Consonant Cluster Simplification in Second Language Acquisition*

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Yoo, Hye-Bae. 1999. Consonant Cluster Simplification in Second Language Acquisition. *Studies in Phonetics, Phonology and Morphology* 5.2, 401-420. This paper investigates the problems related to the simplification of syllable structure by second language learners: 1) Difference in error types between complex syllable onsets and codas; 2) The sites of the deleted coda consonants; 3) The sites of the epenthetic vowels in the modification of a syllable with a coda cluster, CVCC. These patterns are accounted for within the Optimality Theoretic framework (McCarthy & Prince 1995), which describes grammar as a set of universal, ranked constraints. The coda cluster simplification results from the interaction of universal markedness constraints and faithfulness constraints, especially positional faithfulness constraints (Beckman 1998). It offers insights into interlanguage grammars yielding a unified account of transfer and markedness effects and thus provides evidence for the adequacy of Optimality Theoretic approach. **(University of Inchon)**

Keywords: second language acquisition, vowel epenthesis, consonant deletion, positional faithfulness constraints, cluster simplification

1. Introduction

Recently much work in interlanguage phonology has been concerned with the influence of the universals in forming the interlanguage phonology. The studies have demonstrated that less marked structures occur in interlanguages independent of native language transfer (Tarone 1980, Eckman & Iverson 1994 among others). However, the models on which the analyses were drawn have been rule-based and have difficulty in explaining not only the rules that are not motivated by surface representations, but also markedness effects in constructing the interlanguage grammar.

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This paper investigates three problems related to the simplification of syllable structure by second language learners. One is difference in error types between complex syllable codas and onsets: Second language learners are more likely to use epenthesis to simplify onset consonant clusters and are more likely to use deletion to simplify coda consonant clusters. The next problem is the sites of the deleted coda consonants: Learners with different language backgrounds delete different consonants. For example, given a C1C2 sequence in a coda, Japanese learners tend to delete C1 and Spanish speakers tend to delete C2 (Hancin-Bhatt & Bhatt 1997). The last problem is the site of epenthetic vowel in the modification of a syllable with a coda cluster, CVCC (Tarone 1980, Kim 1991).

I will argue that a more recent model of phonology, the framework of Optimality Theory (hereafter OT) (McCarthy & Prince 1994, 1995, Prince & Smolensky 1993, Beckman 1998) provides a potential solution to the problems. In OT, grammar is a set of ranked constraints that define the optimal output corresponding to any input. Thus, languages differ in the rankings of constraints. Acquisition in this model is a process of drawing the ranking of the constraints from the linguistic data, instead of learning the constraints themselves, since the constraints are innate and universal (Gnanadesikan 1995, Stemberger & Bernhart 1997)[1].

It will be argued that the patterns are attributable to rankings of the universal constraints of the interlanguage, which appear during the acquisition process of adjusting the rankings given the input. As shown in many studies (Broselow, Chen, & Wang 1998, Gnanadesikan 1995, Yoo 1996), I will show the cases of "the emergence of the unmarked" (McCarthy & Prince 1994): a constraint which is ranked low in a learner's native language appears to be visible in choosing an optimal output of the interlanguage. Furthermore, it will be shown that the positional faithfulness constraints play a significant role in the interlanguage phonology.

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[1] In the study of child phonology, Gnanadesikan (1995) and Stemberger & Bernhart (1997) view markedness constraints are ranked higher in child phonology, compared to adult phonology and children rerank the faithfulness constraints to approximate the adults' rankings.

This paper supports OT, providing a unified account of transfer and markedness effects, which is not available when investigating the first language and the second language grammar only.

2. Optimality Theory

The basic premises of OT that are relevant to the analysis of interlanguage phonology are as follows.

First, the output of phonology is determined by constraints that select among some candidate set of forms in parallel. Thus, there are no rules or repair strategies, thus no step-by-step derivation. Candidate sets provided by Universal Grammar are in principle infinite and maximally inclusive.

Second, all constraints are relatively ranked. The candidate form that satisfies the highest ranked constraints is regarded as optimal output. The individual grammar fixes a different ranking of the constraints.

Third, all the constraints are violable; the lower ranked constraints can be violated in order to satisfy higher-ranked constraints.

Constraint rankings and output selection are shown in the following tableau.

(1) Constraint Conflict

	Constraint A	Constraint B
☞ candidate 1		*
candidate 2	*	

In tableau (1), candidate 1 is selected as optimal, since it satisfies the dominating constraint A, although it violates a lower-ranked constraint B. Constraint violations are shown with stars. The optimal output is marked with the pointing-hand.

It is generally regarded that the constraints are divided into two types: faithfulness constraints, which require identity between input and output, and markedness constraints (well-formedness constraints), which licence modification of input to avoid marked forms such as

*COMPLEX that blocks the occurrence of cluster.

As far as the faithfulness constraints are concerned, McCarthy and Prince (1995) proposed the Correspondence Theory, in which correspondence is defined as a relation between two structures, such as input and output, or base and reduplicant. When a segment of structure 1 has no correspondent in structure 2, a violation occurs.

In McCarthy and Prince (1995) three correspondence constraint families are proposed: MAX, DEP, and IDENT[F][2]. Among the MAX family, MAX-IO requires that every input segment has a correspondent in the output. This constraint prohibits any phonological deletion.

DEP requires that every output segment must be dependent on the input. No insertion is permitted by this constraint.

The relative ranking of MAX and DEP explains the occurrence of epenthesis and deletion: if MAX dominates DEP, epenthesis is possible; if DEP dominates MAX, deletion of segments is anticipated.

The faithfulness constraints are further divided into the positional faithfulness constraints such as MAX(Onset) and the context-free faithfulness constraints such as MAX(seg) (Beckman 1998, Zoll 1998). Positional constraints require segments in prominent positions to be preferentially faithful to the input.

Universally there are some privileged positions that are more prominent in perception than other positions: root-initial syllables, stressed syllables, syllable onsets, roots, and long vowels. The positions play a role in lexical storage, lexical access and retrieval, and processing. The positional privilege is realized in the patterns of phonological asymmetry, as in (2).

(2) Phonological asymmetries diagnostic of positional privilege
   a. positional maintenance of contrasts which are neutralized elsewhere
   b. positional triggering of phonological processes
   c. positional resistance to processes which apply elsewhere

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[2] IDENT[F] is a family of constraints which requires identity between a segment's value for some feature [F] and the value of that feature in the segment's correspondent. The constraints are not relevant to this study and will not be discussed.

The positional privilege is expressed in OT in terms of higher relative ranking of positional faithfulness constraint such as Max(onset) over context-free faithfulness constraint such as Max(seg).

From the OT perspective, I will investigate the simplification of consonant clusters in interlanguage phonology, showing how interlanguage grammars are formed and how constraint interactions produce the error patterns.

3. Consonant Cluster Simplification

3.1 Deletion vs Epenthesis

Now turn to the discussion of second language learners' modification strategies between onset and coda. Second language learners seem to treat onset clusters and coda clusters differently: they choose epenthesis strategy for onset and deletion for coda. For example, an English word 'tree' is pronounced as [təri], wheres 'sink' is pronounced as [siŋ] (Silvermann, 1992). A number of attempts have been made to account for this, but it still remains unsolved.

In this section, I will attempt to account for the pattern, showing how positional faithfulness constraints function in the interlanguage grammars.

3.1.1 The Data

Recently, Hancin-Bhatt and Bhatt (1997) examined the production of pseudo-words with two-member onsets and codas by 20 intermediate learners, 10 learners each of Japanese and Spanish. The data show that both Japanese and Spanish speakers use different strategies for complex onsets and codas, as in (3).[3]

[3] Similar data are investigated in Silverman's study of Cantonese loanwords (1992), in which a stop+liquid onsets are more likely to undergo epenthesis, whereas a sonorant+stop codas are more likely to undergo deletion.

(3) Mean Number of Errors[4]

Error type	Cluster location	
	Onset	Coda
Epenthesis	2.0	0.1
Deletion	1.2	4.9

The data show a priviledged status of the onset position, in which segments tend to be preserved in contrast to those in the coda position.

3.1.2 Japanese and Spanish Syllable Structure

The Japanese syllable structure is maximally CVC, where coda is limited to a nasal /n/[5]. Thus, Japanese does not allow any consonant clusters in any position. The Spanish syllable structure is CCVC and complex onsets are possible but they have to meet sonority distance requirement that the first consonant should be an obstruent and the second consonant should be a liquid. As for codas, Spanish does not allow any clusters, as in (4).

(4) Japanese and Spanish Onset and Coda (word-final) inventories

	Spanish		Japanese	
consonants	Onsets	Codas	Onsets	Codas
C	All Cs	n, l, r, s, d	All Cs	n
CC	pr, br, tr, dr, fr, fl, kr, kl, gr, gl	—	—	—

We would expect Japanese and Spanish speakers to have difficulty

[4] The 20 subjects made a total of 240 productions for each category and the results are presented as an average number of errors per subject in each category.

[5] As a reviewer pointed out, the nasal sound is often viewed as one with no place of articulation.

with consonant clusters that do not occur in their languages, because the presence of clusters is more marked than their absence (Vennemann 1988).

3.1.3 Earlier OT Analysis

Hancin-Bhatt and Bhatt (1997) analyzed the pattern (3) within the earlier version of Optimality framework (Prince & Smolensky 1993), in terms of the constraints given in (5).

(5) ONS: All syllables must have onsets.
-COD: Syllables must not have codas.
*COMPLEX: Syllables have at most one consonant at an edge.
PARSE: Input segments must be parsed into syllable structure. (MAX in Correspondence Theory)
FILL: Syllable positions are filled with input segments. (DEP in Correspondence Theory)
ONSET SONORITY: A complex segment in the same onset has to be at a maximum distance. This allows only a sequence of an obstruent and a liquid in onset.

They argue that the epenthesis pattern is attributable to the higher ranking of PARSE that prevents deletion than FILL that blocks epenthesis. Given the inventories in (4), Spanish and Japanese rankings are, as in (6) (Hancin-Bhatt & Bhatt 1997: 354, 358, 356, and 357 respectively).

(6) a. Spanish
Onset: ONSET SONORITY》 PARSE》 FILL》 -COD》 *COMPLEX^{ONS}
Coda: CODA CONDITION, *COMPLEX^{COD}》 PARSE》 FILL

b. Japanese
Onset: *COMPLEX^{ONS}, PARSE》 FILL》 ONS
Coda: *COMPLEX^{COD}, PARSE》 FILL》 -COD

Their argument is that the speakers transfer their native language rankings (6) in the pronunciation of English consonant clusters, as shown in the evaluation of the candidates of the English words (7b & 7c).

(7) a. English[6]

input: spay	PARSE	FILL	*COMPLEX	ONS SON
pay	*!			
☞spay			*	*
es.pay/səpay		*!		

b. Spanish English

input: spay	ONS SON	PARSE	FILL	*COMPLEX^{ONS}
pay		*!		
spay	*!			*
☞es.pay			*	

c. Japanese English

input: spay	*COMPLEX	PARSE	FILL	ONS
pay		*!		
spay	*!			
☞su.pay			*	

Please note that the ranking of English (7a) and the rankings of Spanish English and Japanese English (7b & c) differ among others: some markedness constraints are ranked higher than faithfulness constraints. This means that the Spanish and Japanese learners apply their native language rankings in the pronunciation of English words.

While markedness constraints *COMPLEX^{ONS} that blocks clusters and ONSET SONORITY are ranked lower in English as in (7a), they are ranked higher in Spanish and the English input has to be modified in

[6] a. The dotted line ⋮ indicates the two contraints have no ranking differences.
b. Epenthesis site of onset position is not of our concern.

Spanish English unless they are complex onsets with a maximum sonority distance, that are an obstruent and a liquid. As far as Japanese English is concerned, *COMPLEX dominates all the faithfulness constraints and modification results. In both Spanish English and Japanese English, the constraint PARSE is ranked higher than FILL in the hierarchy, which results in the form with epenthesis. Therefore the preference for onset epenthesis is regarded as transfer effects of the rankings of the native languages.

This analysis explains onset epenthesis but fails to explain coda deletion. As the tableau (8) illustrates, the transfer of the native language rankings (6a) predicts a wrong optimal output.

(8) Japanese coda errors[7]

input: nɔlt	*COMPLEX^{COD}	PARSE	FILL	-COD
a. nɔlt	*!			*
b. nɔl<t>		*!		*
c. nɔ<l>t		*!		*
☞d. nɔl.to			*	*

As discussed above, the higher ranking of PARSE than FILL incorrectly selects the output (d) with epenthesis as the optimal form[8], but the actual output form is (b) with [t]-deletion.

In sum, the Hancin-Bhatt and Bhatt's analysis does not account for the difference in modification strategies between onset and coda position.

3.1.4 Positional Faithfulness Analysis

Now, I attempt to solve the onset and coda asymmetry in the choice of simplification strategies resorting to the positional faithfulness constraint given in (9) (Beckman 1998).

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[7] Please note that < > indicates unparsed segments and deleted.

[8] In interlanguage of less proficient learners (as well as loanwords), the epenthetic forms are generally detected. Therefore the errors that Hancin-Bhatt & Bhatt reported can be regarded as developmental errors that occur during the process of acquisition.

(9) MAX(*onset*): Maximize the onset segments.

The coda/onset asymmetry is accounted for in terms of the higher ranking of the onset positional faithfulness constraint that dominates the context-free faithfulness constraint, as in (10).

(10) MAX(onset) 》 MAX (seg)

In Spanish and Japanese, the effects of the positional faithfulness MAX(onset) are not visible because there is no positive evidence that utilizes it; Spanish and Japanese forms are subject to the more general constraint MAX. However, both learners treat onset and coda differently in their identification of target sounds, which indicates that these learners have developed an interlanguage grammar that differs from both the native-language and the target-language grammar. What it means is that MAX(onset) is ranked low in the ranking in both the native and target languages and covered by other constraints and thus it is obscured. But it emerges in second language acquisition, since onset is more salient and to be preserved.

I assume the following rankings for languages including positional constraints.

(11) a. English: MAX(seg), MAX(onset), DEP》 *COMPLEX, ONSET SONORITY, CODA CONDITION

b. Spanish: CODA CONDITION, *COMPLEX^{COD}, ONSET SONORITY》 MAX(seg), MAX(onset)》 DEP》 COMPLEX^{ONS}

c. Japanese: *COMPLEX》 MAX(seg), MAX(onset)》 DEP》 -COD》 ONS

I argue that in contrast to the rankings of the native languages (11), MAX (onset) is placed higher than both DEP and MAX(seg) in the interlanguage, which forces learners to give priority on onsets in identification. The rankings of the constraints in the interlanguage

grammars of the Spanish and Japanese learners are as given in (12).

(12) a. Spanish English: ONSET SONORITY, *COMPLEX^{COD}》 MAX(onset)》 *COMPLEX^{ONS}》 DEP》 MAX(seg)》 CODA CONDITION[9]

b. Japanese English: *COMPLEX》 MAX(onset)》 DEP》 MAX(seg)》 CODA CONDITION

Tableau in (13) shows how onset simplification strategy is determined in Japanese English via the evaluation of constraints.

(13) Japanese English: Onset simplification

Input: spay	*COMPLEX	MAX(onset)	DEP	MAX(seg)
a. <s>pay		*!		*
b. spay	*!			
☞ c. su.pay			*	

In (13) deletion of a segment (a) is not permissible due to the violation of MAX(onset) which is worse than the violation of DEP. (c) with insertion is chosen as optimal, the consequence of which is the preservation of the onset segments in their pronunciation. Now consider (14) to see how coda clusters are simplified with deletion of a consonant.

[9] Voiceless consonants are not possible coda segments in Spanish and violate CODA COND and ill-formed. However, it is reported in Eckman (1988) that Spanish learners devoice syllable-final consonants in their interlanguage, even though there is no such phenomenon in their native language. If so, we may need to add NO VOICED OBS CODA between MAX(onset) and DEP along the line with Eckman(1988) and Broselow, Chen, and Wang (1998).

(14) Japanese English: Coda Simplification

input: nɔls	*COMPLEX	MAX(onset)	DEP	MAX(seg)	CODA COND
a. nɔls	*!				*
☞ ? b. nɔl<s>				*	*
☞ ? c. nɔ<l>s				*	*
d. nɔl.su			*!		*

In the coda case, the constraint MAX(seg) that prohibits the deletion of segments is ranked below DEP that prohibits insertion of a vowel. Both (14b) and (14c) candidates are predicted to be optimal and I assume that the choice of optimal output comes from the interaction of other constraints, which will be discussed later.

Note that the constraints MAX(seg) and CODA CONDITION are demoted below DEP. The demotion indicates the Japanese learners have developed their own grammar, which is different from both English that allows any type of coda consonants or Japanese that allows only /n/: They have passed the stage at which a vowel is inserted after every single consonant except /n/ and now can pronounce the single coda consonants. This does not mean that the learners have acquired rules independent of the native language and the target language, but instead it means the learners have reranked the constraints that exist in their native language.

The optimal output of the Spanish interlanguage is decided much the same way as the Japanese one, as in (15).

(15) a. Spanish: Onset Simplification

Input: spay	O SON	*COMPLEX^{COD}	MAX (onset)	*COMPLEX^{ONS}	DEP	MAX (seg)	CODA COND
a. <s>pay			*!			*	
b. spay	*!			*			
☞ c. es.pay					*		

b. Spanish: Coda Simplification[10]

input: nɔls	*COMPLEX^{COD}	MAX (onset)	*COMPLEX^{ONS}	DEP	MAX (seg)	CODA COND
a. nɔls	*!					*
☞ ? b. nɔl<s>					*	
☞ ? c. nɔ<l>s					*	
d. nɔl.s□				*!		

In (15), CODA CONDITION is demoted below as we discussed in the Japanese pattern. While onset is identified due to the higher ranking of MAX(onset), coda is not forced to be parsed and deletion is possible.

The onset/coda asymmetry in simplification is regarded as an effect of the greater markedness of codas than onsets (Kaye & Lowenstamm 1981). Onsets are more likely maintained in interlanguage than codas are. The markedness effect is explained in terms of the interaction of MAX(onset) and other constraints.

Be reminded that in tableaus (14) and (15), we have not decided which consonant is deleted in coda clusters. I will discuss the deletion sites in the next section.

3.2 Coda Deletion Sites

In Hancin-Bhatt and Bhatt's data, Spanish and Japanese learners show different patterns in deletion sites. As seen in (16), Spanish learners delete the second consonant, while Japanese learners delete the first consonant.

(16) Mean number of deletion errors depending on the sites

	CC# → C∅#	CC# → ∅C#
Spanish English	2.7	1.3
Japanese English	1.0	4.3

[10] □ in d. indicates a slot for vowel insertion. Since I am not sure what the vowel quality is, I leave it as it is.

Hancin-Bhatt and Bhatt suggest that Spanish learners choose the first consonant due to CODA COND which allows only /n, l, r, s, d/; in a word like /nɔlt/, /t/ is not a permissible coda consonant in Spanish and dropped. This is problematic, since in a tested pseudo-word /pern/, where both /r/ and /n/ are possible consonant in coda, [r] is chosen. The analysis of the Japanese case is more problematic: they suggest that Japanese learners might perceive the first consonants (sonorants) as vowels and pronounce only the second consonants. However, they also noted that this should be examined further.

The asymmetry relating to coda deletion sites can be explained in a principled way by alternate priority rankings between two general constraints, CODA SONORITY (Iverson & Lee 1994) and MARGIN HIERARCHY (Prince & Smolensky 1993).

(17) CODA SONORITY:
In syllable codas, parse segments with high sonority.

(18) MARGIN HIERARCHY:
Prefer onset or coda with lowest possible sonority.

The constraints show the contradictory preference for coda consonants: (17) assigns consonants with higher sonority in coda and (18) assigns consonants with lower sonority. (17) is a constraint on production, that is, it is more economical to produce the coda consonants that are similar to the preceding vowels in articulation. On the other hand, (18) is a constraint on perception, that is, consonants with low sonority are easier to perceive since they are easily distinguished from vowels by listeners. As a coda position is not a prominent position, it is subject to both constraints (17) and (18). If (17) is ranked higher than (18), there is preference for more sonorous consonants and if it is ranked lower, the reverse is the case.

Going back to the data, the relative ranking of (17) and (18) in the Spanish interlanguage is illustrated in (19).

(19) Spanish English Coda[11]

Input: sɔlt	*COMPLEX	DEP	MAX	CODA SONORITY	MARGIN HIERARCHY
a. sɔlt	*!				
b. sɔ<l>t			*	*!	
☞c. sɔl<t>			*		*

In the above tableau, (b) is ruled out by ranking of CODA SONORITY over MARGIN HIERARCHY. The more sonorous coda consonant is preserved on the output (c). On the other hand, CODA SONORITY is dominated by MARGIN HIERARCHY in Japanese English coda, which results that the less sonorous consonant is favored, as in (20).

(20) Japanese English Coda

Input: sɔlt	*COMPLEX	DEP	MAX	MARGIN HIERARCHY	CODA SONORITY
a. sɔlt	*!				
☞ b. sɔ<l>t			*		*
c. sɔl<t>			*	*!	

In (20), the candidate (c) incurs a violation of the higher ranked MARGIN HIERARCHY, which is satisfied by (b). Therefore, (b) with the less sonorous consonant is selected as optimal.

As seen above the difference between Japanese and Spanish learners in deletion sites is attributed to the ranking difference of MARGIN HIERARCHY and CODA SONORITY. The constraints are not the ones that exist in only the interlanguage of the learners but they exist in other languages, as proposed in a number of grammars (See Prince & Smolensky 1993 and Iverson & Lee 1994) and I assume they also exist

[11] The relative ranking of CODA CONDITION is lower than MARGIN HIERARCHY and CODA SONORITY.

in Spanish and Japanese. But the markedness effects are obscured due to the higher ranked faithfulness constraints, where there are no complex codas in the languages. Thus, the choice of the deletion sites show cases of "the emergence of the unmarked" (MaCarthy & Prince 1994). The constraints MARGIN HIERARCHY and CODA SONORITY that play no role in Spanish and Japanese are emergent in the interlanguage when the input violates a higher ranked marked constraint *COMPLEX and they determine the optimal output.

The analysis is along the same line of child phonolgy (Stemberger & Bernhart 1997), which explains children's data in terms of the interaction of the constraints that parallel those above. Moreover, it is similar in vein to the analysis of dialectal differences in Korean complex coda (Iverson & Lee 1994).

3.3 Coda Epenthesis

Even if coda epenthesis errors are not regarded as remarkable as deletion errors in Hancin-Bhatt and Bhatt, they are reported in the literature (Tarone 1980, Eckman 1988, Weinberger 1994). Many Korean learners add a vowel after a coda consonant cluster (Kim 1991), as shown in (21).

(21) lɔsti 'lost'
milki 'milk'
dræfti 'draft'
golfi 'golf'

The problem is the insertion site: when CVCC sequences are modified by a foreign language learner, there are two possible insertion sites, one between the first and second consonant of the cluster and the other, after the consonant cluster. Insertion patterns result in the structures, each of which has two syllables CV and CVC, as in (22).

(22) a. CV.C**i**C
b. CVC.C**i**

The data (21) show that (22b) is the preferable structure. Kang (1996), in analysis of Korean loanwords, attempted to solve the problem relying on external linguistic process that changes the input form of the source language into the form of the target language. Her argument is that based on spellings speakers identify the final consonant as a released one which is possible only in onset position in Korean, and hence (22b) results. This analysis is undesirable since it utilizes an additional external concept.

Now, I argue the pattern can be best explained resorting to positional faithfulness. The preference is also attributable to the positional privilege of initial syllable. Beckman (1998), in the analysis of Tamil syllable structure, states that there is a position effect at the level of syllable structure: Initial syllables may be larger than non-initial syllables due to high-ranking MAX-σ_1:

(23) MAX-σ_1: Every input segment has an output correspondent in the root-initial syllable.

The relative ranking of the constraint is given in (24).

(24) *COMPLEX $\gg$MAX-σ_1 $\gg$ DEP $\gg$MAX(σ)

Korean syllable structure is maximally CVC and it has to be filled with the segments in the input, as shown in the interaction of the constraints:

(25) Epenthesis after a final consonant[12]

Input: golf	*COMPLEX	MAX-σ_1	CODA COND	MAX(σ)
☞ a. gol.fə		f		
b. go.ləf		l, f !	*	
c. golf	*!		*	

[12] CODA CONDITION in Korean allows only plain stops, /l/, and nasals.

In the above tableau, (a) is optimal, since (b) incurs two violations of MAX-σ_1, where as (a) incurs only one violation; /f/ is syllabified into the second syllable.

Therefore MAX-σ_1, which favors maximal syllabification of input segments to the initial (root) syllable is responsible for the pattern[13].

4. Conclusion

So far I have attempted to provide a linguistic analysis of coda simplification patterns in the interlanguage within OT. The scenario is that second language learners start with the native ranking of the constraints and fix it gradually according to the input. During the acquisition process, the ranking could be different from either that of their native language or that of target language. For example, MARGIN HIERARCHY, since it is ranked low, plays no role in Japanese and Spanish, it appears to be visible in the interlanguage. This study provides a principled account of both transfer and markedness effects and thus supports Optimality Theory, in particular Positional Faithfulness Theory (Beckman 1998).

References

Archibold, J. 1995. *Phonological Acquisition and Phonological Theory*. Hillsdale, NJ: Lawrence Erlbaum.

Beckman, J. N. 1998. *Positional Faithfulness*. PhD. dissertation. University of Massachusetts, Amherst.

Broselow, E., Chen, S. and C. Wang. 1998. "The Emergence of the Unmarked in Second Language Phonology." *Studies in Second Language Acquisition* 20, 261-280.

Carlisle, R. S. 1994. "Markedness and Environment as Internal Constraints on the Variability of Interlanguage Phonology." In M. Yavaş ed., *First and Second Language Phonology*, 223-250. San Diego: Singular Publishing Group, Inc.

[13] A reviewer commented that a constraint highly ranked NoGap might account for the data better. However, it is also problematic, since vowel epenthesis in second language data often breaks the input sequence, which leads NoGap to be placed relatively lower.

Demuth, K. "Markedness and the Development of Prosodic Structure." *NELS* 25, 13-25.

Eckman, F. 1988. "Markedness and the Contrastive Analysis Hypothesis." In G. Ioup and S. Weinberger eds., *Interlanguage Phonology,* 55-69. Cambridge: Newbury House Publishers.

Eckman, F. 1991. "The Structural Conformity Hypothesis and the Acquisition of Consonant Clusters in the Interlanguage of ESL Learners." *Studies in Second Language Acquisition* 13, 23-41.

Eckman, F. and K. Iverson. 1994. "Pronunciation Difficulties in ESL: Coda Consonants in English Interlanguage." In M. Yavaş ed., *First and Second Language Phonology,* 251-266. San Diego: Singular Publishing Group, Inc.

Gnanadesikan, A. 1995. "Markedness and Faithfulness Constraints in Child Phonology." Paper posted on Rutgers Optimality Archive, ROA-67-0000.

Hale, M. and C. Reiss. 1995. "On the Initial Ranking of OT Faithfulness Constraints in Universal Grammar." Paper presented at Stanford Child Language Research Forum.

Hancin-Bhatt, B. and R. Bhatt. 1997. "Optimal L2 Syllables." *Studies in Second Language Acquisition* 19, 331-378.

Iverson, G. and Shinsook Lee. 1994. "Variation as Optimality in Korean Cluster Reduction." ESCOL '94, 174-185.

Kang, H. S. 1996. "English Loanwords in Korean." *Studies in Phonetics, Phonology and Morphology* 2, 21-48.

Kaye, J. and Lowenstamm, J. 1981. "Syllable Structure and Markedness Theory." In *Theory of Markedness in Generative Grammar*, 287-315. Pisa, Italy: Scuola Normale Superiore.

Kim, M.-J. 1991. Yeongeo chaeumgun paleum-e easseo moeumsayong-e kwanhan yeongu. [On the insertion of a vowel in the pronunciation of English words] Unpublished MA thesis, Yonsei University.

Leather, J., & A. James. 1991. "The Acquisition of Second Language Speech." *Studies in Second Language Acquisition* 13, 305-341.

McCarthy, J. 1993. "Generalized Alignment." Ms. University of Massachusetts.

McCarthy, J. & A. Prince. 1995. "Prosodic Morphology." In J. Goldsmith ed., *The Handbook of Phonological Theory,* 318-366. Cambridge: Blackwell.

McCarthy, J. & A. Prince. 1994. "The Emergence of the Unmarked: Optimality in Prosodic Morphology." *NELS* 24, 333-379.

Prince, A. and P. Smolensky. 1993. "Optimality Theory." Ms. Rutgers University.

Stemberger, J. 1995. "Optimality Theory and Phonological Development." Talk presented at Korean Int'l Conference on Linguistics held on July 3-7, 1995.

Stemberger, J. and B. Bernhart. 1997. *Handbook of Phonological Development.* New York: Academic Press.

Silvermann, D. 1992. "Multiple Scansions in Loanword Phonology: Evidence from Cantonese." *Phonology* 9, 289-328.

Tarone, E. 1980. "Some Influences on the Syllable Structure of Interlanguage Phonology." *IRAL* 18, 139-152.

Vennemann, T. 1988. *Preference Laws for Syllable Structure and the Explanation of Sound Change.* Berlin: Mouton de Gruyter.

Weinberger, S. H. 1994. "Functional and Phonetic Constraints on Second Language Acquisition." In M. Yavaş ed., *First and Second Language Phonology,* 283-302. San Diego: Singular Publishing Group, Inc.

Yip, M. 1996. "Cantonese Loanword Phonology and Optimality Theory." *Journal of East Asian Linguistics* 2, 261-291.

Yoo, H. -B. 1996. "Markedness and Faithfulness Constraints in the Acquisition of Korean Liguids." *Korean Journal of Linguistics* 21, 1085-1194.

Zoll, C. 1998. "Positional Asymmetries and Licensing." Paper posted on Rutgers Optimality Archive, ROA-282-0998.

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