Linguistic Research 42(1): 119-140
DOI: 10.17250/khisli.42.1.202503.005

Voice assimilation in English as an effect of transderivational anti-faithfulness*

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Lee, Sechang. 2025. Voice assimilation in English as an effect of transderivational anti-faithfulness. *Linguistic Research* 42(1): 119-140. The main goal of this paper is to develop the core mechanism illuminating the generalization behind voice assimilation in English. Progressive voice assimilation is, as a default option, most frequently attested in the English data. On the basis of theoretical foundations and results within the constraint-based framework of Optimality Theory and Transderivational Anti-Faithfulness, our analysis provides an effective means for analyzing the voice assimilation at hand. The argument is based on and developed from such contrastive forms as cats and halves. An anti-faithfulness constraint is employed to deal with the semi-productive or irregular nature of the idiosyncratic plural suffix -z. In addition, the base-changing plural suffix –z will invoke lexically-subcategorized anti-faithful ranking of constraints. Such a simple and natural strategy is claimed to allow us to preserve general theory of English grammar at a minimum cost. **(Sookmyung Women's University)**

Keywords voice assimilation, plural suffix, anti-faithfulness, regressive, progressive, subcategorization

1. Introduction

English affixes (both prefixes and suffixes) fall into two broad classes concerning their interaction with the phonology of the base to which they attach (Siegel 1974; Allen 1978; Pesetsky 1979; Kiparsky 1982; Mohanan 1982, among others). Non-neutral (Class I) affixes affect in some way the segmentism or prosody in the base to which they are attached. On the other hand, neutral (Class II) affixes have no phonological

* I am grateful to the anonymous reviewers of *Linguistic Research* for their invaluable comments.

effect on the base to which they are attached.

(1) Non-neutral (Class I) versus neutral (Class II) suffixation in English
Class I: grammar [gr*á*mər] ~ grammar-ian [grəmɛ́əɹɪən]
Class II: grammar [gr*á*mər] ~ grammar-less [gr*á*mərlɪs]

The complex word with Class I *–ian* in *grammarian* changes the phonological properties of its base [gr*á*mər]. The suffixation of a Class II *-less*, however, does not trigger any phonological change on the base.

Affixes are often endowed with certain diacritic properties. For example, in the lexicon affixes are listed with the information as to whether they belong to Class I or Class II categories, along with the information about the bases to which the affixes attach, the grammatical category of the resulting word, etc. In summary, there is a fundamental distinction between neutral (Class II) suffixes which require phonological faithfulness to base and non-neutral (Class I) suffixes which do not. Naturally, any analysis of affixed words in English must recognize this basic distinction.

In terms of the theoretical framework developed in Benua (1997) and Alderete (1999), the two classes of suffixes are distinguished by their subcategorized Output-to-Output (OO) correspondence relations, which is specified by the numerical index. For instance, non-neutral (Class I) affixes trigger a OO_1-correspondence relation between the base and the derived form containing the affix, while neutral (Class II) affixes trigger an independent OO_2-correspondence relation. Granting that phonological alternations are the response to certain well-formedness constraints, it is further argued in Alderete (1999, 2001) that certain affixes activate the anti-faithfulness constraints which affect the base in some way.

In this paper, we adopt the anti-faithfulness framework and develop the analysis of voice assimilation patterns attested in English. By taking a fresh look at the English data from speech error, we take as our working hypothesis that voice assimilation in English is only one-way, which runs counter to a commonly held view among linguists. It will be argued that there are two types of the English plural suffix /-z/: neutral vs. non-neutral. The non-neutral /-z/ triggers the anti-faithful correspondence of obstruent's voice in the base while the neutral /-z/ is phonologically transparent. Such a conception of lexical subcategorization affords a straightforward explanation

for the asymmetrical distribution of the two types of plural suffix /-z/. That is, we will find a natural explanation in the observation that progressive voice assimilation is the normal pattern in English and occurs much more frequently than regressive voice assimilation. It is clearly related to the fact that non-neutral (or regressive) voice assimilation is idiosyncratic and requires lexical subcategorization concerning the anti-faithfulness of voice.

The remainder of this paper is organized as follows. First, some brief background information about English voice assimilation patterns are presented (§2). The next section provides the necessary theoretical background for the analyses that follow by discussing a set of formal problems that motivate anti-faithfulness constraints (§3). Then, the introduction of the core theoretical assumptions follows which underlie transderivational faithfulness and anti-faithfulness of obstruents' voice in the base (§4). After that, the following section goes on to employ these assumptions in the constraint-based analysis of voice assimilation in English (§5). Some previous approaches are then critically reviewed (§6). The last section summarises and concludes the paper (§7).

2. Paradigm and issue

It is widely known that most languages around the world do exhibit the distributional restriction that adjacent obstruents agree in voice (Greenberg 1978; Houlihan and Iverson 1979; Cho 1991, etc.). But domain of the voice-agreeing restriction varies across various languages. English is reported to be a language whose domain of voice agreement is syllable (Mohanan 1993: 63). That leads us to expect that heterosyllabic obstruent sequences should be allowed to disagree in voice, which is proved to be the case.[1] Some representative alternations, adapted from Borowsky (2000), are given in (2-3):

(2) Progressive voice assimilation in English
   a. Regular inflection plural

1 For instance, heterosyllabic obstruent clusters are allowed to disagree in voicing (e.g., *a**bs**olute*). However, onset clusters like *[sb], *[sd], and *[zp], and codas like *[pd], *[pz], *[fd], *[bt], *[bs],*[fd], *[vt] are disallowed.

rope ~ rope[s]	rob ~ rob[z]
reef ~ reefs	five ~ fives
cat ~ cats	dog ~ dogs
b. Past	
kick ~ kick[t]	hug ~ hug[d]
leaf ~ leafed	heave ~ heaved
loose ~ loosed	hose ~ hosed
c. 3rd person singular	
The cat walk[s]...	The train speed[z]
He leafs through…	The man heaves...
He hops over...	The boy rubs...
d. Possessive	
Pet'[s] ball	Jed'[z] cat etc.
the reef's ecology	the hive's honey
Jack's ball	the scribe's pen
e. Contracted *is*	
Pete's going...	Jed'[z] leaving...
Leif's singing...	Genevieve's running...

Notice that examination of all the examples in (2) above shows the change in voice in the suffix not in the base. The data in (2) reveal that progressive voice assimilation is productive in English and can be observed under diverse word-formation processes. But the examples beg an important question here. Can it be the case that the direction of voice assimilation is related to the word-level faithfulness constraints?[2] The interest of the English data extends further:

(3) Regressive voice assimilation in English

a. Irregular inflection plural: /-z/

leaf/lea**ves** [vz]; also calf, elf, dwarf, half, hoof, knife, leaf, life, loaf, self, scarf, sheaf, shelf, thief, wife, wharf, wolf, mouth/mou**ths** [ðz]; also sheath, wreath, youth, house/hou**ses** [zɪz]

b. Irregular inflection past: /-t/

leave/le**ft** [ft]; also bereave/bereft, cleave/cleft, heave/heft, lose/lost, etc.

c. Nominal suffix: /-Θ/

2 Universally, faithfulness constraints to root material are said to take precedence over those to affixal material: Root-faith » Affix-Faith (McCarthy and Prince 1995).

five/fi**fth** [fϴ]; also twelve/twel**fth** [fϴ]

d. Words in *–scribe*

descri**b**e/descri**pt**ion [pʃ], scri**b**e/scri**pt**ure [pʧ]

Essentially, something identical to (2) is going on in (3): A voiced consonant in suffix is being shoved against a voiceless consonant in base, and one of them bends to make the cluster consistent. But strangely, in these nouns the suffix keeps its voice, and the base surrenders to it. For example, (3a) is a class of nouns that takes the regular plural /-z/ ending but changes its final consonant, usually [f] but sometimes [θ] or [s], from voiceless to voiced. Some linguists have posited a special rule, regressive voice assimilation, to generate these examples. However, the rule would have to be handcuffed in usage to these limited number of words. The rule would be postulated only in the irregularities of English. That is because most nouns ending in /f/ or /θ/ belong to a class of regular alternation like (2) and would have to be left untouched, as shown below:

(4) Productivity of progressive voice assimilation

birth/bir**ths**[ϴs]; also booth, earth, faith, growth, hearth, length, month, tenth belief/belie**fs**[fs]; also brief, chief, proof, safe, spoof, turf, etc.

What is at issue is that when obstruents with opposing voice are encountered in morphemic concatenation, voice assimilation takes place. As to the direction of the assimilation, the voiced obstruent assimilates to the voiceless one, either progressively (as in /kæt + z/ →[kæts] 'cats') or regressively (as in /hæf + z/ →[hævz] 'halves'). What is noteworthy from our point of view is as follows. At one end of the plural continuum is the progressive voice assimilation which is productive and are handled by a general rule that says nothing about the words it can apply to. At the other end of the plural continuum are suppletive cases like *mice/mouse*, which are simply listed as pairs. In between are the other irregulars including regressive voice assimilation such as (3), which should be handled by a small set of rules. The regressive alternation appears to be too regular to be regarded completely irregular, but too flawed to be completely regular. This point will turn out to be the key issue. We also need to offer an explanation as to why progressive voice assimilation in English is highly productive, in sharp contrast to regressive one. Our solution in this

article comes from simply traditional Optimality Theory (OT, Prince and Smolensky 1993; McCarthy and Prince 1995) with a twist.

3. Output-output faithfulness and anti-faithfulness

3.1 Benua (1997)

As discussed in §1, affixes in English are grouped into two classes: class I and class II (Siegel 1974). Class II affixes are neutral in that they have no phonological effect on the base to which they are attached. But class I affixes are non-neutral in the sense that they affect in some way the segmental makeup or prosody in the base in which they are added. Some familiar forms are contrasted as shown below:

(5) Non-neutral and neutral affixes (adapted from Katamba and Stonham 2006)

a. Non-neutral affixes in English

Suffix	attach to		Output
$-ion_N$	$[[erode_V]\text{-}ion_N]$	→	$[erosion]_N$
$-al_{Adj}$	$[[Pope_N]\text{-}al_{Adj}]$	→	$[papal]_{Adj}$
$-ic_{Adj}$	$[[mórpheme_N]\text{-}ic_{Adj}]$	→	$[morphémic]_{Adj}$
$-ee_N$	$[[detáin_V]\text{-}ee_N]$	→	$[detainée]_N$

b. Neutral affixes in English

Suffix	attach to		Output
$-ness_N$	$[[remóte_{Adj}]\text{-}ness_N]$	→	$[remóteness]_N$
$-less_{Adj}$	$[[pówer_N]\text{-}less_{Adj}]$	→	$[pówerless]_{Adj}$
$-ful_{Adj}$	$[[púrpose_N]\text{-}ful_{Adj}]$	→	$[púrposeful]_{Adj}$
$-er_N$	$[[preténd_V]\text{-}er_N]$	→	$[preténder]_N$

Highly faithful to their bases, those words with class II affixes in (5b) copy the main stress and segmental properties in the base. On the other hand, the words with class I affixes in (5a) are less faithful in copying their bases.

Associated with each affix class, Benua (1997) argues that a couple of distinct output-output (OO) correspondence relations are instantiated in English. The following schematic examples demonstrate the interaction of an Input-Output (IO) faithfulness and OO-identity relation:

(6) Two OO-correspondence relations (Benua 1997: 163)

a. Class I *damn ~ damnation*

OO_1-identity

[dæm] → [dæmneyšʌn]

↑ ↑

/dæmn/ /dæmn + eyšʌn]

b. Class II *damn ~ damning*

OO_2-identity

[dæm] → [dæmiŋ]

↑ ↑

/dæmn/ /dæmn + Iŋ/

Each of OO-correspondence relation in (6) is characterized by a set of identity constraints. Class I paradigms (*damn ~ damnation*) are evaluated by OO_1-identity constraints while class II paradigms (*damn ~ damning*) are ruled by OO_2-identity ones. Both OO_1- and OO_2-identity constraints are ranked with respect to markedness and IO-faithfulness constraints in the English grammar.

Each affix's class membership is subcategorized such that class I affixes trigger an OO_1-correspondence relation in the base-derivative paradigm, while class II affixes trigger an OO_2-correspondence one. And as a result each set of affixes is only sensitive to the OO-faithfulness constraints defined on their own correspondence relation. The distinction between class I and class II affixes can now be modelled in terms of familiar kinds of optimality-theoretic constraint interaction, as shown below. That is, OO_2-identity constraints are high-ranking and OO_1-identity ones are low-ranking:

(7) OO_2-IDENT » IO-IDENT, MARKEDNESS » OO_1-IDENT

The ranking dictates that words with class II affixes (*damn ~ damning*) cannot instantiate material that is not present in the base, but class I affixed words (*damn ~ damnation*) can realize the material. In other words, syllabification consideration does not allow the base of the paradigm in (6) *damn* to realize its coronal nasal /n/ in surface. Since OO_2-identity is ranked above IO-IDENT, deletion of /n/ overapplies in (6b). Class I affixation in (6a) is a different story, however, simply because OO_1-identity is ranked below OO_2-identity. In case of *damnation*, the syllable structure allows the root-final /n/ to surface, despite its violating paradigmatic identity.

3.2 Alderete (1999)

There is a widespread observation that phonological processes have a morphological motivation. For example, the voice alternation observed in *hou[s]e ~ hou[z]es* may be considered to be a phonological process serving to mark a morphological relationship between a singular and plural form. In generative phonology, the standard approach to this kind of morpho-phonological alternations is lexical specification, which requires a lexical [+voice] specification for a consonantal position in the affixes, as depicted below:

(8) English morpho-phonology as lexical specification (Alderete 1999: 128)

[+voice]
|
/hous + Cɪz/ → hou[z]-ɪz

The alternation derives from the lexical specification of [+voice] and the lexical specification strategy accounts for the morpho-phonological pattern, employing one of the most basic assumptions in generative phonology, the underlying representation.

The English case in (8) is 'one-way' in that it effects a change of segment from one class to another. But a two-way operation is also attested, fully reversing the lexical properties of the targeted segment. The voice exchange phenomenon found in the Nilotic language Luo is a well-known example characterizing the reversal which entails a two-part change, where voiceless obstruents become voiced and voiced ones become voiceless, as exemplified in (9a) and (9b) respectively:

(9) Consonantal polarity in Luo (Gregersen 1972; Okoth-Okombo 1982; Alderete 2001)

	singular	plural	
a.	bat	bed-e	'arm'
	luΘ	luð-e	'walking stick'
b.	čogo	čok-e	'bone'
	owadu	owet-e	'brother'

In OT terms, such exchange processes pose a ranking paradox and cannot be described

as the interaction of markedness and faithfulness constraints alone, as discussed in Moreton (1996) and Prince (1997). Fleshing out the point in detail, if the ranking 'markedness constraint » faithfulness constraint' produces /X/ → [Y], then [Y] must be less marked than [A]. The same grammar will not then change /Y/ to [X] because to do so would result in a form which fares worse on the markedness constraint in question. Unfortunately, this is what happens in Luo, as shown in (9).

The proposal made here by Alderete is that in addition to markedness and faithfulness constraints, Universal Grammar contains the so-called Transderivational Anti-Faithfulness (TAF) constraints which actively induce an alternation in morphologically-related words.[3] Especially, anti-faithfulness constraints involve a wide-scope negation of the proposition expressed by faithfulness constraints.

(10) Anti-faithfulness (Alderete 1999: 132)
For every faithfulness constraint *F*, there is a corresponding anti-faithfulness constraint ¬*F* that is satisfied in a string *S* iff *S* has at least one violation of *F*.

Viewed in this way, it would not be surprising that TAF constraints trigger alternations for reasons other than markedness. Applying this idea to the exchange effect in Luo, a TAF constraint requiring a violation of featural identity (i.e., IDENT[voice]) is supposed to establish the opposition between singular and plural forms:

(11) Faithfulness and anti-faithfulness for [voice] (Alderete 1999: 211)
a. IDENT[voice]
Corresponding segments agree in the feature [voice].
b. ¬IDENT[voice]
It is not the case that corresponding segments agree in the feature [voice].

Exchange-inducing affixes subcategorize for the corresponding OO relation. For example, a lexical entry for the plural suffix *–e* in Luo therefore has such a subcategorization form as [[stem] ___]$_{\text{OO-EXCHANGE}}$, which defines the correspondence

3 This idea of anti-faithfulness is not entirely a new one. The notion has been developed in the analysis of various phenomena (Baković 1996; Yip 1996; Blevins 1997; Hayes 1997, among others).

relation between the base and derived plurals. The exchange effect is made explicit in the analysis given below:

(12) Voice exchange in Luo as anti-faithfulness (Alderete 1999: 211)

Base	Derivative	¬OO_{Ex}-ID[vce]	OO_{Ex}-ID[vce]
a. /bat/	☞i. bed-e		*
	ii. bet-e	*!	
b. /čogo/	☞i. čok-e		*
	ii. čog-e	*!	

The anti-faithfulness constraint (¬OO_{Ex}-ID[vce]) induces alternation by requiring a violation of a related faithfulness constraint (i.e., IDEN[vce]). Owing to its symmetrical nature, the anti-faithfulness constraint ¬OO_{Ex}-ID[vce] requires the opposite feature value of [voice] whatever its input value is. If it outranks the related faithfulness constraint, OO_{Ex}-ID[vce], the interaction effects a mutation of [voice] specification in the base-plural paradigm.

4. Proposal

Speech errors often give us clues as to how our speech system is organized. The following quote provides a corroborating evidence that three forms of a plural suffix *-s*, *-z*, and *-ɨ̇z* are created on the fly by a phonological rule of voice assimilation:

> ... For example, when a person intends to say *grapefruits* but accidentally leaves out the *t*, how does he pronounce the plural? If there were a distinct plural suffix pronounced *-ss*, he would say *grapefrooss*, since this is what the *t* in the *grapefruit* entry would have demanded. In fact he says *grapefrooz*--pronouncing the plural as *z*, which is appropriate to words ending in a vowel. Similarly, a person may say *The infant tucks--touches the nipple,* not *tuck-ɨ̇z*, or may say *Did you buy enough breakfasɨ̇z*?, not *breakfass*. The errors show that the form of the suffix must be computed after the vowels and consonants of the noun or verb were placed on the chute to the vocal tract... (Pinker 2015: 40)

Another important clue implicit in the above spoonerism is that the direction of voice assimilation should be progressive, not regressive.[4] Applying this idea to our current issue, *cat ~ cats* alternation should constitute the progressive assimilation of voice, which should be normal direction-wise. On the other hand, the apparent voice assimilation attested in *thief ~ thieves* alternation cannot be attributed to regressive assimilation of [voice]. Then, we are compelled to ask what, if anything, governs the apparent regressive assimilation observed in *thief ~ thieves* type of alternations given in (3a)?

According to functional, especially phonetic, explanations of phonological phenomena, there are two fundamental forces shaping phonology: (i) the need to minimize effort on the part of the speaker and (ii) the need to minimize the likelihood of confusion on the part of the listener. That is, from listeners' point of view, successful communication depends on being able to recover what speakers are saying. Therefore, it should be important to avoid perceptually confusable manifestations of distinct categories. In OT terms, this means that Universal Grammar includes constraints favoring less confusable contrasts over more confusable ones between distinct categories. Especially, the former simply asks the related words to be different and language-specific interactions of makedness/faithfulness constraints will decide the way in which such a difference (e.g., between base and derivative) is realized. That is, morphologically-motivated phonological operations could be triggered by a general DISTINCTFORM constraint, which simply requires related forms to be phonologically different (Alderete 2001: 212). This line of reasoning will be claimed in this section to explain the non-neutral effects of the so-called 'Class I' lexical items.

Taking TAF theory as a point of departure, we will argue for the following. The so-called 'irregular' case of voice assimilation (e.g., thief ~ thieves) should be described as an effect of an anti-faithfulness constraint which requires dissimilarity in a base and its related derivative.[5]

4 Faithfulness to root material universally takes precedence to faithfulness to affixal material (McCarthy and Prince 1995). The slip of the tongue at hand may be due to this aspect of universality.

5 We might say that the English case at hand is a one-way version of voice exchange phenomenon in Luo.

(13) Transderivational anti-faithfulness for non-neutral (regressive) voice assimilation

	Anti-faithfulness		
	[ϴi:f]	→ [ϴi:vz]	
IO-correspondence	↑	↑	IO-correspondence
	/ϴi:f/	/ϴi:f + z/	

The plural word [θi:vz] and its singular base [θi:f] are linked phonologically by an anti-faithfulness correspondence relation. Class I affixes trigger an anti-faithfulness relation while Class II affixes are not subcategorized by such a relation. The reliable diagnostic of an affix's class membership is the phonology of the words it appears in. The plural suffix /-z/, particularly in /θi:f+ z/, should be non-neutral in that it induces the stem-final [f] ~ [v] alternation.

The connection between the individual affixes and the anti-faithfulness constraints responsible for the non-neutral effects is made in the lexicon through the subcategorization of OO-correspondence:

(14) Subcategorization of neutral/non-neutral lexical items

a. Non-neutral suffix [-z]: $\text{Suffix}_{\text{Plural}}$ $[[\text{Noun}_{<\text{OONoNu}>}]_{\text{Stem}}\_\_\_\_]_{\text{Plural}}$

b. Irregular stem [thief]: $\text{Noun}_{\text{Singular}}$ $[[\_\_\_\text{-z}_{<\text{OONoNu}>}]_{\text{Plural}}$

'NoNu' is simply a handy mnemonic for marking non-neutral class of lexical items. Angled bracket is used to show an interdependency between two optional specifications so that the features within angled brackets are evaluated together. That is, if a suffix is subcategorized for non-neutral OO correspondence as schematized in (14a), it requires its stem to carry the same subcategorization as in (14b).[6] If a suffix is not subcategorized as <OONoNu>, it must be attached to a stem which is not subcategorized as such, either. In that case, we will simply be dealing with a neutral 'Class II' base-suffix concatenation.

Assuming OO-correspondence relations (see §3.1), the behavioral distinction between neutral and non-neutral plural suffixes of English is derived through the

6 This bears a striking similarity to the notion that both affixes and stems are often endowed with certain 'diacritic properties'. For example, (i) the stem $[\text{ox}]_{\text{Noun}}$ is subcategorized for $[\text{-en}]_{\text{Suffix}}$ for its plural and (ii) the suffix [-en] also is specified in the English lexicon as a plural suffix.

constraint ranking given below:

(15) ¬OO$_{\text{NoNu}}$-IDEN(voice) » AGREE(voice) » IO-IDEN(voice)

If AGREE(voice) outranks IO-IDEN(voice), the typical pattern of voice assimilation is bound to take place. If, in addition, ¬OO$_{\text{NoNu}}$-IDEN(voice) outranks these two constraints, the ranking results in regressive voice assimilation. Only those affixes with the subcategorization of <OONoNu> activate the high-ranking TAF constraint, ¬OO$_{\text{NoNu}}$-IDEN(voice). Consequently, it triggers a change of voice in the base with the identical subcategorization. The effect of ¬OO$_{\text{NoNu}}$-IDEN(voice) is thus a change of voice and nothing more. The rest of the grammar predicts the ultimate outcome of this change.[7]

5. Analysis

Starting with the neutral behavior of the plural suffix /-z/, this suffix is not subcategorized for any anti-faithfulness correspondence and calls for a base without any such subcategorization. So, words with this suffix are not evaluated by the TAF constraint defined on base-derivative relation. To see this, consider our first tableau in (16):

(16) /kæt/ 'cat' + /z/ 'plural' (neutral suffix) → [kæts] 'cats'

Stem + Plural z	¬OO-IDEN(voice)	AGREE(voice)	IO-IDEN(voice)
a. kæt + z		*!	
☞ b. kæt + s			*

Evidently, ¬OO-IDEN(voice) is not relevant in evaluation. (16a) is eliminated by the AGREE(voice) violation incurred by the plural suffix [z]. The optimal output is (16b), in which voice assimilation takes place at the expense of violating low-ranking

7 This line of 'grammar dependency' follows directly from the assumptions inherent in TAF theory. Such a featural change in the base (e.g., /hæf + z/ →[hæ**vz**] 'halves') is required by the anti-faithfulness constraints. The rest of the constraint system dictates how the change is accommodated. In the case at hand, the location of the featural change is due to an additional constraint in the system, AGREE(voice). It will become clear as we proceed in the next section.

IO-IDEN(voice) in the suffix.

In morphologically related words, attachment of a non-neutral suffix must be accompanied by a violation of IO-IDEN(voice) in the stem-final segment. The next tableau illustrates the analysis of non-neutral plural suffix /-z/. Since this non-neutral suffix subcategorizes for TAF correspondence as in (14a), it does condition a change of voice feature in the base[8]:

(17) /hæf/ 'half' + /z/ 'plural' (non-neutral suffix) → [hævz] 'halves'[9]

Stem + Plural z	¬OO-IDEN(voice)	AGREE(voice)	IO-IDEN(voice)
a. hæf + z	*!	*	
b. hæf + s	*!		*
☞c. hæv + z			*
d. hæv + s		*!	**

The anti-faithfulness constraint ¬OO-IDEN(voice) is not satisfied in (17a-b) which preserve the voicelessness of the stem-final obstruent. Both remaining candidates (17c-d) satisfy the anti-faithfulness by changing the stem-final [f] into [v], hence both are passed on for evaluation by the next-lower-ranked constraint in the hierarchy, AGREE(voice). Candidate (17c) is chosen as optimal under the ranking at hand. This candidate satisfies AGREE(voice) at the cost of violating the relatively low-ranking IDEN(voice).

It is important to note in this context that the theory of TAF did not yet tell us which segment of the base will be affected by the anti-faithfulness constraint ¬OO-IDEN(voice). Put another way, as far as ¬OO-IDEN(voice) is concerned, the plural form of /θi:f/ could either be [θi:vz] or [ði:fs], both of which equally satisfy the anti-faithfulness constraint. This state of affairs is portrayed in the following tableau:

8 Borowsky (2000) notes that regressive voicing assimilation of English is limited to a relatively small number of idiosyncratic lexical items and occurs frequently with respect to fricatives. It seems reasonable to hypothesize, then, that regressive voicing assimilation must exact some grammatical price, lexical subcategorization.

9 Schematically, the stem [hæf]$_{\text{Noun/Singular/OONoNu}}$ and suffix [-z]$_{\text{Suffix/Plural/OONoNu}}$ should be subcategorized in the input as [____-z]$_{\text{Plural/OONoNu}}$ and [[Noun]$_{\text{Stem/OONoNu}}$_____]$_{\text{Plural}}$, respectively. Note that in the tableaux to come, we will be suppressing these subcategorizations in the input, a practice we will follow throughout to save space.

(18) /Θi:f/ 'thief' + /z/ 'plural'(non-neutral suffix) → [Θi:vz] 'thieves'

Stem + Plural z	¬OO-IDEN(voice)	AGREE(voice)	IO-IDEN(voice)
a. Θi:f + z	*!	*	
b. Θi:f + s	*!		*
☞c. Θi:v + z			*
d. Θi:v + s		*!	**
e. ði:f + z		*!	*
f. ði:f + s			**!
g. ði:v + z			**!
h. ði:v + s		*!	***

Candidates (18a-b) are eliminated by undominated ¬OO-IDEN(voice), as each preserves the voicelessness of the base obstruents. AGREE(voice) is crucially violated in (18d, e, h) across the morpheme boundary. Candidate (18f) chooses to have the plural [s] under the pressure of the dominant AGREE(voice), which results in two violations of IDENT(voice). The doubly-mutated candidate stem, [ði:v] in (18g-h), with a total reversal of obstruent voice, also suffers from a gratuitous violation of low-ranking IO-IDEN(voice). Although both (18c) and (18f-g) violate IO-IDENT(voice), the former is selected since it violates IO-IDEN(voice) minimally. It has only one violation, while its contestants (18f-g) incurs two violations, one more than is necessary. The gratuitous violation of faithfulness turns out to be fatal and makes (18c) optimal.[10]

There are some apparent exceptions in that the following data are not subject to voice assimilation:

10 Before drawing this tableau to a close, however, let us consider one further issue: the locality of anti-faithfulness. Comparing [θi:vz] versus *[ði:fs], the changed obstruent in the actual form is closer to the plural suffix. There is a great deal of research in generative phonology concerning the explanation of locality effects in phonological processes (Hayes 1995, Odden 1995, and Goldsmith 1990 and references therein). As to the issue faced by Luo, Alderete (1999: 136) claims that the language requires a notion of locality between morphological and phonological categories. In the English case at hand, however, it is the rest of the grammar which determines the optimal structure resulting from the voicing assimilation. In other words, the AGREE(voice) and gradient evaluation of IO-IDENT(voice) are responsible for the language-particular default structure. This state of affair should be in line with what is commonly described as 'grammar dependence' by Alderete.

(19) Some exceptions of voice assimilation (Kang 2002: 5)

a.	har**dsh**ip, fla**gsh**ip	vs.	cler**ksh**ip, troo**psh**ip
b.	wi**sd**om, clu**bd**om	vs.	bo**ssd**om, chie**fd**om
c.	nee**df**ul, drea**df**ul	vs.	bli**ssf**ul, baske**tf**ul
d.	bli**the**some, gla**ds**ome	vs.	ca**ps**ome, fre**ts**ome
e.	di**sg**race, su**bp**art	vs.	di**sf**avor, su**bg**roup
f.	pi**gp**en, ca**tb**ird, pe**gb**oard		

Such English suffixes as *-ship*, *-dom*, *-ful* and *-some* do not seem to trigger voice assimilation, let alone undergoing it (19a-d). The same story applies through prefixes (19e) and compounds (19f). However, we must remember that the domain of voice agreement is syllable, as noted by Mohanan (1993). Not surprisingly, we do not need to go to the trouble of explaining the data as all the obstruent clusters cited in (19) are heterosyllabic. Therefore, a theory that seriously attempted to account for the data in (19) would be woefully inadequate.

Having said that, we lastly turn our attention to describe ~ description case, given in (3d), repeated below in (20):

(20) = (3d) Words in *-scribe*
describe/descri**pt**ion [pʃ], scribe/scri**pt**ure [pʧ]

The [pʃ] in *descri**pt**ion* should not be the result of voice agreement since it constitutes heterosyllabic cluster. Therefore, the discrepancy between (19) and (20) calls for an explanation. In line with what has been discussed so far, we adopt the strategy that such phonological differences are best explained through a focus on lexical subcategorization rather than on the syllable structure of the obstruent cluster. That is, the link of the suffix *–tion* to TAF correspondence is responsible for the [b]~[p] alternation:

(21) /dɪskɹaɪb/ 'describe' + /-ʃən/ '-tion' → [dɪ.skɹɪp.ʃən] 'description'

/dɪskɹaɪ**b**/ + /-**ʃ**ən/	¬OO-IDEN (voice)	AGREE (voice)	IO-IDEN (voice)
a. dɪskɹɪ**bʃ**ən	*!		
☞ b. dɪskɹɪ**pʃ**ən			*

As shown in (21), the morpho-phonological alternation is analyzed as a simple response to a well-formedness constraint requiring difference in the base, rather than as either a realization of any input element nor voice assimilation. The fact of the matter is that there is no voice agreement in the first place, but only a change of root-final obstruent's voice feature value. That change is caused by the subcategorization of *–tion* which requires anti-faithfulness of the base. The suffix *–tion* is apparently irregular in that it runs a foul of the generalization: voice agreement is required only within homosyllabic obstruent clusters. No wonder the suffix '-tion' typically belongs to non-neutral Class I category.

6. Previous treatments

It has been pointed out by Borowsky (2000) that there are two types of plural suffix /-z/ in English: root-level vs. word-level. Appealing to the notion of 'Richness of the Base,'[11] he considers two different input forms of the English plural suffix (i.e., /-z/ and /-s/) and assigns them to each different level:

(22) Voice assimilation through level of suffixes (Borowsky 2000: 11-14)

a. Root-level regressive voice assimilation

leaf + z	AGREE	IDMS[12]	IDLAR	*LAR
lea[fz]	*!			*
lea[fs]		*!	*	
→lea[vz]			*	**

11 In most OT work, the notion says that there are no language-particular restrictions on the input, so all generalizations about the inventory of elements permitted in surface structure must be derived through the interactions of markedness and faithfulness constraints.

12 The constraint is introduced by Borowsky to assert that the affix be faithfully parsed.

IDMS: Don't change a morpheme which consists of only one segment.

(cf. IDWD: Do not change features of the WORD.)

b. Word-level regressive voice assimilation (1)

cat + s	IDWD	AGREE	IDMS	IDLAR
ca[tz]		*!	*	*
→ca[ts]				
ca[dz]	*!			*

c. Word-level regressive voice assimilation (2)

dog + s	IDWD	AGREE	IDMS	IDLAR
do[gz]	*!		*	*
→do[ks]				*
do[gs]		*!		

Essentially, Borrowsky's tableaux in (22) do not provide us with any insight as to why the root-level plural suffix in (22a) is voiced while the word-level plural suffix in (22b-c) are voiceless. It only seems that the different rankings of IDMS, IDWD, and AGREE accidentally derive the actual outputs. Besides, why on the earth does the root-level suffix cause regressive voice assimilation and the word-level one cause progressive one, rather than the other way around? The problem with this kind of explanation is that one cannot state a cross-linguistically valid definition for combining morphological levels and direction of assimilation. An assimilation is regressive because it is word-level; the assimilation is word-level because it is regressive. On top of that, progressive voice assimilation in English is highly productive but regressive one is observed only in the irregularities of the language. Why is progressive voice assimilation the dominantly productive pattern, not the regressive one?

A natural answer to these fundamental questions within the TAF framework we are adopting here is twofold: (i) to suppose that voice assimilation is essentially progressive as implied by Pinker (2015: 40), and (ii) lexical subcategorization in the sense of anti-faithfulness is responsible for the regressive assimilation of voice. We showed in this section that the change of voice feature achieved in the TAF analysis is not due to a lexical specification of the plural suffix. Rather, it is an effect of a high-ranking constraint, triggered by subcategorized TAF correspondence relations.

Improving on Borowsky's approach to account for the voice assimilation that takes place in English, Kang (2002) reaches the same conclusion, based on the analysis of a range of voice assimilation phenomena within the framework of OT. Let us consider the problem posed by following pattern of voice assimilation:

(23) Kang's analysis of voice assimilation

a. Compound

cat-bird	IDWD	IDONS LAR	AGR	IDMS	IDLAR	*LAR	IDRT
☞a. ca[tb]ird			*			*	
b. ca[db]ird	*!				*	**	
c. ca[tp]ird	*!	*	*		*		

b. Base + suffix

boss-dom	IDWD	IDONS LAR	AGR	IDMS	IDLAR	*LAR	IDRT
☞a. bo[sd]om			*			*	
b. bo[zd]om	*!				*	**	
c. bo[st]om		*!			*		

c. Prefix + base

dis-grace	ID WD	IDONS LAR	IDPRE LAR[13]	AGR	ID MS	ID LAR	*LAR	ID RT
☞a. di[sg]race							*	
b. di[zg]race				*!		*	**	
c. di[sk]race	*!	*				*		

In suffixation and prefixation as well as compounding in (23), the lack of voice assimilation is the favored outcome, by virtue of the ranking given. However, this result is completely predictable on purely syllabification grounds. All the obstruent clusters we are considering in (23) are heterosyllabic, so they do not constitute the ordinary domain of voice assimilation: the domain of voice agreement is syllable, as mentioned earlier at the beginning of §2. In a nutshell, what we are claiming here is that there was no voice assimilation in (23) in the first place. No wonder the obstruent sequences preserve the lexical specifications of voice as they are at the surface. We do not bother to analyze cases of this sort, since the phenomenon is so much automatic.

13 The constraint requires faithfulness to the laryngeal feature of a prefix.

7. Conclusion

A unifying theme throughout this paper is that the direction of voice assimilation in English needs not necessarily be stated directly in the grammar. Ideally, it could be a consequence of other independent properties: anti-faithfulness correspondence relation and lexical subcategorization. That is, the TAF constraint responsible for voice alternation requires a change in base, but the resulting change should obey the independently-motivated constraints governing faithfulness and well-formedness for voice assimilation. At first sight, facts of regressive voice assimilation in English appear to be an infrequent and more or less idiosyncratic set of realizations in English. As pointed out throughout the discussion, they are due to an interactive set of constraints most of which recur with high frequency throughout the English language. Direction-wise, relatively higher productivity of progressive voice assimilation comes into the picture. That is because the regressive one is designed to be triggered by the information which is subcategorized in the lexicon. In other words, only the relevant suffixes as well as stems are subcategorized for the TAF relation, and so they act together. To summarize the results, the predictions of TAF theory clarifies the relationship between the direction of voice assimilation and the relative productivity differences in English. A theory that seeks the most economical grammar--one with the simplest rules or constraints and representations compatible with the data--would almost inevitably be led to postulate just such a grammar for English voice assimilation.

References

Alderete, John. 1999. *Morphologically governed accent in Optimality Theory*. PhD Dissertation. University of Massachusetts, Amherst.

Alderete, John. 2001. Dominance effects as transderivational anti-faithfulness. *Phonology* 18(2): 201-253.

Allen, Margaret. 1978. *Morphological investigations*. PhD Dissertation. University of Connecticut.

Baković, Eric. 1996. Foot harmony and quantitative adjustments. Available as ROA-168-1296 from *Rutgers Optimality Archive* http://roa.rutgers.edu.

Benua, Laura. 1997. *Transderivational identity: Phonological relations between words*. PhD Dissertation. University of Massachusetts, Amherst.

Blevins, Juliette. 1997. Rules in Optimality Theory: Two case studies. In Iggy Roca (ed.), *Derivations and constraints in phonology*, 227-260. Oxford: Clarendon Press.

Borowsky. Toni. 2000. Word-faithfulness and the direction of assimilation. *The Linguistic Review* 17(1): 1-28.

Cho, Young-Mee. 1991. *Parameters of consonantal assimilation*. PhD Dissertation. Stanford University.

Goldsmith, John. 1990. *Autosegmental and metrical phonology*. Oxford: Basil Blackwell.

Greenberg, Joseph H. (ed.) 1978. *Universals of human language: Phonology*, *vol 2*. Stanford, CA: Stanford University Press.

Gregersen, Edgar A. 1972. Consonant polarity in Nilotic. In Erhard Voeltz (ed.), *3rd Annual Conference on African Linguistics*, 105-109. Bloomington, IN: Indiana University.

Hayes, Bruce. 1995. *Metrical stress theory: Principles and case studies*. Chicago, IL: University of Chicago Press.

Hayes, Bruce. 1997. Phonological restructuring in Yidin and its theoretical consequences. In Ben Hermans and Marc van Oostendorp (eds.), *The derivational residue in phonological optimality theory*, 175-205. Amsterdam: John Benjamins Publishing Company.

Houlihan, Kathleen and Gregory K. Iverson. 1979. Functionally-constrained phonology. In Daniel A. Dinnsen (ed.), *Current approaches to phonological theory*, 50-73. Bloomington, IL: Indiana University Press.

Kang, Seok-Keun. 2002. Voice assimilation in English revisited. *Korean Journal of Linguistics* 27(1): 1-24.

Katamba, Francis and John Stonham. 2006. *Morphology*. London: Red Globe Press.

Kiparsky, Paul. 1982. Lexical morphology and phonology. In In-Seok Yang (ed.), *Linguistics in the morning calm*, 3-91. Seoul: Hanshin.

McCarthy, John J. and Alan Prince. 1995. Faithfulness and reduplicative identity. Available as ROA-60 from *Rutgers Optimality Archive* http://roa.rutgers.edu.

Mohanan, Karuvannur Puthanveettil. 1982. *The theory of lexical phonology*. PhD Dissertation. Massachusetts Institute of Technology.

Mohanan, Karuvannur Puthanveettil. 1993. Fields of attraction in phonology. In John Goldsmith (ed.), *The last phonological rule: Reflections on constraints and derivations* (*Studies in contemporary linguistics*), 61-116. Chicago, IL: University of Chicago Press.

Moreton, Elliott. 1996. Non-computable functions in Optimality Theory. Ms. University of Massachusetts, Amherst.

Odden, David. 1995. Tone: African languages. In John Goldsmith (ed.), *Handbook of phonological theory*, 445-75. Cambridge, MA: Basil Blackwell.

Okoth-Okombo, Duncan. 1982. *Dholuo morphophonemics in a generative framework*. Berlin: Dietrich Reimer.

Pesetsky, David. 1979. Russian morphology and lexical theory. Unpublished paper. Massachusetts Institute of Technology.

Pinker, Steven. 2015. *Words and rules: The ingredients of language*. New York, NY: Basic Books.
Prince, Alan. 1997. Endogenous constraints on Optimality Theory. Paper presented at *The Hopkins Optimality Theory Workshop*. University of Maryland Mayfest, Baltimore.
Prince, Alan and Paul Smolensky. 1993. Optimality theory: Constraint interaction in generative grammar. Ms. Rutgers University, New Brunswick; University of Colorado, Boulder.
Siegel, Dorothy. 1974. *Topics in English morphology*. PhD Dissertation. Massachusetts Institute of Technology.
Yip, Moira. 1996. Tonal reductions and speech rate at the word and phrase level in Chinese. Available as ROA-159-1196 from *Rutgers Optimality Archive* http://roa.rutgers.edu.

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Received: 2024. 10. 28.
Revised: 2024. 11. 18.
Accepted: 2024. 11. 19.