

While candidate (c) is crossed out since it violates Max-Stem, relatively higher than Max-IO, candidate (d) is optimal as it only violates Max-IO, satisfying the higher constraints. The vowel /æ/ is the part of base, so Max-Stem is very important in this evaluation.

4.4. Vowel Hiatus Resolution – All in One

Up to now, we have examined each case of the strategies for vowel hiatus resolutions. Even though they are different phonological processes, all these strategies are for the same goal, which is to avoid the vowel hiatus in the Jeju dialect. Therefore, we need to integrate all the constraints to reflect that each strategy has the same goal. Though it might be complex to list all the constraints in one constraint ranking and evaluate each case, it is worth doing it. All the constraints for the vowel hiatus in the Jeju dialect are

presented in (37) and these are presented in the previous sections.

(37) Constraints for vowel hiatus in the Jeju dialect

a. *V.V

A vowel sequence over a morpheme or syllable boundary is prohibited.

b. OCP(CG)

Consecutive segments with (similar) features are not allowed.

c. Ident-IO(place)

Correspondents in input and output have identical place features (Kager2007: 132).

d. Agree-VG(place)

A sequence of vowel and glide across the syllable boundary is identical in the place feature specifications.

e. *Low-Son(vowel)

A vowel with higher sonority is preferred in a sequence of vowels.

f. Ident-IO(height)

Input and output correspondents are identical in their height feature specifications.

g. Max-Stem

Every segment of the stem in the input has its correspondent in the output.

h. Dep-IO

Output segments or features must have input correspondents. ('No epenthesis')

i. Max-IO

Every segment in the input has its correspondent in the output.

j. *Complex-onset

Do not have the complex onset. No Cw or Cy (Kang, 1998)

Again, *V.V is the trigger constraint, so it should dominate all the other constraints involved. The OCP constraint should be ranked higher than Ident-IO(place) in order not to allow glide formation. There is another constraint for suppressing glide formation. Ident-IO(height) is to prevent mid-vowel from glide formation, and this constraint is also

very specific, so it should be ranked higher than the violable constraints. As we have seen in all the strategies, some constraints are related to the glide formation, others are to glide insertion and the others are to vowel deletion. There is no ranking order between the constraints, which are in the different categories. More specifically, there is no ranking between Ident-IO(place), related to glide formation, and Agree-VG(place) for glide insertion; and there is no ranking order among *Complex-onset for glide formation, Dep-IO for the glide insertion, and Max-IO for the vowel deletion. Since these constraints are violable, they should be ranked in the lowest position. As for the deletion, even though the vowel in the suffix is usually deleted, the stem vowel can be deleted when the vowel has lower sonority than the suffix vowel. We can assume that suffix vowel deletion is more general than stem vowel deletion. Based on this assumption, *Low-son(vowel) for deleting the stem vowel should be ranked higher than Max-Stem. *Complex-onset for the glide formation, Dep-IO for glide insertion, and Max-IO for vowel deletion are the constraints that are violable to ensure the related phonological issues. Therefore, they should be ranked in the lowest position.

Keeping all the considerations in mind, the final constraint ranking order for vowel hiatus resolutions in the Jeju dialect is suggested as in (38).

(38) Constraints Ranking for the {-əŋ} Suffixation in the Jeju dialect[6)]
V.V, OCP(CG), Ident-IO(height) ≫ Ident-IO(place), Agree-VG(place) ≫ *Low-Son(vowel) ≫ Max-Stem ≫ *Complex-onset, Dep-IO, Max-IO

(39) Obligatory Glide Formation - /poi+əŋ/ → [po.yəŋ] 'to be seen'

/poi+ə ŋ/	*V.V	OCP (CG)	Id (h)	Id (pl)	Ag (pl)	*Low	Max -st	*Com-ons	Max-IO	Dep-IO
a. po.i.ə ŋ	*!*					*(j)				
b. po.ə ŋ	*!						*		*	
c. po.wə ŋ				*!						*
☞ d. po.yə ŋ										

Table (39) shows that candidate (d) is chosen as an optimal form because it does not violate any constraint. Candidates (a) and (b) mainly violate the highest ranked constraint *V.V. (c) crucially violates Ident-IO(place). /i/ and /w/ do not agree in the place feature.

6) Glide formation and deletion strategies are related to the syllable shortening, so the constraint such as Indent-[+syll] will be needed. However, the optimal candidate is chosen without it. Therefore, in this analysis, the constraint related to the syllable will not be used.

(40) Optional Glide Insertion - /nu+əŋ/ → [nu.wəŋ] 'to lie down'

/ nu+ə ŋ /	*V.V	OCP (CG)	Id (h)	Id (pl)	Ag (pl)	*Low	Max -st	*Com-ons	Max-IO	Dep-IO
a. nu.ə ŋ	*!					*(u)				
b. nu ŋ						*!			*	
c. nə ŋ							*!		*	
d. nu.yə ŋ					*!					*
e. nyə ŋ				*!				*		
☞ f. nu.wə ŋ										*

Candidate (f) in (40) is chosen as an optimal candidate, only violating Dep-IO, the lowest ranked constraint. Candidate (a) is crossed out, violating the highest ranked constraint *V.V. Candidates (b) and (c) are not chosen. (b) violates *Low-son(vowel) and (C) Max-Stem. Candidate (d) fails to satisfy Agree-VG(place).

(41) Optional Stem Vowel Deletion - /ci+əŋ/ → [cəŋ] 'to lose'

/ ci+ə ŋ /	*V.V	OCP (CG)	Id (h)	Id (pl)	Ag (pl)	*Low	Max -st	*Com-ons	Max-IO	Dep-IO
a. ci.ə ŋ	*!					*(i)				
b. ci ŋ						*!			*	
☞ c. cə ŋ							*		*	
d. cyə ŋ		*!						*		
e. ci.wə ŋ					*!			*		*
f. cwə ŋ				*!				*		

As the constraint *Low-son(vowel) is crucial in this case, the candidate (b) is crossed out, while the candidate (c) is chosen as the optimal one, satisfying *Low-son(vowel), while violating Max-Stem. The candidate (d) violates OCP(CG) crucially, and it shows that glide formation is blocked by OCP(CG) and it lead to the deletion of the vowel whose sonority is lower than the other.

(42) Optional Suffix Vowel Deletion - / pe+əŋ / → [peŋ] 'to be cut'

/ pe+ə ŋ /	*V.V	OCP (CG)	Id (h)	Id (pl)	Ag (pl)	*Low	Max -st	*Com - ons	Max-IO	Dep-IO
a. pe.ə ŋ	*!									
b. pə ŋ							*!		*	
☞ c. pe ŋ									*	
d. pyə ŋ			*!					*		
e. pe.wə ŋ					*!					*
f. pwə ŋ		*!		*				*		

In the case of suffix vowel deletion, *Low-son is not relevant because there is no sonority difference between the vowel in the stem and in the suffix. In this case, Max-Stem is the constraint for selecting the optimal candidate. Therefore, candidate (c) is chosen, only violating a relatively low-ranked Max-IO constraint, while (b) is not as it violates Max-Stem.

So far, we have seen the resolution of vowel hiatus in the Jeju dialect based on constraint-based analysis. Even though there are so many considerations to be taken into, and it makes the constraints complicated, we evaluate all the data related to the vowel hiatus resolutions with a single constraint ranking order.

5. Conclusion

In this study, we examined the vowel hiatus resolutions in the Jeju dialect. To avoid the vowel hiatus in verbal suffixation, three different strategies - glide formation, glide insertion, and vowel deletion – are adopted.

For the glide formation, there are two different cases. One of them is obligatory, where V_1 is onsetless syllable in the base, and V_2 is the vowel in the suffix, or V_1 and V_2 are in the base followed by V_3 in the suffix. The other case of glide formation occurs when the two vowels meet at the morpheme boundary. For glide formation, *V.V, Ident-IO(place), and *Complex-onset are used. For the case of glide insertion, Agree-VG (place), and Dep-IO are mainly adopted to resolve the vowel hiatus. When it comes to vowel deletion, there are three different cases, one of which is the obligatory case where

identical vowels come in a line at the morpheme boundary. Another case is where OCP affects deleting the vowel whose sonority is lower than the other instead of glide formation. The last case is the one where the stem vowel is not a high vowel. For all the cases, we used the constraints, such as OCP(CG), Ident-IO(Hight), *Low-son(vowel), Max-Stem and Max_IO.

From this analysis, we can draw several phonological implications. First of all, the vowel hiatus resolutions in the Jeju dialect are various as seen so far. All the strategies require different rules, such as deletion rules, glide formation, or insertion rules. The rules have seemingly different roles; however, all of them are for only one goal, which is to avoid vowel sequences at the morpheme boundary. With rule-based analysis, it would not be possible to explain vowel hiatus resolutions, because all the strategies should be explained differently. With OT analysis, however, we can successfully explain the vowel hiatus resolution with a single constraint ranking.

Secondly, the Jeju dialect shows different aspects from standard Korean in vowel hiatus resolution. One is whether vowel hiatus is permitted or not. While standard Korean permits vowel hiatus except for the obligatory glide formation case, the Jeju dialect does not allow it in any circumstances. In the case related to the OCP, standard Korean also adopts vowel deletion obligatorily, whereas the Jeju dialect uses another strategy-glide insertion. It is concluded that unlike standard Korean, the Jeju dialect does not allow vowel hiatus in any cases, and in order to avoid it, glide insertion is also used with glide formation and deletion.

Lastly, when it comes to the constraints for the speech mode, it is not necessary to deal with formal and casual speech separately. As the formal and casual speeches are the variations of speech mode, it cannot be seen that the casual speech is derived from the formal speech. Therefore, it is reasonable to evaluate the data with a single constraint regardless of the speech mode. Both the formal and informal speeches can be evaluated in the input and output relation, not OO-corresponding.

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