Cumulative Constraint Effects in Korean Consonant Simplification

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[Abstract]

This paper argues that multiple lower ranked constraints can make up for violation of a high-ranked constraint based upon Korean Consonant simplification. This kind of process is observed in the devoicing of German, Dutch and Polish. Korean does not allow any consonant complex in the coda. There are some constraints for the proper consonant selection in the consonant clusters. Although their rankings are strict, the lower ranked combination of Place and Neutralization surpasses the ranking of Coda Condition. This approach chooses the proper coda in the Korean consonant clusters and shows more plausible explanation in the consonant simplification.

Key Words : Optimality Theory, Hierarchical ranking, Effects of constraint combination, Constraint reranking, Devoicing, Korean consonant simplification,

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Underspecification

1. Introduction

The purpose of this paper is to argue that multiple lower ranked constraints can make up for violation of a high-ranked constraint based upon Korean Consonant simplification. According to Optimality Theory (OT) (Prince and Smolensky, 1993/2004), relative well-formedness is decided by the hierarchical ranking of the constraints. Constraints operate in a dominance hierarchy, which allows the priority of higher-ranking constraints over lower ranking constraints. However, this paper argues that a candidate with two violable constraints can surpass the candidate with only one violable higher-ranked constraint. This suggest that each constraint has its own constraint weight and the constraints may have the hierarchical ranking, but the combined constraints can have heavier weight than a higher ranked constraint. It is natural that the heavier constraints are highly ranked although each constraint has the hierarchical ranking. In addition, a phonological process can be described with less rules than the traditional approach when the combined constraints are used. Thus, this paper at first observes the phonological processes of the combined constraints in the languages such as German, Dutch and Polish, and shows the consonant selection in the coda clusters in Korean.

2. Combined Constraints in Devoicing

Constraints play an important role to choose an optimal output among candidates. Optimality Theory is a constraint-based theory of phonology and has five main components: input, output, generator (GEN), evaluation (EVAL) and constraints (CON). If an input is given for an output, GEN produces an infinite set of potential candidates including an optimal output. The generated candidates are evaluated by language particular ranked constraints. The candidate having the least number of higher constraint violations is chosen as the optimal output. This operation involves three principles: constraint violability, strict constraint ranking and evaluation. In recent research, however, lower-ranked cumulative constraints contribute a more important role to choose an optimal output than only one higher-ranked constraint (Ito and Mester, 1998; Jager and Rosenbach, 2006; Jesney and Tessier, 2007, 2008; Kager and Shatzman, 2007; Keller, 2005; Pater, Bhatt and Potts, 2007; Pater, Jesney and Tesar, 2007). This cumulative effects can observed in German, Dutch and Polish.

2.1. German and Dutch

This evidence for the cumulative effects comes from German (Guessmann, 2002:146) and Dutch (Grijzenhout and Kramer 2000:57). German and Dutch have only devoiced obstruents in the word-final position.

(1) German

a. Schi[f] ‘ship’ Schi[fə]s ‘gen.sg.’
Bla[t] ‘leaf’ Blä[tɐ] ‘nom.pl.’
hie[s] ‘he was called’ hei[sən] 'be called'

Wer[k]‘work, n.’ wer[kə]n ‘vb.’

b. Lie[t] ‘song’ Lie[dɐ] ‘nom. pl.’
Wei[p] ‘woman’ Wei[bə] ‘gen. sg.’
klu[k] ‘clever’ klu[gə] ‘nom. pl.’
bra[f] ‘good’ bra[və]s ‘gen. sg. masc.’
Gan[s] ‘goose’ Gän[zə] ‘geese’

(2) Dutch

(a) /pɑd/ [pɑt] ‘toad’ (b) /pɑd+ən/ [pɑdən] ‘toads’
/lɑt/ [lɑt] ‘lath’ /lɑt+ən/ [lɑtən] ‘laths’
/puːz/ [puːs] ‘cat’ /puːz+ən/ [puːzən] ‘cats’
/vɔs/ [vɔs] ‘fox’ /vɔs+ən/ [vɔsən] ‘foxes’

The example (1a) shows that voiceless word-final obstruents still remain voiceless although they precede the suffix beginning with a vowel. But then, the example (1&2b) says that final voiceless obstruents become voiced ones before a vowel-initial suffix. In German and Dutch, voiced obstruents are prohibited in the word-final position, which is called German and Dutch coda devocing, although voiced obstruents are permitted prevocalically.

According to Caroline (1999:2-3), there are four constraints for German final devoicing: IDENT(voice), IDENT(voice)onset, *VDOBSTR, NOCODA. Each constraint is defined as follows:

(2) Constraints for German Final Devoicing

IDENT(voice) means that correspondent segments must agree in voicing.

IDENT(voice)onset onset means that segments and their input

correspondents must agree in voicing.

*VDOBSTR means that obstruents are voiceless.

NOCODA means that syllables have no coda.

If these constraints are applied to the final devoicing for German, the following tables (3&4) can be made (Caroline 1999:3).

(3) blind

/blínd/ 'blind'	IDENT (voice)$_{onset}$	*VDOBSTR	IDENT(voice)	NOCODA
☞ .blínt.		*	*	**
.blínd.		**!		**
.plínt.	*!		**	**

(4) blinde

/blínd+ə/ 'blind'	IDENT (voice)$_{onset}$	*VDOBSTR	IDENT(voice)	NOCODA
☞ .blín.də.		**		*
.blín.tə.	*!	*	*	*
.plín.də.	*!	*	*	*
.plín.tə.	*!*		**	*

However, Itô and Mester (1997) said that there are three constraints to explain this devoicing process: FAITH, *VOIOBS and NOCODA. The constraint FAITH says that input and output correspondents have the same value for the feature voice. *VOIOBS prohibits voiced obstruents and NOCODA means that coda obstruents are not allowed as Caroline mentioned those constraints at the tables above. In addition, it is necessary to mention that FAITH is ranked above *VOIOBS and NOCODA as shown under the tables (5&6).

(5) blind

/blĺnd/ 'blind'	FAITH	*VOIOBS	NOCODA
.blĺnt.	*	*!	*
☞.blĺnd.		**	*
.plĺnt.	**!		*

(6) blinde

/blĺnd+ə/ 'blind'	FAITH	*VOIOBS	NOCODA
☞.blĺn.də.			*
.blĺn.tə.	*	*	*
.plĺn.də.	*	*	*
.plĺn.tə.	**!		*

However, the problem is that the table (5) does not choose the optimal output as shown in the table (3). Itô and Mester (1997) solved this problem with the combination of *VOIOBS and NOCODA. In other words, the combination of the lower ranking constraints *VOIOBS and NOCODA, which is commonly-used constraint *VOICODA, surpasses the higher ranking constraints FAITH. It seems to be more plausible for explanation of this phonological process when each constraint, *VOIOBS and NOCODA, is considered as proper constraints. Thus, we can say that the violation of *VOIOBS plus NOCODA is higher ranked than FAITH as follows:

(7) blind

/blĺnd/ 'blind'	*VOICODA	FAITH	*VOIOBS	NOCODA
☞.blĺnt.		*	*!	*
.blĺnd.	*!		**!	*
.plĺnt.		**!		*

(8) blinde

/blínd+ə/ 'blind'	*VoiCoda	Faith	*VoiObs	NoCoda
☞.blín.də.				*
.blín.tə.		*	*	*
.plín.də.		*	*	*
.plín.tə.		**!		*

In addition, this tells that the combination of the low ranked constraints must be higher ranked than a single constraint.

2.2 Polish

Polish also undergoes the word final devoicing of all the obstruents. The following examples show that the underlying voicing sounds become voiceless at the surface forms (Obiała 2008:19).

(9) Polish Obstruent Devoicing

a. klu[p] 'club' klu[b]u gen.sg
b. płu[k] 'plough' płu[g]i nom. pl.
c. ga[t] 'reptile' ga[d]y nom.pl.
d. no´[ʃ] 'knife' no[ʒ]y gen.pl.
e. no´[sk] 'brain' mo´[zg]om dat.pl.
f. ło´[tɕ] 'boat' ło[dʑ]iami inst.pl

The above examples show that all the voiced word-final obstruents become the voiceless sounds: the underlying ones becomes [p], [d] [t], [k] [g], [ʃ], [ʒ] etc. This means that they all undergo neutralization when they occur at the word final position and become homophones such as /kred/ 'chalk' pl. gen and /kret/ 'mole' nom. sing. although they have different underlying forms.

This process can be explained with two different methods – Caroline's and Itô & Mester's. Caroline and Itô & Mester use the different constraints to explain the devoicing although they mean the same thing as follows:

(10) klu[b] 'club'

/klub/ 'blind'	*VOICODA	FAITH	*VOIOBS	NOCODA
.klub.	*!		*	*
☞.klup.		*		*

(11) klu[b]u 'blind' *gen.sg*

/klub+u/ 'blind'	*VOICODA	FAITH	*VOIOBS	NOCODA
.klu.pu.		*		
☞.klu.bu.			*	

Itô and Mester (1997) combine two different constraints *VOIOBS and NOCODA with *VOIOBS. This combined constraint *VOIOBS is higher ranked than each separated constraint. This approach shows the correct selection for the words 'klub' and 'klubu' in (10) and (11). In (10), the final obstruent /b/ is realized into [p], which positions at the end of the word, although the obstruent /b/, which positions in front of a vowel /u/, is realized into [b].

It is worth to argue which approaches are better. According to Minimalists (Razaghi, Rahavard and Sadighi, 2015:2), economy condition refers to few grammatical operations as possible. This means that a phonological process is considered to be better when it shows simple, shorter and no superfluous steps in process. If this is true, the Itô and Mester's approach can be one of the more plausible approaches in that it is more simple and uses few constraints.

3. Combined Constraints in Korean consonant clusters

3.1. Consonant cluster simplification in Korean

A Korean syllable does not allow complex onset and coda in the phonetic level. However, it is often observed that consonant clusters are allowed in the final position of the phonemic level. For example, the Korean /kaps/ 'price'in the underlying level is realized into [kap̚] in the surface level. If a vowel follows this morpheme, it is realized into [kap.si] 'price+ Subjetive marker.' When the following morpheme begins with a consonant, the consonant [s] is not realized in [kap̚k'wa] 'price and'which is composed of [kap̚] 'price' and [kwa] 'and.' This means that consonant clusters in Korean are simplified or linked at the phonetic level as shown in (12).

(12) Consonant Cluster Reduction (Kim 2000:64)

a. Nasal plus Stop

/anc-ko/ [an.k'o] 'sit and'

b. Lateral plus Nasal

/salm/ [sam] 'life'

c. Lateral plus Stop

/talk/ [tak̚] 'chicken'

d. Stop plus Fricative

/kaps/ [kap|] ‘price’
/saks/ [sak̚] ‘wage’
e. Lateral plus Aspirated Stop
/halth-ko/ [hal.k'o] ‘lick and’

f. Nasal plus Glottal
/manh-ko/ [man.kho] ‘many and’

g. Lateral plus Glottal
/alh-ta/ [altha] ‘sick-Dec’

One of coda consonants in the consonant clusters should be deleted in each of the above examples. However, it is a problem to decide which consonant will be deleted. First, when consonant clusters occur with a nasal and a stop such as /nc/ in (12a) or with a lateral and a nasal such as /lm/ in (12b), the nasal is always selected as a coda consonant. For example, /anc/ ‘sit’ is realized as [an] and /salm/ ‘life’ as [sam]. Second, when consonant clusters are a lateral and a stop such as /lk/ in (12c) or a stop plus a fricative such as /ps/ in (12d), the stop is always selected as a coda. For example, /talk/ ‘chicken’ is realized as [tak̚] and /kaps/ ‘price’ is realized as [kap̚]. However, when a lateral is combined with an aspirated stop such as /lth/ in (12e), the selected coda consonant is the lateral. When the nasal /n/ or the lateral /l/ occurs with a glottal /h/ (16f&g), the glottal /h/ is deleted in front of vowels. However, when the glottal /h/ occurs in front of lax stops, it is merged to the stops and aspirated. For example, /manh-i/ ‘many-Adv’ and ‘alh-i’ ‘sick-Nom’ are pronounced as [mani] and [ari] in front of vowels. However, /manh-ko/ ‘many-and’ and /alh-ko/ ‘sick-and’ are pronounced [mankho] and

[alkho] respectively. This phonological process may be complicated when it is formulated with the scheme of Generative Phonology. If a consonant to be deleted is specified, the rules are more complicated or require an additional condition. The following table shows the consonant selection in Korean. This includes all the consonant clusters in the coda position. Some of them show alternation between two consonants in the coda selection.

(13) Consonant Selection [1)]

	Clusters	Selection	Examples
1	ks(ㄱㅅ)	k (ㄱ)	/moks/ → [mok̚] 'share' 몫 → 목
2	lk(ㄹㄱ)	l, k (ㄹ, ㄱ)	/malkko/ → [makk'o], [malk'o] 'clear and' 맑고 →막꼬, 말꼬
3	lp(ㄹㅂ)	l, p (ㄹ, ㅂ)	/yeoteolp/ → [yeoteol], [yeoteop̚] 'eight'여덟 → 여덜, 여덥
4	ls(ㄹㅅ)	l (ㄹ)	/oykols/ → [oykol] 'inflexibility'외곬 → 외골
5	ps(ㅂㅅ)	p (ㅂ)	/kaps/ → [kap̚] 'price' 값 → 갑
6	nc(ㄴㅈ)	n (ㄴ)	/ancko/ → [ank'o] 'sit and' 앉고 → 안꼬
7	nh(ㄴㅎ)	n (ㄴ)	/anhne/ → [anne] 'be not' 않네 → 안네
8	lt^h(ㄹㅌ)	l (ㄹ)	/$halt^h$ko/ --> [halk'o] 'lick and' 핥고 --> 할꼬
9	lp^h(ㄹㅍ)	l, p	/ɨlp^hko/ → [ɨpk'o] 'cite'

1) There are three different variations for the consonant cluster simplification according to regions: standard, Kyeongsang and Jeolla. However, the above table is commonly acceptable in the three areas.

		(ㄹ, ㅍ)	읊고 → 읍꼬
10	lh(ㄹㅎ)	l (ㄹ)	/alhne/ → [alne] ‘be sick’ 앓네 → 알네

3.2 Combined constraint effects

Consonant cluster simplification is motivated by the fact that no language requires codas typologically (Prince & Smolensky 1993:89). The family constraint of *Complex is *Coda. This constraint specifies that syllables do not have coda or end with a vowel (Prince & Smolensky 1993:34, Archangeli 1997:7). This constraint is motivated by the fact that some languages such as Senufo (Guinea) and Hawaiian do not allow codas, while some languages such as English and Yawelmani (California) allow codas (Hammond 1997:37). English allows three coda segments, while Korean allows two coda segments. Consonant Selection constraints specify that a higher ranked constraint in the coda harmony scale is more harmonic than one of lower ranked ones. This is also motivated by the Nuclear Harmony Constraint, which specifies harmony based on the sonority hierarchy scale (Prince & Smolensky 1993:16). Each constraint is described as follows:

(14) *Complex
Syllables have at most one consonant at an edge.

(15) Coda Condition[2)]

2) According to dialects, nouns and predicatives, the consonant selection can be different. However, it is generally considered that [continuant] and [laryngeal] features are abandoned in the coda selection (Kim 2002:91, Kim Renaud 1973:134).

a. * [Laryngeal]]σ
b. * [continuant]]σ

Korean coda consonants in the syllable edge are allowed only [p, t, k, m, n, ŋ].

(16) Consonant Cluster Selection in Coda

nasals > stops, laterals > fricatives > aspirated stops, glottals

This hierarchy says that the nasal stops are the most highly ranked and stops and laterals are alternative. *Complex constraint is considered as more highly ranked than Coda Condition in that Korean does not allow the complex consonant clusters. If there are two consonants in the underlying level, they are always linked in front of a vowel or deleted in word-final position and in front of the other consonants. Consonant Cluster Selection specifies which consonant is more harmonic or optimal for a coda. The supposed constraint rankings are as follows:

(17) The Constraint Ranking[3)]
*Complex >> Coda Condition >> Consonant Cluster Selection

The optimal consonant may be chosen by this constraint ranking in their coda position. However, these selection can be explained with constraints mentioned above in the optimality theory. The following tableau shows the optimal selection at the coda position.

3) Yoo(1999:417) mentions that *Complex has higher constraint ranking than Coda Condition in second language acquisition.

(18) /kaps/ → [kap̚] ‘price’

/kaps/	*Complex	Coda Condition	Faith
kaps	*!		
☞kap			*
kas		*!	*
kat			*!

(19) /malk+ko/ → [makk’o], [malk’o] ‘Clear and’

/malk+ko/	*Complex	Coda Condition	Faith
malk+ko	*!		
☞mal+ko			*
☞mak+ko			*
ma+ko			*!

The tableau (18) and (19) show the exact optimal output selection. Basically, two consonants are banned in the constraint *COMPLEX and the fricative [s] CODA CONDITION. The constraint FAITH specifies that the outputs do not differ unnecessarily from the inputs. However, there are some problems when the following examples are considered.

(20) /halth+ko/ → [halk’o] ‘lick and’

/halt^{h}+ko/	*Complex	Coda Condition	Faith
halt^{h}ko	*!		
☞halko			*
hat^{h}ko		*!	*
hatko			*!

(21) /ɨlp^{h}+ko/ --> [ɨpk’o] ‘cite’

/ɨlp^{h}+ko/	*Complex	Coda Condition	Faith
ɨlp^{h}ko	*!		
☞ɨlko			*
ɨpko			*!
ɨp^{h}ko		*!	*

The tableau (20) is acceptable in that Korean speakers generally do not pronounce [hatk'o] regardless of regions. However, the tableau (21) is usually pronounced [ɨpk'o] rather than [ɨlk'o]. According to this tableau, the constraints only select the second one, which choose the wrong optimal output. [hatk'o] in (20) and[ɨpk'o] in (21) causes the fatal violation in that the lateral [l] and the aspirated feature [h] are deleted.

Kim (2002) explains this with ALIGN-R and IDEN-IO(Lar), and shows the following constraints and the tableau.

Youngsun Kim's Constraints (2002:82-112)

*Complex: Consonant clusters are prohibited in the coda/onset.

Align-R: 'Align the right edge of a stem with the right edge of a syllable.

Iden-IO(F): Output correspondents of an inptu [YF] Segment are also [YF]. (No featural change)

CodaSon: In syllable codas, parse sonorant segments.

(22) /ɨlph+ ta/ --> [ɨpt'a] 'cite' (Kim 2002:103)[4)]

ɨlp^{h}+ta	*Complex	CodaCond	Max	Align-R	Iden-IO(Lar)	CodaSon

4) This table comes from Kim (2002:103). He seems to make a mistake the third candidate in CodaSon violation. This does not violate the constraint.

ɨlp^h.t'a	*!	*				
ɨp^h.t'a		*!	*			*
ɨl.t'a			*	*!		
☞ɨp.t'a			*		*	*

Kim mentions that /lph/ is idiosyncratic and the constraint ranking is specified by lexical constraint ranking. If this solution is applied to the /halth+ko/, it does not select the proper output when the coda consonants are simplified. In Korean, speakers never pronounce /halth+ko/ with *[hat̚.k'o] as follows:

(23) /halth+ko/ --> [halk'o] 'lick and'

halt^h+ko	*COMPLEX	CODACOND	MAX	ALIGN-R	IDEN-IO(Lar)	CODASON
halt^h.ko	*!	*				
hat^h.ko		*!	*			*
hal.ko			*	*!		
☞hat.ko			*		*	*

This means that Korean aspirated stops are always neutralized in the coda position. In addition, as mentioned in the Consonant Selection tableau (17), a selected one of consonant clusters is never realized into [t] although it is realized when it is only one consonant, not complex consonants. The avoidance of [t] in the coda is observed in the borrowing word. For example, the English word, 'robot' has the /t/ in the coda position. However, when Koreans write this word /robos/ and read [robot̚] after applying neutralization. When this word are followed by an vowel such as /robos/+/i/ 'Nominative Marker', it is pronounced into [robosi], not [roboti]. Thus, we need two more constraints for the cluster simplification as follows:

(24) Neutralization
The specified consonants are neutralized in the coda position.

(25) LICENSING [place]
The specified [place] consonant is selected as its coda.

According to Oh (1994:165), the Korean consonant /c, th, h/ do not have the place specification underlyingly. Thus, the aspirated /th/ does not undergo neutralization until it will be syllabified as a coda by phonetic syllabification. This means that these consonants in the complex clusters are never selected as a coda because the constraints Faith and [+sonorant] in the coda condition automatically select the sonorant consonant as its coda. Their rankings are as follows:

(26) Constraint Ranking
*Complex >> Coda Condition >> Faith >> Neutralization >> Licensing Place >> Sonorant

However, these two constraints Neutralization and Place do not go alone as each separated rule because each ranking is lower than *COMPLEX and CODA CONDITION. Thus, these are combined together and has higher ranking than CODA CONDITION by the cumulative constraint effect. The combined constraint is represented by *NEUTRAL LICENSING.

(27) /ɨlp^{h}+ta/ --> [ɨpt'a] 'cite'

ɨlp^{h}+ta	*Complex	NeutLicensing	CodaCond	Faith	Place	Neut	Son
ɨlp^{h}.t'a	*!	*	*			*	*

ip^{h}.t'a		*	*	*		*	*
il.t'a		*		*	*		
☞ip.t'a				**			*

halt^{h}+ko	*Complex	NeutLicensing	CodaCond	Faith	Place	Neut	Son
halt^{h}.ko	*!	*	*			*	*
hat^{h}.ko		*	*	*		*	*
☞hal.ko				*	*		
hat.ko				**			*

(28) /halth+ko/ --> [halk'o] 'lick and'

The tableau (27) says that the specified and place licensed consonant must be neutralized and selected as its coda. Thus, the consonant /ph/ with the specified features is neutralized into [p] and selected as its coda. However, the tableau (28) says that the uderspecified /th/ cannot be neutralized and the lateral [l] is selected by the constraint [+sonorant]. As mentioned above, this tells that the combination of the low ranked constraints must be higher ranked than a single constraint. This effects for the combined constraints properly explain the Korean consonant simplification and show the more plausible phonological processes.

4. Conclusion

This paper has observed the effects of constraint combination in final devoicing of German, Dutch and Polish, and applied to Korean consonant simplification. Although there are several solutions about coda selection in Korean consonant clusters, it is more plausible to

explain the coda selection with neutralization and the underspecified [t]. The evidence comes from the contradictory selection of /ɨlph+ ta/ 'cite' and /halth+ ta/ 'lick' in the similar combination of a lateral and aspirated stops. The former one select the coda [p] and the latter [l]. If only neutralization is considered, the stop should be selected in both data. However, if the [+ sonorant] condition for selection is considered, the lateral [l] should be selected. As mentioned above, the coronal stop /t/ is underspecified in their features in the underlying form, its position is not resolute and undergoes the featural changes by the neighboring sounds. That's why the coronal stop behaves differently with the other stops. The combined constraints in Optimality theory can solve the problem of the coda selection in that the constraint rankings can be reversed when two constraints are combined. The constraints, neutralization and underspecification, are low rankings. However, when they are combined together, the constraint surpasses the constraint Coda Condition. Thus, the combined constraints select the proper optimal output.

[국문초록]

한국어 자음 단순화에서 결합제약 효과

김창겸

이 논문의 목적은 최적성 이론의 엄격한 제약 순위는 하위 제약의 결합에 의해 상위 순위의 제약보다 더 높은 제약으로 올라 갈 수 있다는 것을 한국의 종성단음화로 설명하고자 한다. 실제로 이러한 예는 독일어, 네덜란드어, 폴란드어의 무성음화에서 찾아 볼 수 있다. 이러한 하위 순위의 제약 결합이 상위 순위의 제약보다 높은 순위로 올라감으로써 보다 효율적인 음운현상을 설명할 수 있는 이점이 있다. 이는 곧 각 제약이 차지하는 비중이 낮을 지라도 두개의 제약이 결합할 때 그 비중이 상위 제약의 비중보다 높아진다는 것을 의미한다. 그 실례로 독일어 무성음화에서 *Voiced Obstruents, No Coda라는 제약이 Faith 보다 하위 제약에 속하지만 이 둘이 결합하여 *Voiced Coda가 되어 Faith보다 상위에 랭크된다. 이러한 제약의 결합을 활용하는 이유는 기존의 제약을 그대로 활용할 수 있고 또한 적은 수의 제약으로 설명이 가능하기 때문이다. 한국어의 종성 단음화도 중화규칙과 불완적 표시 제약의 결합이 종성규칙보다 선행하는 상위계층의 순위가 된다면 ‘읊고’와 ‘핥고’의 ‘ㅂ’과 ‘ㄹ’로 상반된 구현을 효율적으로 설명할 수 있다.

주제어 : 최적성이론, 계층적 제약 순위, 제약 결합 효과, 제약순위 변경, 무성음화, 한국어 종성 단음화, 불완적 표시제약

참고문헌

Kim, Changkyum. 「Transfer and Occurrences of the Korean Features in English Editorials」, 『국제언어문학』 제24호, 2011.10

Archangeli, Diana, Optimality Theory: An Introduction to Linguistics in the 1990s, *Optimality Theory: Overview*, Edited by Archangeli and Langendoen, Blackwell, Massachusetts, 1997. 1-32면.

Caroline, Féry. Final Devoicing and the stratification of the lexicon in German. The Phonological Spectrum. Volume I: Segmental Structure. *Current Issues in Linguistic Theory*. Vol. 233. Edited by Vincent van Heuven, Harry van der Hulst & Jeroen van de Weijer, 1999. 145-169면.

Grijzenhout, Janet, and Martin Krämer. Final devoicing and voicing assimilation in Dutch Derivation and Clicticization. Ed. by Stiebels, Barbara and Wunderlich, Dieter. *Lexicon in focus* 45, 2000. 55-82면.

Guessmann, Edmund. *Phonology: Analysis and Theory*, Cambridge University Press, Cambridge, 2002.

Hammond, Michael. n.d. Parsing Syllables: Modeling OT Computationally. ROA-222. (Rutgers Optimality Archive, http://ruccs.rutgers.edu/roa.html).

Itô, J. and A. Mester, Markedness and word tructure: OCP effects in Japanese, Ms., University of California, Santa Cruz, 1998.

Ito, J. and A. Mester. Sympathy theory and German truncations. *University of Maryland Working Papers in Linguistics* 5. Selected Phonology Papers from Hopkins Optimality Theory Workshop 1997/University of Maryland Mayfest 1997. Edited by V. Miglio and B. Moren, 1997. 117-139면.

Jager, G. and A. Rosenbach, The winner takes it all almost: Cumulativity in grammatical variation. *Linguistics* 44, 2006. 937-971면.

Jesney, K. C. and A.-M. Tessier, Gradual learning and faithfulness: Consequences of ranked vs. weighted constraints, *Proceedings of the North East Linguistic Society* 38, M. Abdurrahman, A. Schardl and M. Walkow. Amherst, MA, GLSA, 2008.

Jesney, K. C. and A.-M. Tessier, Re-evaluating learning biases in Harmonic Grammar, *University of Massachusetts Occasional Papers* 36: Papers in Theoretical and Computational Phonology, M. Becker. Amherst, MA, GLSA, 2007.

Kager, R. and K. Shatzman, Phonological constraints in speech processing. Paper presented at *Experimental Approaches to Optimality Theory*. University of Michigan, May, 2007.

18-20면.

Keller, F., Linear optimality theory as a model of gradience in grammar, *Gradience in Grammar: Generative Perspectives*, G. Fanselow, C. Fery, R. Vogel and M. Schlesewsky, Oxford University Press, Oxford, 2005.

Kim, Chang-kyum. Phonological Processes in English and Korean: Direct Optimality Theory Approach. Ph. D. Dissertation. 2000.

Kim Renaud, Young-Key, Korean consonantal phonology. Ph. D. Dissertation. University of Hawaii, 1974.

Kim, Youngsun, Coda Cluster simplification and its interactions with other coda processes in Korean. *Working papers of the Cornell Phonetic Laboratory*, 2002, vol. 14, 82-112면.

Oh, Mira, A Reanalysis of Consonant Cluster simplification and s-Neutralization, *Theoretical Issues in Korean Linguistics,* Edited by Young-Key Kim-Renaud. Leland Stanford Junior University: CSLI Publications for Stanford Linguistics Society, 1994. 157-174면.

Obiała, Tomasz, Reranking Constraints: Coda obstruent devoicing in the acquisition of English phonology by Polish speakers, MA Degree, University of Essex. 2008.

Pater, J., R. Bhatt and C. Potts, Linguistic optimization, Ms., University of Massachusetts, Amherst, ROA 924, 2007.

Pater, J., K. C. Jesney and A. M. Tessier, Phonological acquisition as weighted constraint interaction. *Proceedings of the 2nd Conference on Generative Approaches to Language cquisition-North America*, A. Belikova, L. Meroni and M. Umeda, Somerville, MA, Cascadilla Proceedings Project, 2007. 339-350면.

Prince, A. and P. Smolensky, *Optimality Theory: Constraint Interaction in Generative Grammar*, MA, Blackwell, Malden, 1993/2004.

Razaghi, M., S. Rahavard and F. Sdighi. Economy, Simplicity and Uniformity in Minimalist Syntax. *International Journal on studies in English Language and Literature*. Volume 3, Issue 1, January 2015, 1-6면.

Tesar, B., A comparison of lexicographic and linear numeric optimization using violation difference ratios, Unpublished manuscript, Rutgers University, ROA 939, 2007.

Yoo, Hye-Bae. Consonant Cluster Simplification in Second Language Acquisition. *Studies in Phonetics, Phonology and Morphology* 52, 1999: 401-420면.

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