『영어영문학연구』 제44권 제4호 (2018) 겨울 131－153
Studies in English Language & Literature
http://dx.doi.org/10.21559/aellk.2018.44.4.07

An Alternative Account of Truncation in English Word Formation*

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Chung, Chin-Wan. "An Alternative Account of Truncation in English Word Formation." ***Studies in English Language & Literature*** **44.4 (2018): 131-153.** This paper focuses on base truncation in English word formation. Deletion of base final vowel or rime occurs over a morpheme boundary formed by a morpheme concatenation. It is argued in this study that such truncation is attributed to avoid a sequence of vowels over a morpheme boundary, two contiguous syllables with identical onsets, the neutralization of a strong vowel in the *-ate* suffix, and three or more consecutive stressless syllables in the output of word formation. Truncation of base final vowel is based on cross-linguistic tendency, which is reflected in the interaction between specific and general segmental faithfulness constraints. The deletion of base-final rime in three different sub-groups of data is implemented through Contiguity-Base, Id-Str(V), *Clash, and prosodically-related constraints such as Ft-Bin and *Lapse. The constraints and their rankings proposed in this study show effects of vowel-initial suffixes in word formation process in English. Even though structural requirements from diverse vowel-initial suffixes are incongruous, they all demand structural well-formedness in outputs and they are explained by the current analysis. (Chonbuk National University)

Key Words: Word formation, Truncation, Derivational suffixes, Constraints, Ranking, Optimality theory

* A part of this paper was presented at the 3rd Joint International Conference of MBALL, AELLK, MESK, NAELL 2018 held at Gyeongsang National University, Oct. 12-13, 2018. I thank anonymous reviewers for their insightful comments. Any remaining errors are my own responsibility.

I. Introduction

In English, one of the methods that the language can utilize to create new words is derivation. Through this process, a new word is made when a derivational affix is added to a base. Word formation itself is a purely morphological process and it seems to be very simple. However, a very intriguing morpho-phonological issue arises in the output depending on whether a derivational suffix begins in a vowel or not. This is because vowel-initial derivational suffixes belong to a non-neutral or Class/Level/Stratum I compared to a neutral or Class/Level/Stratum II and they may trigger truncation in the base of word-formation process in English. This interesting behavior of vowel-initial suffixes is in accordance with a traditional claim. That is, suffixes belonging to different Classes play an important role in the morphological component of a grammar, which is assumed to consist of several hierarchical strata (cf. Siegal, 1974; Allen, 1978; Kiparsky, 1982a, 1982d, 1985; Mohanan, 1986; Spencer, 1991; Katamba and Stonham, 2006).

Base truncation occurring in English word formation process can be attributed to phonological requirements: a ban on two adjacent vowels over a morpheme boundary, the prohibiton on identical onsets in contiguous syllables, the restriction of a strong vowel neutralization in the suffix such as *-ate*, and a ban on the sequence of three or more unstressed syllables in the output. Especially, final three structural requirements motivate base-final rime deletion in English. Thus, this study examines diverse cases of base truncation in word formation process in English and attempts to provide an analysis, which is based on phonologically-grounded constraints and their ranking. Specifically the study delves into some thorny issues such as the designation of deleting segment(s) in bases and the specific motivation of truncation in English word formation. For the analysis, we mainly look into verb-forming *-ate* and *-ize*, noun-forming *-ee*, and adjective-forming *-al* and *-ese* to demonstrate how these vowel initial suffixes affect segmental realization in bases.

The paper is structured as follows. Section 2 introduces a set of examples that show deletion of base segment(s) in word formation. Section 3 reviews previous studies and discusses their problems. Section 4 provides an alternative account, which is based on constraints and their ranking and it is followed by a summary of the study and its phonological implications in section 5.

II. Data Presentation

This section presents various cases of base segment deletion in the process of word formation in English. Typically, truncation of segments in bases occurs when a vowel-initial derivation suffix is added to a base ending either in a vowel or a consonant. Thus, we divide base truncation data into two types based on whether a base ends in a vowel or a consonant. We first present the examples of segmental truncation in vowel-final bases when they are followed by vowel-initiating suffixes. The following examples are from Raffelsiefen (1999), Plag (2003), Katamba and Stonham (2006), and Bauer, Lieber, and Plag (2013).

(1) a. Bases ending in a vowel / b. Bases ending in a consonant

a. Bases ending in a vowel			b. Bases ending in a consonant		
luna+al	→	lunar	pole+al	→	polar
ulna+al	→	ulnar	column+al	→	columnar
orchestra+al	→	orchestral	nodule+al	→	nodular
Malta+ese	→	Maltese	Sudan+ese	→	Sudanese
China+ese	→	Chinese	Nepal+ese	→	Nepalese
cavity+ate	→	cavitate	caffeine+ate	→	caffeinate
mercury+ate	→	mercurate	amalgam+ate	→	amalgamate
necessity+ate	→	necessitate	assassin+ate	→	assassinate
memory+ize	→	memorize	alphabet+ize	→	alphabetize
colony+ize	→	colonize	opinion+ize	→	opinionize
category+ize	→	categorize	awful+ize	→	awfulize
apology+ize	→	apologize	glitter+ize	→	glitterize
summary+ize	→	summarize	computer+ize	→	computerize
analogy+ize	→	analogize	routine+ize	→	routinize
military+ize	→	militarize	hospital+ize	→	hospitalize

The examples given in (1a) show that one of the vowels over a morpheme boundary is not realized in the output. This type of vowel deletion occurs when a vowel-ending base word is followed by a vowel-initial derivational suffix. All the base words in (1a) are vowel-final and they are affixed with adjective forming *-al* and *-ese* suffixes in the first five examples. On the other hand, vowel-ending bases are followed by verb-forming *-ate* and *-ize* suffixes in the rest of the examples. It is assumed in this study that vowels over a morpheme boundary are not desirable so that one of the vowels is deleted in the derived words. With respect to the target of deletion, we follow Casali (1997, 2011) who argues that the first vowel is generally deleted cross-linguistically in vowel hiatus. Thus, a base final vowel is assumed to be deleted when it is followed by a vowel-initial suffix in the word formation examples in (1a).

Deletion of base-final vowel in (1a) is supported by the corresponding examples given in (1b). The word formation examples in (1b) are composed of consonant-final bases and vowel-initial derivational suffixes. In such examples, there is no vowel deletion in newly derived words. Instead of vowel deletion, the final consonant in the base becomes the onset of a vowel-initial suffix through resyllabification. Thus, the assumption that vowels abutting over a morpheme boundary are a legitimate motivation of vowel deletion in word-formation is justified.

(2) a Bases undergoing truncation / b. Bases not undergoing truncation

saturnine+ism	→	saturnism	national+ism	→	nationalism
feminine+ism	→	feminism	modern+ism	→	modernism
maximum+ize	→	maximize	radium+ize	→	radiumize
optimum+ize	→	optimize	vacuum+ize	→	vacuumize
minimum+ize	→	minimize	medium+ize	→	mediumize
feminine+ize	→	feminize	masculine+ize	→	masculinize
emphasis+ize	→	emphasize	catharsis+ize	→	*catharsisize
synthesis+ize	→	synthesize	ellipsis+ize	→	*ellipsisize
hypothesis+ize	→	hypothesize	aphaeresis+ize	→	*aphaeresisize
parenthesis+ize	→	parenthesize	synapsis+ize	→	*synapsisize

appetite+ize	→	appetize	parasite+ize	→	parasitize
rehabilitate+ee	→	rehabilitee	delegate+ee	→	delegatee
amputate+ee	→	amputee	consecrate+ee	→	consecratee
interrogate+ee	→	interrogee	communicate+ee	→	communicatee
nominate+ee	→	nominee	relocate+ee	→	relocatee
vaccinate+ee	→	vaccinee	educate+ee	→	educatee
evacuate+ee	→	evacuee	dedicate+ee	→	dedicatee
alienate+ee	→	alienee	mandate+ee	→	mandatee
alluvium+al	→	alluvial	inflection+al	→	inflectional
folium+al	→	foliar	function+al	→	functional
millennium+al	→	millennial	nation+al	→	national
effluvium+al	→	effluvial	instrument+al	→	instrumental
epithelium+al	→	epithelial	tradition+al	→	traditional
antheridium+al	→	antheridial	occasion+al	→	occasional
bacterium+al	→	bacterial	fraction+al	→	fractional

The examples in (2) show different realization patterns of segments from those in (1b) even though the composition of a base and a suffix is identical: a consonant-final base plus a vowel-initial suffix. Unlike the examples in (1b), we observe some portion of a base element is not realized in newly derived words. As shown by the examples, the final -VC of a base word is deleted in newly derived words in (2a). Deletion of a rime in the final syllable of the base occurs when a noun-forming suffix *-ism*, a verb-forming suffix *-ize*, a noun forming suffix *-ee*, and an adjective forming suffix *-al* are affixed in (2a).

The examples in (2a) can be divided into three groups depending on the structural composition in the output when a suffix is added to a base. The first group has identical onsets in adjacent syllables as shown by the examples from *saturnine+ism* to *amputate+ee*. The second group of examples does not have identical onsets in contiguous syllables but the data end in *-ate* and they still undergo base-final rime deletion. This is represented by the examples from *interrogate+ee* to *alienate+ee*. The final group of data has neither identical onsets in adjacent syllables nor final *-ate* in the base. The final seven examples end in *-um* in their bases and they are truncated when suffixed by the adjective-forming *-al* affix.

The truncation of base-final rimes in (2a) is evinced by the examples provided in (2b) where we do not observe any deletion of segments in word formation. For example, when a base and a suffix do not form a sequence of syllables with identical onsets, there is no rime deletion as shown in *masculine+ize* → *masculinize*. One thing to note is that words from *catharsis* to *synapsis* show a different behavior in word formation in that they are not verbalized by being suffixed with *-ize* (cf. Raffelsiefen 1999). Such examples are lexically-specified in that they do not take *-ize* suffix to form a verb in English. In the example where there are no identical onsets in consecutive syllables and followed by *-ee* such as in *consecrate+ee*, there is no truncation in the final rime in the base, which is contrasted with *nominate+ee* → *nominee*. Finally, when an adjective forming suffix *-al* is added to a base-noun *inflection*, it is realized in the output as *inflectional*, which can also be measured against a base ending in *-um* such as in *millennium* → *millennial*. Thus, structurally incongruous groups of examples interestingly show a uniform truncation pattern in (2a), whose truncation is compared to non-truncating examples in (2b).

As we have described so far, there are various cases of base truncation in word formation process in English. In the next section, we will briefly review previous studies on base truncation and discuss their possible problems.

III. Previous Analyses

In this section, we look over previous studies on segmental deletion in bases of word formation. Concerning the deletion of a base-final vowel, Plag (2003:73, 94) briefly describes that a base-final vowel is deleted if a base ends in two stressless open syllables and such a base is followed by a vowel-initial suffix such as *-ize* and *-ate*: *mémory* → *mémorìze* and *mércury* → *mércuràte*, respectively. On the other hand, polysyllabic derived forms created by *-ize* do not allow to have final adjacent syllables with identical onsets: *féminine* → *féminìze* **fémininìze* and *émphasis* →

émphasìze **émphasisìze*. The description proposed by Plag is insightful in explaining some of the English examples if we only confine derivatives created by *-ize*. However, as we have presented in (1a) and (2a), there are other examples such as *luna, ulna, Malta,* and *China* in (1a) that do not fit to the description of Plag. With respect to deletion of base-final rime, the explanation of Plag is only valid for derived words formed by the *-ize* suffix. But there are other suffixes such as *-al*, *-ism*, and *-ee* that trigger the identical base-final truncation in the base nonetheless such suffixes do not necessarily require a base to have identical onsets. Since Plag (2003) briefly mentions such a phenomenon in limited examples of word formation in English without providing any analysis, one needs to propose a comprehensive account, which can explain various types of base truncation examples in English.

Raffelsiefen (1999) considers extensive data of base truncation in English and provides a constraint-based analysis. In this study, we focus only on the cases that are relevant to the current study such as *-ee* and *-ize* related derivatives. In order to explain the deletion of the base-final rime in word formation, she employs the following constraints.

(3) a. Ident(S): A stressed syllable in a derived word must correspond to a stressed syllable in the base.
b. *Ons_iOns_i: Identical syllable onsets are prohibited.
c. *Clash: Two adjacent stressed syllables are prohibited. Domain:pword.
d. M-Parse: Morphemes are parsed into morphological constituents.

Ident(S) calls for the faithful correspondence of prosodically prominent syllables in the derived word to those in the base. On the other hand, *Ons_iOns_i requires the inhibition of adjacent syllables with identical onsets and it is ranked lower than Ident(S) in the analysis. *Clash is a typical markedness constraint, which bans two consecutive stressed syllables. This constraint is dominated by Ident(S) and *Ons_iOns_i because there are some words that violate this constraint: *téxtìle* and *cónvòy* (Giegerich 1992: 185). M-Parse demands that a morpheme be parsed into a morphological constituent so that it can be a part of a word. This is the lowest-ranking constraint in the analysis, which can explain cases where non-affixation or non-realization of a certain formative in English. The following table illustrates how the given constraint ranking selects the best form for base truncation in English.

(4) emphasis-ize → emphasize

ɛ́mfəsɪs-áyz	Ident(S)	*Ons$_i$Ons$_i$	*Clash	M-parse
(ɛ́mfəsɪsàyz)$_\omega$		*!		
☞(ɛ́mfəsàyz)$_\omega$				
(ɛ́mfàyz)$_\omega$			*!	
ɛ́mfəsɪs-áyz				*!

The proposed constraints and their ranking seem to explain base truncation examples in English. However, there are some problems in the above analysis. First, there are examples that do not have identical onsets in adjacent syllables but they sill undergo the same base truncation when suffixed by *-ee* in *vaccinate*, *evacuate*, and *alienate*. If the constraint ranking in (4) applies to the above examples, the ranking selects more than one outputs as optimal as demonstrated by the following table.

(5) vaccinate+ee → vaccinee

vǽksənèyt-í:	Ident(S)	*Ons$_i$Ons$_i$	*Clash	M-parse
(væ̀ksənèytí:)$_\omega$			*!	
☜(væ̀ksənətí:)$_\omega$				
☞(væ̀ksəní:)$_\omega$				
vǽksənèyt-í:				*!

As shown in (5), the actual optimal form is the third one but the current ranking also chooses the second output as optimal, which is not the harmonic form. It is because the second candidate does not violate any given constraints just like the actual third candidate.

Another problem of the analysis is that the given ranking does not specifically point out the final rime deletion. This is because truncation of the final syllable core (CV) in bases also results in the identical output string of segments like the form undergone base-final rime deletion. In such a case, the ranking selects two optimal forms as shown in (6).

(6) ɛmfəsɪs-ayz → ɛmfəsayz

ɛ́mfəs$_1$ɪ$_2$s$_3$-áyz	Ident(S)	*Ons$_i$Ons$_i$	*Clash	M-parse
(ɛ́mfəs$_1$ɪ$_2$s$_3$àyz)$_\omega$		*!		
☞(ɛ́mfəs$_1$àyz)$_\omega$				
☜(ɛ́mfəs$_3$àyz)$_\omega$				
(ɛ́mfàyz)$_\omega$			*!	
ɛ́mfəs$_1$ɪ$_2$s$_3$-áyz				*!

The constraint ranking selects the second and third candidate as optimal. However, the actual output is the second candidate where the base final rime is deleted. Thus, the analysis proposed by Raffelsiefen (1999) fails to explain some of the examples presented in (2a). This may indicate that we need to consider some other factors in base truncation in English.

Another previous account related to base truncation in English is from Kang and Gao (2017) who also utilize constraints framed in optimality theory and correspondence theory. They propose the following constraints.

(7) a. Obligatory Contour Principle (OCP): Same onsets are disfavored as constituent siblings.
b. Ident-F: Segments should be faithful to their underlying features.
c. Max-IO: Every segment of input must have a corresponding segment in the output.

The ranking of the constraints in (7) is OCP, Ident-F ≫ Max-IO and this ranking seems to explain some of the base truncation examples formed by *-ize*, *-ee*, and *-ity* suffixes. But the analysis faces the identical problems we pointed out for Raffelsiefen's account. That is, the constraint ranking cannot distinguish the difference between the second and third candidate in (6). In addition, the analysis has problems in accounting for the examples, which do not have identical onsets in adjacent syllables as in *vaccinate+ee* → *vaccinee*.

In order to explain the deletion of a base final vowel when followed by a vowel initiating suffix, Kang and Gao (2017) propose No Vowel Hiatus, Dep-IO, and Max-IO constraints, which are ranked No Vowel Hiatus, Dep-IO ≫ Max-IO. The analysis, however, fails to differentiate an optimal form from a suboptimal form because the given constraint ranking selects both [$luna_1r$] and [$luna_2r$] as optimal forms of the input /$luna_1$+a_2l/. It can be ascribed to the fact that the general faithfulness constraint does not distinguish a vowel from a base and an affix. As discussed in previous researchers (Raffelsiefen, 1999; Plag, 2003), it has been assumed that a vowel in the stem is the target of deletion, but the target vowel should be specified by the relevant constraints in the analysis. Thus, we need to decompose the general faithfulness constraint Max-IO into Max-Affix and Max-IO in order to accurately designate the target of deletion when two vowels occur next each other.

In this section, we reviewed previous accounts of base truncation in English word formation. We found out that each analysis has its own insightful points for the issues we are dealing with in this study but some of the points discussed in the previous studies need to be reconsidered in order to account for various types of base truncation examples. Thus, we will provide an alternative analysis of base truncation in English in the next section.

IV. An Alternative Analysis

In this section, we first discuss the examples where we observe adjacent vowels over a morpheme boundary whose examples are presented in (1a). The examples in (1a) show that a sequence of vowels over a morpheme boundary undergoes truncation. We assume that such an unwanted sequence of sounds is resolved by deleting a final vowel in the base. The selection of base vowel deletion is based on the claim from Casali (1997, 2011) who argues that the first vowel deletion in vowel sequences is preferred cross-linguistically. We use the following constraints for the examples in (1a).

(8) Constraints for vowel hiatus resolution
  a. *Vowel Hiatus: A sequence of vowels across a morpheme boundary is banned.
  b. Max-IO: Every element of input has a correspondent in output.
  c. Max-Affix: Every element of affix has a correspondent in output.

*Vowel Hiatus (Orie and Pulleyblank, 2002) is a general markedness constraint, which bans a sequence of vowels in the output. Since this is a general markedness constraint, it does not pinpoint the target of deletion. The selection of a vowel to be deleted is decided by the two faithfulness constraints: Max-Affix and Max-IO. Between these two faithfulness constraints, the former is ranked higher than the latter because Max-IO is more general than Max-Affix and this type of ranking is grounded in Pāṇini's theorem of constraint (Prince and Smolensky, 1993/2004). In this analysis, *Vowel Hiatus and Max-Affix do not show any specific ranking but we rank Max-Affix over *Vowel Hiatus because there are some examples where two vowels occur over a morpheme boundary as in *evacuee*, which is created by base truncation. In the following tables, we do not include a candidate that has an inserted consonant to break up the vowel sequence. In addition to this, we also do not propose a featural identity constraint, which monitors the featural specification of the lateral.

(9) a. ulna+al → ulnar

$ulna_1$+a_2l	Max-Aff	*VH	Max-IO
$ulna_1a_2r$		*!	
$ulna_1r$	*!		*
☞$ulna_2r$			*

b. memory+ize

$memory_1+i_2ze$	Max-Aff	*VH	Max-IO
$memory_1+i_2ze$		*!	
$memory_1ze$	*!		*
☞$memori_2ze$			*

As shown in (9), a sequence of vowels formed by a vowel final base and a vowel initial suffix is resolved by deleting the base final vowel, which is secured by Max-Affix over Max-IO. Without the interaction of these two constraint, one cannot differentiate the second and third candidate in (9a) and (9b), respectively. The constraint ranking used in (9) can explain all the examples given in (1a).

However, the examples in (2a) show different base truncation pattern from the one observed in (9) and the data in (2a) cannot be accounted for by the constraint ranking in (9). In order to explain the different pattern of base truncation, we divide the data into three groups as we explained in the previous section. The first group, which has identical onsets in adjacent syllables after a suffix is added, shows that base-final rime is truncated in the output. The second group of examples, ending in -*ate*, does not have identical onsets in neighboring syllables but the examples still experience the same pattern of base truncation in *evacuate+ee* → *evacuee*. The final group includes examples that have neither identical onsets nor base-final -*ate* but they still undergo the identical base truncation.

In order to explain the first sub-group of base truncation examples in (2a), we propose following constraints in which we also employ the constraints (8b) and (8c) used for the examples in (1a).

(10) Constraints for the first sub-group of base truncation

a. Contiguity-Base: No medial skipping of input base in output.

b. $*Ons_iOns_i$: Identical onsets in adjacent syllables are not allowed.

c. *Clash: No stressed syllables are adjacent.

d. Max-IO: Every element of input has a correspondent in output.

e. Max-Affix: Every element of affix has a correspondent in output.

Contiguity-Base, which is a modified version of Contiguity (McCarthy and Prince, 1995, 2004), calls for no skipping of base realization in the output. The constraint specifically indicates deletion of final elements in the base because truncation of edge elements does not lead to a violation of Contiguity-Base. This plays an integral role because it distinguishes a base final syllable core from a rime in base truncation and it is undominated in the analysis. We adopt *Ons$_i$Ons$_i$ from Raffelsieffen (1999), which demands that two consecutive syllables with identical onsets not be allowed. This markedness constraint motivates base truncation. Ranking Contiguity-Base over *Ons$_i$Ons$_i$ guarantees the deletion of base-final rime in English.

*Clash (cf. Kager, 1999; Raffelsieffen, 1999) prohibits the occurrence of adjacent stressed syllables from rhythmic consideration of English. This constraint is dominated by Contiguity-Base and *Ons$_i$Ons$_i$ in the analysis. Concerning segmental faithfulness constraints, Max-Affix ranks equally with Contiguity-Base but the general Max-IO is ranked lowest in the analysis because the examples generally show base truncation. The following tables demonstrate how constraint interaction leads to the selection of the best forms of base truncation. In the tables below, we do not include a candidate that has a segment undergone featural changes such as *femini<u>t</u>ism* to avoid the violation of *Ons$_i$Ons$_i$.

(11) a. feminine+ism → feminism

fɛ́mən$_1$ɪ$_2$n$_3$+ìsm̩	Contig-B	Max-Aff	*On$_i$On$_i$	*Clash	Max-IO
fɛ́mən$_1$ɪ$_2$n$_3$ìsm̩			*!		
fɛ́mən$_3$ìsm̩	*!				**
☞fɛ́mən$_1$ìsm̩					**
fɛ́mìsm̩				*!	****

b. optimum+ize → optimize

áptəm$_1$ə$_2$m$_3$+àyz	Contig-B	Max-Aff	*On$_i$On$_i$	*Clash	Max-IO
áptəm$_1$ə$_2$m$_3$àyz			*!		
áptəm$_3$àyz	*!				**
☞áptəm$_1$àyz					**
áptàyz				*!	****

As shown in (11), when adjacent syllables with identical onsets are made by suffixation, the base-final rime is elided to satisfy the *Ons_iOns_i constraint. However, the selection of the truncation target is specified by Contiguity-Base, which eliminates the second candidate in (11a) and (11b) from the competition. The sub-optimal second forms in (11) violate the constraint because the candidates skip over the two medial segments -$n_1ɪ_2$- and -$m_1ə_2$-, respectively. If Contiguity-Base is not in action, the second and third candidates are chosen as optimal forms, which were a problem for previous analyses discussed in section 3. On the other hand, the final candidates in (11) are filtered out by *Clash which is induced by deleting final-four segments in the base. This indicates that deletion of base-final segments is limited so that it does not lead to a violation of another constraint such as *Clash. Thus, the third candidate in (11a) and (11b) emerges as optimal, which has minimal violation of Max-IO.

Following two constraint tables illustrate two contiguous syllables with identical obstruent onsets. Such type of examples also can be explained by the constraint ranking in (11).

(12) a. emphasis+ize → emphasize

$\acute{ɛ}mfəs_1ɪ_2s_3$+áyz	Contig-B	Max-Aff	*On_iOn_i	*Clash	Max-IO
$\acute{ɛ}mfəs_1ɪ_2s_3$àyz			*!		
$\acute{ɛ}mfəs_3$àyz	*!				**
☞$\acute{ɛ}mfəs_1$àyz					**
ɛ́mfàyz				*!	****

b. amputate+ee → amputee

$\acute{æ}mpyut_1\grave{e}y_2t_3$+í:	Contig-B	Max-Aff	*On_iOn_i	*Clash	Max-IO
$\grave{æ}mpyut_1\grave{e}y_2t_3$í:			*!	*!	
$\grave{æ}mpyut_3$í:	*!				**
☞$\grave{æ}mpyut_1$í:					**

As shown in (11) and (12), if contiguous syllables with identical onsets are created by a vowel-initial suffix, this unwanted structure violates *On_iOn_i and it is bypassed by truncating the base-final rime. The choice of the base-final rime as deletion target is specified by the undominated Contiguity-Base.

For the analysis of the second sub-group of base-truncation examples, we need some other constraints other than those in (10) because the second sub-group of examples do not have identical onsets in contiguous syllables. Thus, there must be some other reasons why such examples still undergo the same base-final truncation. For this issue, we assume that it has to do with prosodic structure related elements such as foot and sub-division of the *-ate* suffix into a strong and weak form with respect to alternation of the vowel in *-ate*. We propose the following constraints that reflect such elements.

(13) Constraints for the second sub-group of examples
   a. Ft-Bin: Feet are binary under moraic or syllabic analysis.
   b. Parse-σ: Syllables are parsed into a foot.
   c. Id-Str(V): A strong vowel and its output correspondent are identical in their feature.

Ft-Bin (Prince 1980; Prince and Smolensky, 1993) demands a foot to have two necessary elements and it does not allow a degenerate and ternary foot. Parse-σ calls for the inclusion of a syllable into a foot in order for it to be prosodically active. Between Ft-Bin and Parse-σ, the former outranks the latter otherwise a language may allow a degenerate or ternary foot to parse syllables exhaustively.

Id-Str(V) requires that a non-alternating strong vowel and its correspondent be identical in their feature. That is, neutralization of a non-alternating vowel is prohibited by the constraint. This constraint is relevant to the *-ate* suffix because words containing *-ate* show two different realizations of it. In the first group, the *-ate* does not alternate when followed by other suffixes. On the hand, the vowel in *-ate* may have a possibility to be neutralized when followed by a certain suffix. We call such a type of *-ate* weak vowel. Thus, the formative *-ate* in the words from *interrogate* to *alienate* in (2a) does not alternate in the output when followed by other suffixes. An interesting aspect of such words is that they are formed by back-formation except for *evacuate* and *alienate* and the *-ate* in such words does not alternate in the output forms. For example, *álienàte* has derivatives such as *àlienátion* and *àlienátor* while *evácuàte* has *evácuàtor*, *evácuàtive* and *evàcuátion* as its derivatives. Thus, the vowel in *-ate* in the above words is dubbed 'strong vowel' since it does not undergo neutralization. For the examples such as *interrogate* which does not have a strong vowel but still undergoes base truncation, we assume that the words formed by back-formation follow the identical truncation pattern of a strong vowel in the *-ate* suffix.

Compare to these examples, the vowel of *-ate* in the examples in (2b) from *delegate* to *dedicate* has a possibility of undergoing alternation when affixed by other suffixes. For example, *dédicàte* has non-alternating derivatives such as *dèdicátion* and *dédicàtor* but it also has an alternating *dédic**a**tòry*. At the same time, *cónsecràte* has non-alternating *cònsecrátion*, *cónsecràtor*, and *cónsecràtive* but it has *cónsecr**a**tòry* as its alternating derivative as well. Thus, when such words are followed by a suffix, which results in shifting stress from *-ate* to other syllables, the vowel in *-ate* undergoes neutralization and it still is realized in the output. We call such a vowel 'weak vowel' so that it may undergo alternation. Thus, when *dédicàte* is suffixed by *-ee*, the vowel in *-ate* is neutralized to [ə] in *dèdic**a**tée* instead of truncating the base final rime as in **dèdicée*.

However, since the strong vowel in *-ate* of the words in (2a) is not alternating in the output, it is fully realized with its stress, causing problems when followed by an auto-stressing suffix like *-ee*. The problems are: if the *-ate* maintains its stress, it violates *Clash or if it undergoes neutralization, it violates Id-Str(V). Thus, the only option that the *-ate* can take when suffixed by *-ee*, it undergoes truncation to satisfy *Clash and Id-Str(V) in word-formation. In the analysis, we rank Id-Str(V) over Parse-σ, which is equally ranked with the lowest-ranking Max-IO. The following tables show the role of the constraints proposed in (13). Concerning the ranking relation, Ft-Bin, Id-Str(V), *Clash are not in conflict and they do not show any ranking among themselves. A strong vowel and its output correspondents are underlined in (14). At the same time, we do not propose a constraint such as Id-IO(V), which can be contrasted with Id-Str(V) and is ranked lowest if it is included in the analysis. Since Id-IO(V) does not have a critical role in the analysis, we do not employ this general faithfulness constraint.

(14) a. evacuate+ee → evacuee

ɪvǽkyuèyt+í:	Ft-Bin	*Clash	Id-Str(V)	Parse-σ	Max-IO
ɪ(vækyu)(èy)(tí:)		*!		*	
ɪ(vækyu)ə(tí:)			*!	**	
ɪ(vækyuə)(tí:)	*!		*!	*	
☞ɪ(vækyu)(í:)				*	**

b. vaccinate+ee → vaccinee

vǽksənèyt+í:	Ft-Bin	*Clash	Id-Str(V)	Parse-σ	Max-IO
(væksə)(nèy)(tí:)		*!			
(væksə)nə(tí:)			*!	*	
(væksənə)(tí:)	*!		*!		
☞(væksə)(ní:)					**

Since the input vowel in *-ate* is a non-alternating one, it does not undergo neutralization. If it alternates as shown in the sub-optimal second and third candidates in (14a) and (14b) respectively, they incur a violation of Id-Str(V). If, however, a strong vowel does not alternate and preserves its stress, it renders an occurrence of two contiguous stressed syllables, which result in a critical violation of *Clash, as shown by the undesirable first candidate in (14a) and (14b). Furthermore, the third candidates in (14) violate Ft-Bin, which is also turned out to be critical. Thus, the only strategy a candidate can adopt is to delete the base-final rime and it enables the candidate to satisfy *Clash and Id-Str(V). The optimal candidates satisfy Id-Str(V) vacuously because there are no correspondents of the strong input vowels. The examples that do not have identical onsets in neighboring syllables undergo base-final rime truncation and such examples can be explained by the constraint-ranking in (14).

The constraint ranking revealed in (14) can also be applied to the examples in (2b), which have a weak vowel in *-ate* such as in *dedicate*. This is demonstrated by the following table.

(15) dedicate+ee → dedicatee

dɛ́dəkèyt-í:	Ft-Bin	*Clash	Id-Str(V)	Parse-σ	Max-IO
(dɛ̀də)(kèy)(tí:)		*!			
☞(dɛ̀də)kə(tí:)				*	
(dɛ̀dəkə)(tí:)	*!				
(dɛ̀də)(kí:)					**!

The first candidate is eliminated due to its violation of *Clash. It incurs a violation of the constraint because the candidate preserves the stressed ultimate syllable of the base in the output. Maintaining the stressed final syllable of the base is not necessary since the *-ate* in the base does not have a strong vowel. The optimal second candidate neutralizes the final weak vowel of the base and it is not parsed into a preceding foot. Neutralization of a weak vowel enables the candidate to avoid the violation of *Clash, which turns out to be a better strategy than that of the first candidate. Another option that the optimal candidate utilizes is not to include the penult syllable into a preceding foot so that the preceding foot satisfies Ft-Bin. If it were parsed, it would make the preceding foot a ternary foot or a dactylic foot, which violates Ft-Bin as shown in the third candidate. The final candidate that deletes the base-final rime loses out to the optimal form due to its violation of Max-IO twice, which turns out to be unmotivated. Thus, the constraint ranking we established for the second sub-group of base-final rime deletion examples can explain the words with strong and weak vowels in *-ate* suffix.

The constraint ranking in (15) needs to be substantiated by a following constraint in order to explain the final sub-group of examples. We adopt a constraint from Elenbaas and Kager (1999) to explain such examples and the constraint is given in (16).

(16) *Lapse: Every weak beat must be adjacent to a strong beat or the word edge.

The constraint prohibits three or more adjacent stressless syllables. The positions where unstressed syllables are licensed to occur are both sides of stressed syllables and the word edges. It plays an important role in words that end in two or more unstressed syllables and followed by a suffix that does not carry any stress. In such word formation processes, a base final rime is truncated to satisfy *Lapse. The effect of *Lapse is illustrated in (17).

(17) alluvium+al → alluvial

əlú:vɪə$_1$m$_2$-ə$_3$l	Contig-B	Max-Aff	Ft-Bin	*Lapse	Parse-σ	Max-IO
ə(lú:vɪ)ə$_1$m$_2$ə$_3$l				*!(ə$_1$)	***	
ə(lú:vɪ)ə$_1$l		*!			**	**
ə(lú:vɪ)m$_2$ə$_3$l	*!				**	*
ə(lú:vɪə$_3$l)			*!		*	**
☞ə(lú:vɪ)ə$_3$l					**	**

The first candidate crucially violates *Lapse because the unstressed penult syllable occurs after a unstressed antepenult syllable. The second and third candidates are sub-optimal due to their Max-Affix and Contiguity-Base violation each. The optimal final candidate edges out the fourth candidate because of the violation of Ft-Bin by the fourth candidate. This implies that it is more important to satisfy Ft-Bin than to achieve exhaustive parsing. Thus, the newly adopted constraint triggers the truncation of base-final rime in the examples where words do not have either identical onsets in contiguous syllables or a strong vowel in the output form. If *Lapse is applied to other examples in (2a), it will be trivially satisfied. On the other hand, if the constraints that were proposed for the second sub-group of examples in (2a) are applied to the first sub-group of data in (2a), they will be trivially satisfied as well. Thus, it seems possible to combine the constraint rankings into a unified one because constraints and their rankings employed in each sub-group do not have specific influence on the selection of the optimal forms in other groups. And furthermore some of the constraints generally play an important role at each sub-group. The constraint rankings established in this section are given in (18) and the combined ranking is presented in (19).

(18) a. Ranking for the data in (1a)
Max-Affix ≫ *Vowel Hiatus ≫ Max-IO
b. Ranking for the first sub-group of data in (2a)
Contig-B, Max-Affix ≫ *Ons$_i$Ons$_i$, *Clash ≫ Max-IO
c. Ranking for the second sub-group of data in (2a)
Ft-Bin, *Clash, Id-Str(V) ≫ Parse-σ, Max-IO
d. Ranking for the third sub-group of data in (2a)
Contig-B, Max-Aff ≫ Ft-Bin, *Lapse ≫ Parse-σ, Max-IO

(19) Combined constraint ranking

Contig-Base Max-Affix	≫	*Vowel Hiatus *Ons$_i$Ons$_i$, *Clash Ft-Bin, Id-Str(V), *Lapse	≫	Parse-σ, Max-IO

Since the constraint ranking for each sub-division of the data can be applied to other examples as well, the combined constraint ranking can explain all the examples of base truncation in word formation in English.

V. Conclusion

In this study, we presented a constraint-based alternative analysis of base truncation occurring in English word formation. Base truncation in word formation is motivated to achieve a better syllabic and prosodic structure in the output. Even though the base final rime deletion is triggered by three different structural requirements, all of them can be resolved by truncating the base final rime. The specific designation of the truncation target is achieved through the implementation of undominated Contiguity-Base. In addition to this, constraints, which reflect structural requirements of three sub-groups of truncation examples in (2a), interact to select optimal candidates.

There are several phonological implications we can draw from the current analysis. Firstly, there is a segmental realization difference between a base and a suffix. In the word formation of English, suffix faithfulness takes precedence over base faithfulness. This is contrary what we observe in reduplication where base faithfulness is more important than that of reduplicative affix (cf. MaCarthy and Prince 1995). Secondly, truncation of the base is limited to the right edge element(s). This reflects the concepts of positional faithfulness (Beckman 1997, 2004) concerning initial positions versus other positions where the former makes better cues for word recognition and awareness of speech-error related issues than those of latter. A similar idea can be alluded from psycholinguistic perspective in which the truncation of cluster-final segments at the right-edge of a word leads to less information loss compared to that of the left-edge (Schreier 2005). Thirdly, it is possible that a vowel in a suffix may be sub-divided into a strong and weak vowel depending on its behavior in word formation: the vowel in *-ate* can be either strong and weak in its realizations. Since we just described and provided a portion of truncation examples occurring in word-formation process of the English language, a more comprehensive study for truncation of base elements is expected in the future.

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Received: September 29, 2018 / Revised: October 30, 2018 / Accepted: November 08, 2018