Coda Cluster Simplification in Korean

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Seo, Hong-Won. (2015). Coda Cluster Simplification in Korean. *The Linguistic Association of Korea Journal* 23(3), 17-29. The goal of this paper is to investigate some aspects of coda cluster simplification in Korean within the framework of Optimality Theory. Until now, although many studies have been conducted on coda cluster simplification in Korean, satisfactory answers were not given about an exception pattern. In the previous analyses, which consonant is retained or deleted in the output is determined based on whether a consonant is allowed in the coda or not. When dealing with dialectal variations, the interaction of two constraints, CodaSon and Align-R plays a crucial role in choosing the optimal form. However previous analyses have some drawback, in that they cannot explain the stem /ilp^h/ 'cite' under their constraint ranking. Accordingly, we suggest the specifically decomposed constraints related to Max(place) and their ranking hierarchy, which have some advantages over the previous analyses. That is, the more specified the place of a consonant is, the less that consonant is deleted. In this vein, the most preferred target for the deletion is pharyngeals, and then they are followed by coronals.

Key Words: coda cluster simplification, consonant deletion, Max(place), neutralization, Optimality Theory

1. Introduction

Until now, several studies on Coda Cluster Simplification (hereafter CCS) in Korean have been conducted from the various points of view such as phonetically-driven Optimality Theoretic account (Jun 1995, Cho 1999) and the interaction between CCS and Neutralization and the following consonant effect (Kim 2002). In their analyses, some dialectal variation can be also dealt with by way of reranking two lower ranked constraints.

In Korean, consonant clusters are not allowed within a syllable, which results in CCS in order to comply with the well-formed syllabic structure. In particular, CCS in Korean refers to a process in which a coda cluster is reduced to a single consonant when two consonants underlyingly exist in the coda position. For example, /kaps/ 'price' is simplified as [kap] by deleting the second consonant of the coda cluster. However, when a coda cluster is followed by a vowel as in /kaps+i/ 'price+nominative marker', it should be fully represented, and its second consonant is resyllabified into the onset of the following syllable, as shown in [kap.si].

However, under the circumstance that CCS in Korean should be applied to coda clusters, which consonant will survive or be deleted does not seem to be straightforward. Thus, Kim (2002) tries to classify the data into two groups: group 1 clusters consisting of a permissible coda and an impermissible coda, and group 2 clusters composed of two permissible codas. According to Kim's analysis, group 1 clusters allow only permissible consonants in the coda position to be retained in the surface form, while those not permitted are eliminated. In contrast, in group 2, sonority and peripherality related to the place feature have a decisive role in selecting the deleted consonant. However, her analysis has some drawback and limitation in that an exceptional case, /ɨlp^{h}/ 'cite' cannot be appropriately dealt with. She tries to approach this issue from a diachronic perspective, and she argues that this stem is lexically marked and realized as [ɨp] via undergoing CCS and neutralization.

However, we note that all the deleted consonants in CCS in Korean are confined either to pharyngeals or to coronals. In particular, a pharyngeal sound, /h/ is the weakest of non-vowels in Korean (Kim-Renaud, 1975) and lacks oral place in underlying representation (McCarthy, 2007), resulting in its frequent deletion in the intervocalic position. Lombardi (2002) also adds that pharyngeals are the least marked with respect to place. In similar to this perspective, Ladefoged (2000) argues that coronals are less marked than dorsals and labials, as well. In this vein, Jun (1995) suggests a production hypothesis requiring that speakers make more effort to preserve the articulation of speech sound with powerful acoustic cues, whereas they relax in the articulation of sounds with weak cues. Considering this point, the less marked pharyngeals and coronals can be deleted with ease, whereas other sounds can be retained in the coda

position. Thus, in our analysis we will present how the faithfulness constraints, Max-IO (place) along with markedness constraints, Coda Condition and *Complex can play an important role in selecting the optimal output. When it comes to the constraint ranking hierarchy, constraints obligating to preserve more acoustically salient or more marked segments are higher ranked than those to preserve less acoustically salient or less marked segments.

The structure of this paper is organized as follows. In section 2, we will present the data related to CCS in Korean and describe how CCS can be applied to. Section 3 will provide an analysis on CCS in Korean within the framework of Optimality Theory (henceforth, OT) (Prince & Smolensky 1993, McCarthy & Prince 1995) and in section 4, we'll summarize this study and provide some implications.

2. Data and Description

Although a complex coda underlyingly exists in Korean, the syllable structure maximally permitted in the surface form in Korean is CGVC, resulting in deleting a segment of clusters in underlying representation. Thus, if two consonants occur in the coda position, it is imperative that they be reduced to a single consonant depending on the legitimate syllable condition of Korean.

Let us consider how CCS in Korean can be applied. As given in (1), /kaps/ is realized as [kap] by eliminating the second consonant when it occurs alone, before a consonant, or before a word or compound boundary (Sohn 1999: 170). However, when a cluster precedes a vowel, it is fully realized and undergoes resyllabification as the onset of the following syllable without having any consonant deleted. In contrast to (1a), when /lk/ is followed by a consonant, it shows a totally different pattern that the second consonant, not the first one, is only retained as in /ilk+ta/ given in (1b).

(1) a. /kaps/ → [kap] 'price'
/kaps+əc^{h}i/ → [ka.bə.c^{h}i] 'price+worth'
/kaps+kwa → [kap.k'wa] 'price+and'
/kaps+i/ → [kap.si] 'price+nominative'

b. /ilk+ta/ → [ik.t'a] 'read+declarative'
/ilk+ɨl/ → [il.gɨl] 'read+objective'

Sohn (1999: 170) states that only 11 consonant clusters underlyingly exist in the syllable final position of morpho-phonemic forms in Korean. In order to satisfy the well-formedness of the Korean syllable structure, the type of segments consisting of the cluster play a crucial role in determining which consonant survives or is deleted. Let us consider the following examples presented in (2), all of which are from Sohn (1999):

(2)	a.	p<s>[1]	/kaps/	→ [kap]	'price'
		k<s>	/saks/	→ [sak]	'wage'
		l<t^h>	/halt^h/	→ [hal]	'lick'
		l<s>	/kols/	→ [kol]	'blind lane'
		l<h>	/k'ɨlh/	→ [k'ɨl]	'boil'
		n<c>	/anc/	→ [an]	'sit'
		n<h>	/manh/	→ [man]	'many'
	b.	<l>p	/palp/	→ [pap]	'step on'
		<l>k	/ilk/	→ [ik]	'read'
		<l>m	/kulm/	→ [kum]	'starve'
	c.	<l>p^h	/ɨlp^h/	→ [ɨp]	'recite'

Even though which consonant remains in the surface form seems arbitrary, Kim (2002) indicates that CCS in Korean can be largely generalized into two ways in (3):

(3) Cluster Simplification (Kim 2002: 87)[2]
  a. Group 1 clusters (Coda+*Coda): Coda survives and *Coda deletes.
  b. Group 2 clusters (Coda+Coda): The first consonant deletes and the second one survives.

First, in group 1 clusters consisting of a permissible consonant and an impermissible one in the coda position as given in (2a), only consonant not violating Coda Condition can survive as it does not have to undergo a process of neutralization.

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1) The symbol <> indicates that the segment in the <> should be deleted.
2) Coda indicates a consonant allowed in the coda position, while *Coda does a consonant not permitted in the coda.

In contrast, in case of group 2 clusters composed of two licit codas including a sonorant, the second consonant survives at the expense of deleting the first one, although both consonants do not violate the restriction on coda condition in Korean[3]. Kim (2002) adds that which consonant survives is determined by the order of consonants. However, based on the fact that the second pattern has a sonorant, /l/ in common, some scholars assume that some sonority-driven factor might have a significant effect on choosing the remaining segment. Actually, Iverson and Lee (1994) state that segments with higher sonority are more often preferred than those with lower sonority in the coda. It is also supported by Yavas (2011: 153) that minimum descent in sonority is the most unmarked or expected sequencing from the nucleus to the coda, whereas maximum rise in sonority is the most preferred sequencing from the onset to the nucleus. From this viewpoint, the target of the coda cluster to be deleted would be a consonant with lower sonority.

However, the results do not support what we expected in that the segments with higher sonority are deleted in the coda position. To deal with this issue, Kenstowicz (1994) and Iverson & Lee (1994) try to explain these data by using the constraint, Parse-Place requiring that when given a choice, a more salient consonant be parsed. Based on peripherality posited in the feature geometry subordinate to place, coronals are unspecified for all place nodes, which makes coronals assimilate by taking on the qualities of labials and velars and deleted more frequently than other segments. Considering this factor, in case of coda clusters consisting of a coronal and a labial or a dorsal, it is predicted that the coronal sound will be more likely to be deleted.

Lastly, the cluster /lp^h/ is expected to be realized into [l], in that /p^h/ is not possible in the coda position. However, [p], not [l], is attested by undergoing the neutralization process of /p^h/ into [p]. In order to deal with this problematic

3) Kim (2002) states that when applying CCS to group 2 clusters, dialectal variation occurs between the Standard Korean and the Kyungsang dialect. For example, /hi̱lk/ 'soil' is realized as [hi̱k] and [hi̱l] in the Standard Korean and in Kyungsang dialect, respectively. She tries to demonstrate dialectal variations by reranking two low-ranked constraints, CodaSon and Align-R. Refer to Kim (2002) concerning the ranking hierarchy.

a. CodaSon: In syllable codas, parse sonorant segments. (Iverson and Lee 1994)

b. Aligh-R: Align the right edge of a stem with the right edge of a syllable,. (McCarthy & Prince 1993)

issue, Kim (2002) indicates that the verb stem /ɨlp^h/ 'cite' is only one lexical item containing /lp^h/ and it can be handled as a lexically marked form from the diachronic perspective.

However, for the analysis of more systematic and unitary explanation we might need to reconsider which consonants are deleted based on the place of articulation of each segment in coda clusters. Let us reconsider the following clusters given in (4):

(4) a. l<h>, n<h>
b. p<s>, k<s>, <l>p, <l>k, <l>m, <l>p^h
c. l<t^h>, l<s>, n<c>

Note that the consonants which are deleted with respect to place are limited either to pharyngeals or to coronals. In particular, the most preferred target of deletion processes is /h/ that lacks oral place in underlying representation, and then is followed by coronals. Compared with other place- specified consonants, pharyngeals can be classified as the least marked place, and coronals are less marked place than other labials and dorsals. Thus, we argue that the less marked the consonant is, the more frequently it is deleted. That is, pharyngeals without oral place and coronals underspecified for place are more likely to be deleted, while those specifically marked by peripheral place features like dorsal or labial are retained in the coda position. This prediction seems to be correct since the segments to be deleted are /h/ or coronals, as shown in (4a) and (4b), respectively. However, in case of clusters consisting of two coronals, another important reason other than place feature, Coda Condition plays a decisive role in choosing a remaining segment. It means that a consonant with no violation of Coda Condition is retained without the need of going through neutralization, as given in (4c). This attempt to account for the data is more convincing than the previous analyses in that even any exceptional case like /ɨlp^h/ can be easily handled.

In the next section, we will consider how CCS in Korean can be dealt with within the framework of Optimality Theory.

3. An Analysis of CCS in Korean

In this section, we will provide how CCS in Korean can be dealt with based on Correspondence Theory (McCarthy & Prince, 1995). The first two markedness constraints that are employed to satisfy the legitimate syllabic structure in Korean are as follows:

(5) a. CodaCon
Only seven consonants /p, t, k, m, n, ŋ, l/ are allowed in the coda position.
b. *Complex
More than one consonant association to any syllable position is prohibited.

Both CodaCon and *Complex are the undominated constraints in order to comply with the phonological realization in Korean. It means that consonant neutralization or deletion must inevitably be applied to words violating CodaCon and *Complex, as repair strategies to eliminate illicit clusters and to meet the condition on Coda in Korean.

However, an effort to satisfy *Complex mentioned above entails that an input segment must be deleted in the output form. It incurs a violation of faithfulness constraint, Max-IO given in (6) requiring that an input segment have its correspondence segment in the output form.

(6) Max-IO
Input segments must have output correspondents.

When we account for CCS in Korean, we should consider the following question as a remaining issue: which segment will remain and which one will be deleted? As stated earlier, the less marked the consonant is with respect to place feature, the more it is deleted. In this vein, the targets to be foremost deleted are pharyngeals and coronals. Thus, we will adopt the specifically decomposed constraints relativized to each place, following Hume (2003) and Bradley (2006), who argue that place constraints can be freely rankable

depending on languages and dialects. Of course, their arguments show a different asymmetric pattern from a universally ranked hierarchy *Dorsal, *Labial》 *Coronal 》*Pharyngeal, suggested by Prince & Smolensky (1993) and Lombardi (2002). However, as Bradley (2006) points out in the analysis of neutralization in stop-lateral clusters in English, since velar stops are allowed before laterals, but coronal stops are not, this pattern can be only captured with the help of the ranking of Max(Dor)》 Max(Cor). Thus, we will adopt the decomposed Max-IO constraints in (7) and their ranking is as follows:

(7) Max-IO (Place) constraint ranking
Max(Dor), Max(Lab)》 Max(Cor)》 Max(Pharyn)

The dominant Max(Dor) and Max(Lab) keep dorsals and labials from being deleted in CCS in Korean, while the lower ranked Max(Pharyn) and Max(Cor) permit pharyngeals and coronals to be more omitted than specifically place-feature marked dorsals and labials.

Finally, the lower ranked constraints Ident-IO(Laryngeal) and Ident-IO(Continuant) play a relatively less important role in selecting the optimal output. As shown in the example of [ɨp] from /ɨlp^{h}/ 'cite', although it incurs a violation of Ident-IO(Lar) lower ranked than Max(Dor), [ɨp] as an optimal output, rather than [ɨl], can be obtained by undergoing neutralization as a last resort to avoid a violation of CodaCon.

(8) a. Ident-IO(Larnygeal)
Correspondents have identical laryngeal specifications.
b. Ident-IO(Continuant)
Correspondents have identical continuant specifications.

Coda Cluster Simplification in Korean can be dealt with under the following constraint ranking:

(9) Constraint ranking in CCS in Korean
CodaCon, *Complex 》Max(Dor), Max(Lab) 》Max(Cor) 》 Max(Pharyn) 》Ident-IO(Laryn), Ident-IO(Cont)

As illustrated in (9), two undominated constraints, CodaCon and *Complex cannot be violated in Korean, and specific Max(place) can play a crucially significant role in choosing the optimal output among candidates, as well.

Let us now consider how CCS in Korean can be applied in the following tableaux:

Tableau 1. /k'ɨlh/ → [k'ɨl] 'boil'

/k'ɨlh/	Coda Con	*Complex	Max (Dor)	Max (Lab)	Max (Cor)	Max (Pharyn)	Ident-IO (Cont)
☞a. k'ɨl						*	
b. k'ɨh	*!				*		
c. k'ɨt					*!		*
d. k'ɨlh	*!	*!					

As illustrated in Tableau 1, in case of a coda cluster consisting of a coronal and a pharyngeal the retained segment should be a coronal. Both candidate (b) and (d) should be first eliminated, as each violates CodaCon. Candidate (d) also violates another undominated constraint *Complex. Two remaining candidates (a) and (c) satisfying the legitimate syllable structure of Korean are evaluated by the next lower ranked constraints Max(Cor) and Max(Pharyn). Although the former violates Max(Pharyn) minimally, it is chosen as the optimal output. On the contrary, candidate (c) is ruled out as it incurs a violation of Max(Cor).

Let us now turn to a coda cluster including a coronal regardless of its order. As mentioned earlier, we can predict that a coronal will be deleted, while other segments such as a dorsal or a labial will survive in the optimal output. The tableau is presented below:

Tableau 2. /kaps/ → [kap] 'price'

/kaps/	Coda Con	*Complex	Max (Dor)	Max (Lab)	Max (Cor)	Max (Pharyn)	Ident-IO (Cont)
☞a. kap					*		
b. kas	*!			*			
c. kat				*!			*
d. kaps	*!	*!					

Candidate (b) is ruled out by fatally violating CodaCon, and candidate (d) is also removed by simultaneously contravening undominated constraints, CodaCon and *Complex. Candidate (c) is also eliminated by deleting a labial instead of a coronal. Accordingly, candidate (a), which incurs the least expensive violation is chosen as an optimal output.

However, as given in Tableau 3, in case of a coda cluster comprising two coronals, Ident-IO(Cont) militating against the neutralization of a coda emerges as a decisive constraint in choosing the optimal output. Although both candidates (a) and (c) violate Max(Cor) in parallel, candidate (a) without the need of undergoing neutralization can be selected as a winner.

Tableau 3. /kols/ → [kol] 'blind lane'

/kols/	Coda Con	*Complex	Max (Dor)	Max (Lab)	Max (Cor)	Max (Pharyn)	Ident-IO (Cont)
☞a. kol					*		
b. kos	*!				*		
c. kot					*		*!
d. kols	*!	*!					

Finally, even when evaluating /ɨlp^h/ 'cite', which has been dealt with as an exceptional case, the additional tableau below shows that it can be accounted for by the constraints and ranking which we suggest without any difficulty.

Tableau 4. /ɨlp^h/ → [ip] 'cite'

/ɨlp^h/	Coda Con	*Complex	Max (Dor)	Max (Lab)	Max (Cor)	Max (Pharyn)	Ident-IO (Laryn)
a. ɨl				*!			
b. ɨp^h	*!				*		
☞c. ɨp					*		*
d. ɨlp^h	*!	*!					

The strategy to minimize the ill-formed structure in Korean causes CodaCon and *Complex to be high placed in the constraint ranking, resulting in the removal of candidates (b) and (d). Next, as candidate (a) deleting a labial incurs the fatal violation of Max(Lab) it is also eliminated. Thus, candidate (c) can be selected as

a winner of this tableau. According to Kim's generalization about cluster simplification (2002), the cluster /lp^h/, consisting of a permissible coda and an impermissible coda is expected to be realized as [l] in the output, in that a consonant allowed in the coda can survive. It is revealed that her generalization produces the totally different result from the actual output. In order to avoid this issue, she tries to refer to this stem as an exceptional case based on Lee's diachronic explanation (1997). Accordingly, we note that our suggestion to analyze CCS in Korean under the specifically decomposed Max(Place) constraint ranking is more persuasive than the previous analysis.

These tableaux illustrated earlier can be summarized as follows: Whatever place of articulation is specified at the lexical level will reach the surface level. That is, the more specified the place feature of a consonant is in the input, the less it is deleted in the output after applying CCS in Korean. Without considering the constraint interaction between CodaSon and Align-R, we can account for all simplification of coda clusters in Korean without any exception.

The following section will summarize the analyses of this study and present some implication.

5. Conclusion & Implication

In this study we have analyzed CCS in Korean, which is obligatorily required to comply with the well-formed syllable structure in Korean. A few previous analyses focused on whether or not a consonant is a licit segment allowed in the coda position. In particular, Kim (2002) classifies coda clusters into two groups: Coda+*Coda and Coda+Coda. In case of a Coda+*Coda cluster, only a permitted segment is retained in the coda; otherwise it is deleted. On the contrary, when it comes to a cluster consisting of Coda+Coda, the first consonant is deleted and the second one survives in Standard Korean. In addition, she tries to explain some dialectal variations including Kyungsang Korean by a way of reranking two low-ranked constraints, CodaSon and Align-R. However, her analysis cannot appropriately account for /ɨlp^h/ 'cite', and [ɨl] is expected to be derived differently from the actual output, [ɨp]. In order to resolve this issue, she views this stem as a lexically marked exceptional case hypercorrected in the

transition period into Modern Korean, adopting Lee (1997).

However, we have shown that the explicitly decomposed Max constraints can readily clarify CCS in Korean without any exceptional case. Their ranking is as follows: Max(Lab), Max(Dor) ⟫ Max(Cor) ⟫ Max(Pharyn). According to the degree of markedness related to Place feature, the more marked a segment is, the less it is deleted, and vice versa. Thus, pharyngeals tend to be deleted at the cost of preserving other segments, and coronals immediately follow. On the contrary, labials and dorsals, specified for the place, are not likely to be deleted in CCS in Korean.

In conclusion, this study has some advantages over the previous analyses in that an exceptional case such as /ɨlp^{h}/ 'cite' can be handled within the framework of OT and the decomposed Max(Place) constraints can account for CCS in Korean without the constraints Align-R and CodaSon.

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