

CONSONANTAL WEAKENING AND LICENSING IN OPTIMALITY THEORY

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ABSTRACT

This paper explores several patterns of consonantal weakening such as voicing and spirantization. Given that such weakening usually applies to either intervocalic or intersonorant obstruents, this paper contends that inherently redundant features such as [voice] for sonorants or [continuant] for vowels, cannot license their syllabic constituents, thus triggering consonantal weakening. In addition, based on the typology of consonantal weakening such as one-step weakening with voicing or spirantization and full weakening with both voicing and spirantization, this paper maintains that several patterns of consonantal weakening is the consequence of licensing and more importantly, of constraint relations such as conjunction. Finally, this paper provides unified analysis of all types of consonantal weakening relying on constraints and constraint relations within the framework of Optimality Theory.

1. PRELIMINARIES

It is a well-known cross-linguistic occurrence that an intervocalic or postvocalic consonant, especially an intervocalic obstruent, tends to become either voiced or spirantized and thus weakened. Based on such several types of consonantal weakening, this paper will first focus on special behavior of redundant features. Then, this paper will maintain that patterns of weakening are consequences of indirect feature licensing which requires an inherently redundant feature to license an adjacent segment where the feature is not considered as redundant. It will also contend that constraint conjunction plays an important role in accounting for various types of consonantal weakening in a unified manner.

In accounting for the patterns of weakening, this paper will rely on constraint-based approaches such as Optimality Theory (OT: [18]) since they account for typology of a given phonological phenomenon in a most convincing and unified fashion with universal constraints and their rankings. Section 1.1. will show various types of consonantal weakening occurred in many languages.

1.1. Typology of Consonantal Weakening

Consonantal weakening is a common phonological phenomenon and is found in many languages. For example, in Kalenjin, plain noncoronal stop consonants become voiced and thus weakened intervocalically.

- (1) Intervocalic Voicing in Kalenjin (Kenya) (Data quoted from [10])
- | | | | |
|---------|------------|---------|---------------|
| a) kep | 'to notch' | kebe:t | 'is notching' |
| b) nap | 'to sew' | nabe:t | 'is sewing' |
| c) luk | 'to fight' | luge:t | 'is fighting' |
| d) ku:t | 'to blow' | ku:te:t | 'is blowing' |

This is similar to voicing in Old English [13], Modern Dutch [26], Akan [20] and Spanish [10], [19] and contrasts with intervocalic spirantization in other languages such as Tiberian Hebrew. As illustrated in (1), an intervocalic labial and a velar stop in Kalenjin are subject to voicing assimilation.

We see examples of intervocalic voicing in historical phonology as well. Some data from historical phonology are given in (2).

(2) Historic Intervocalic Voicing in Spanish

<i>Latin</i>	<i>Italian</i>	<i>Spanish</i>	
vita	vita	vida	'life'

Korean also invokes a similar pattern of intervocalic (or rather, intersonorant as in (4)) voicing as in (3).

(3) Intervocalic voicing

<i>UR</i>	<i>SR</i>	<i>gloss</i>
a) /kupo/	[ku.bo]	'running'
b) /mati/	[ma.di]	'knot'

(4) Intersonorant voicing in Korean

a) /kamki/	[kam.gi]	'flu'
b) /cunpi/	[cun.bi]	'preparation'

Another type of consonantal weakening is spirantization, where in contrast to intervocalic voicing, obstruents, either postvocally or intervocalically, become corresponding fricatives. For example, in Tiberian Hebrew, /p, t, k/ and /b, d, g/ are weakened to [f, θ, x] and [v, ð, ɣ], respectively, when they follow a vowel as in (5).

(5) Postvocalic Spirantization in Tiberian Hebrew (Data from [2])

micpaha	'family'	sefer	'book'
štain	'two'	oθax	'you'
tannur	'stove'	iθi	'with me'
kol	'all'	barux	'blessed'

Similarly, in Mexico City Spanish [5], intervocalic /b, d, g/¹ are changed to their corresponding fricatives and are realized as [β, ð, ɣ] as in (6).

(6) Intervocalic Spirantization in Mexico City Spanish
(Data from [5], English gloss from [12])

<i>UR</i>	<i>SR</i>	<i>gloss</i>
aba	aβa	bean
ada	aða	fairy
aga	aɣa	make
dewda	dewða	debt

Also, Proto-Dravidian /c, k/ become [s, x] intervocalically in Tamil [14]. Intervocalic /t/, interestingly, takes part in both intervocalic voicing and intervocalic spirantization as in (7).

¹More precisely, spirantization does not apply word-initially, after a nasal and after a lateral which is homorganic. It applies elsewhere (e.g., between vowels, between a sequence of a glide and a vowel, between a vowel and a nasal, between a vowel and a lateral etc.) as the examples in (6) show.

(7) Proto-Dravidian medial /t/ -----> Tamil [ð] [14]
 utir- uðiruu 'drop off'

A particularly interesting type of this consonantal weakening is known as initial mutation and is found in various Celtic languages. As mentioned by Lass [14], stem-initial consonants in languages such as North Welsh undergo the lenition process after a prefix vowel. Also, lenition affects both voicing and spirantization and result in the effect of a chain shift. Hence, the consequence of the chain shift is that each initial consonant of a stem becomes only one level lower in the strength hierarchy as illustrated in (8).

(8) Intervocalic One-level Weakening in North Welsh [14]

- a) voiceless stops are weakened to voiced stops (intervocalic voicing)
- b) voiced stops are weakened to voiced fricatives (intervocalic spirantization)
- c) voiceless lateral fricatives become voiced (intervocalic voicing)

<i>Root Noun</i>	<i>his (noun)</i>	<i>gloss</i>
pen	i ben	head
brand	i vraud	brother
ɫɔŋ	i ɫɔŋ	ship

Especially, this pattern of weakening, shown in (8), is a good example which supports the idea that intervocalic voicing and spirantization must be accounted for in a unified fashion.

Similar data from historical phonology are given in (9).

(9) Intervocalic One-level Weakening from Historical Phonology [14]

a) Latin /k/ -----> Old Spanish /g/ -----> Modern Spanish [G]
 aqua aqua aya

b) Lenition in Portuguese [16]

<i>Latin</i>	<i>Portuguese</i>	<i>gloss</i>	<i>change</i>
apiculam	abelha	bee	p ---> b (intervocalic voicing)
fabem	fave	bean	b ---> v (intervocalic spirantization)

I have shown several types of consonantal weakening, so far. This typology of consonantal weakening can be summarized as in (10).

(10) Typology of Consonantal Lenition

- a) Intervocalic voicing -- Korean, Old English, Modern Dutch, Akan etc.
- b) Intervocalic spirantization -- Tiberian Hebrew, Tamil etc.
- c) Intervocalic weakening with both voicing and spirantization --Panamint, Tamil /t/ etc.
- d) One-level lowering (either intervocalic voicing or spirantization depending on the input)
 --North Welsh, Portuguese etc.
- e) No weakening

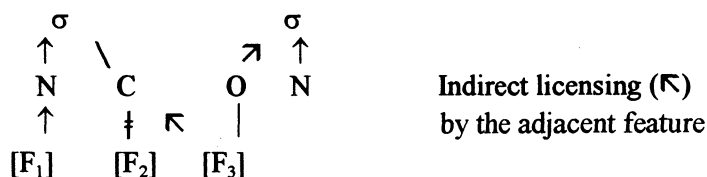
In the following sections, I will show how feature licensing in Optimality theory accounts for the typology of consonantal weakening.

2. LICENSING IN OPTIMALITY THEORY

The notion of 'licensing' in this study is quite different from that in earlier studies ([4], [6], [7], [8], [9]). First, the licensing framework developed here is bottom-up rather than from the top down. Hence, features are the primary licensers of a segment appearing as a syllable constituent. However,

even if a syllable constituent is not properly licensed by its feature it can still be parsed if it is licensed by a feature of an adjacent constituent, which can trigger phonological processes as shown in (12).

(12) Indirect licensing of a feature from the neighboring constituents



As illustrated, when a feature such as [F₂] does not license the coda, the coda must be licensed by [F₃] from the following onset in order to be realized.

The licensing in this study, as mentioned, is different mainly from that in earlier studies in that a feature licenses a segment and a segment licenses a syllable. Compared to the top-down licensing, this notion of licensing accounts for a wider range of phonological phenomena (See [21], [22] for more discussion about top-down licensing applied to place assimilation and coda restrictions) and has the following advantages.

First, the bottom-up licensing predicts in a more straightforward manner that when a segment is not licensed by its feature, it can delete. Note the following examples from [6].

(13) Segment deletion in Diola Fogany ([6])

- | | | | | |
|----|---------------|--------|-----------|-------------------|
| a) | /ujuk-ja/ | -----> | [ujuja] | ‘if you see’ |
| b) | /let-ku-jaw/ | -----> | [lekujaw] | ‘they won’t go’ |
| c) | /-kob-kob-en/ | -----> | [kokoben] | ‘yearn, long for’ |

Under the notion of top-down licensing, Itô argues that a coda in Diola Fogany cannot license [+consonantal], and this results in the deletion of a stop consonant that would otherwise appear in the coda as in (13). However, under the notion of top-down licensing, when a segment does not license its feature, one would predict that the feature would change or be deleted, not that the whole segment would delete. On the other hand, under the notion of bottom-up licensing if a feature does not license a segment (such as [+consonantal] not licensing a coda segment in Diola Fogany), the deletion of that segment is unproblematic since the segment itself is not licensed.

In the specific example of Diola Fogany, if there is top-down licensing where a segment licenses a feature, desyllabification should apply rather than segment deletion or there could be spreading from the following onset to the empty C-slot. These possibilities are shown in (14).

(14) Segment deletion in Diola Fogany (II)

- | | | | | | | |
|----|---------------|--------|-------------|-------------|-----------|-------------------|
| a) | /let-ku-jaw/ | -----> | *[lekkujaw] | *[leykujaw] | [lekujaw] | ‘they won’t go’ |
| b) | /-kob-kob-en/ | -----> | *[kokkoben] | *[kowkoben] | [kokoben] | ‘yearn, long for’ |

In terms of bottom-up licensing posited in this study, these problems are easily solved. That is, segment deletion applies in Diola Fogany since it is not properly licensed by its feature.

Second, the bottom-up licensing better explains the role of a syllable onset. That is, the top-down licensing cannot account for the phonological phenomena where an onsetless syllable is not considered as a real syllable. Hence, if a syllable licenses an onset, an onset should be optional in the syllable structure. This view, however, might result in an incorrect prediction with respect to the prosodic role of an onset in a syllable in example. Note the following reduplication process in Timugon Murut.

(15) Reduplication in Timugon Murut ([17]; cited in [3])

	<i>stem</i>	<i>Reduplication</i>	<i>gloss</i>
a)	bulud	bu-bulud	hill/ridges in which tuberous crops are planted
b)	limo	li-limo	five/about five
c)	abalan	a-ba-balan	bathes/often bathes
d)	indimo	in-di-dimo	five times/about five times

As is given, the reduplicant in Timugon Murut is generally realized as a prefix. However, when the first syllable of the base is onsetless, the reduplicant is realized as an infix, following the first syllable (not following the onset as shown in (d)). This suggests that a syllable may have no role as a prosodic unit if it lacks an onset (See more examples in [3]).

On the contrary, if an onset licenses a syllable, a syllable must have an onset: otherwise the syllable is not considered to be a real syllable and has no prosodic role as a syllable.

In the remainder of this paper, I will show how this notion of licensing accounts for various types of consonantal weakening within the framework of OT.

3. LICENSING IN CONSONANTAL WEAKENING

This section will show how licensing introduced in section 2 accounts for the various types of consonantal weakening such as voicing and spirantization.

3.1. Voicing and Licensing

As for the voicing process, it would seem plausible to say that under the feature geometric framework, the two [voice] features from the surrounding sonorants trigger voicing of the intervocalic obstruent. Such an analysis, however, is problematic since the feature [voice] of vowels and nasals are predictable as well as redundant. Hence, the feature should be underspecified from the perspective of Underspecification Theory. And this means that adjacent vowels would lack the specified [voice] feature to spread. In this section, given the active role of the feature [voice] in the process of voicing and also based on the notion of licensing, I apply the License constraint which is modified from [9].

(16) License [voice]:

$\forall_x(\text{voice}(x) \rightarrow \exists_y(\text{SC}(y) \wedge \lambda(x, y)))$ ('SC' stands for a syllable constituent)
'The feature [voice] must license its syllable constituent'

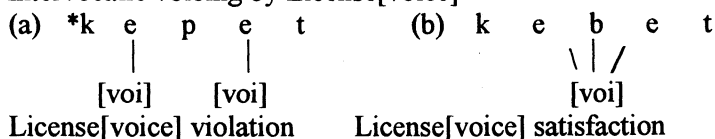
In the paper, partly following [9], I crucially assume that if a feature is redundant, the feature cannot license its syllable constituent. Furthermore, given the stipulation that a feature should license a syllable constituent in order to appear in a syllable structure, the redundant feature must seek another anchor to attach itself to and to license. This is summarized in (17).

(17) Inherently redundant features such as [voice] for sonorants or [continuant] for vowels can not license a syllable constituent.

: These features must be linked to another syllable constituent to appear.

Hence, the License[voice] constraint requires that the redundant feature, which is [voice] of vowels in this case, should license another syllable constituent where the [voice] feature is not redundant, thus triggering voicing of the consonant as seen in the comparison of (18a) and (18b).

(18) Intervocalic voicing by License[voice]

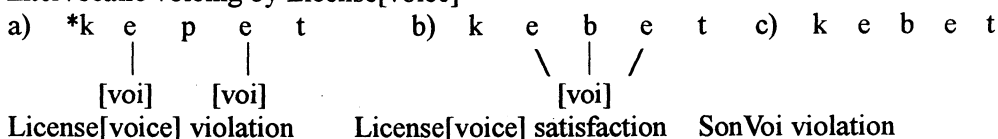


Both vowels in (18a) have the voice feature. The [voice] feature, however, cannot license its anchor, which is a nucleus, since the feature is redundant. Hence, two violations of License[voice] result. In contrast, the voice feature in (18b) licenses the adjacent onset with a consonant for which the feature is not redundant². Then, the question is immediately raised with respect to the feature specification of (68b) as to why the two vowels should be specified by the redundant voice feature. That is, underspecification of the [voice] feature will resolve the License[voice] violation. This analysis by virtue of underspecification of the feature, however, cannot account for intervocalic voicing. In order to resolve such a conflict, I make use of another constraint, Sonorant Voice (SonVoi) following [9]. The SonVoi constraint requires that all sonorants including vowels be specified by [voice] as stated in (19).

(19) SonVoi: Sonorants must be voiced. [9]

The constraints in (16) and (19) are inherently contradictory since License[voice] requires a vowel not to have a specified [voice] feature, and SonVoi, on the contrary, requires a vowel to be specified by the [voice] feature. In this section, I maintain that the interaction of these two constraints results in intervocalic voicing as illustrated in (20b).

(20) Intervocalic voicing by License[voice]



With the constraints described above, the tableau in (21) accounts for the patterns of intervocalic voicing in Kalenjin and illustrates the interaction of these constraints.

(21) Intervocalic Voicing in Kalenjin

/kep + et/ ----> [ke.be:t] 'is notching'

/k e p / + e : t [voi] [voi]	SonVoi	License[Voice]	Ident[Voi]
a. k e p e : t [voi] [voi]		*!* [shaded]	[shaded]
b. k e b e : t \ / [voi]	*! [shaded]	[shaded]	* [shaded]
c. kebet \ / [voi]			* [shaded]

²Redundancy here does not consider if a feature is phonologically redundant in a specific language. Hence, I say [voice] for consonants is not redundant since this feature for consonants is potentially contrastive, while for vowels it is not.

Both vowels in candidate (a) have a specified [voice] feature, thus respecting SonVoi. However, since the redundant [voice] feature cannot license its anchor (i.e., nucleus), a violation of License[voice] results, thus eliminating candidate (a) from further consideration. In contrast, the vowel [e] in candidate (b) is voiced, thus respecting SonVoi. Furthermore, the feature [voice] of the following consonant is not redundant and can license the consonant. Candidate (b), however, incurs a fatal violation of SonVoi since the second vowel [e] is not specified by [voice]. As a consequence, even though candidate (c) violates the correspondence constraint with respect to [voice], it respects all high-ranking constraints by retaining the licensed [voice] feature for both vowels and thus emerges as the optimal output.

The following section will show how this notion of licensing and license constraints account for another type of consonantal weakening, i.e., spirantization.

3.2. Spirantization and Licensing

Within the framework of Feature Geometry within Underspecification Theory, spirantization might be accounted for by the spreading of the feature [continuant] from a vowel to the adjacent consonant. Again, such an account is problematic, though, since a vowel must have [continuant] in order to spread the feature to an adjacent underlying stop. However, vowels are inherently or redundantly [continuant], and thus specifying [continuant] to a vowel is incongruent with Underspecification Theory.

Given the feature [continuant] with its inherent property of redundancy for vowels, I maintain that the [continuant] feature, like the redundant [voice] feature of a sonorant, cannot license its syllable constituent and instead must license an adjacent constituent such as an onset, to satisfy License[continuant] defined in (22).

(22) License[continuant]:

$$\forall_x(\text{continuant}(x) \rightarrow \exists_y(\text{SC}(y) \wedge \lambda(x, y)))$$

'The feature [continuant] must license its syllable constituent'

On the other hand, like SonVoi which requires a vowel to be specified by [voice], VowCont forces a vowel to be specified by [continuant] as is defined in (23).

(23) VowCont: Vowels must be specified as continuant.

For the phonological phenomenon of consonant-vowel interaction, the crucial role of the consonantal feature [continuant] for a vowel could be seen as controversial if vowels do not pattern with other [continuant] phonemes. Nonetheless, there are, in fact, some languages where vowels pattern with other consonants by the feature [continuant]. For instance, as [11] notes, in nasal harmony in Warao, Malay and Sundanese, targets must have [continuant], and so vowels are also targets of nasal harmony. That is, vowels, laryngeals, oral glides, liquids and fricatives participate in nasal harmony in these languages. In the harmonic process, the only feature that can group the phonemes that undergo harmony is [continuant]. This can be used to justify the role of [continuant] in the process of spirantization.

Using the constraints described in (22) and (23) and an Ident constraint, the tableau in (24) examines intervocalic spirantization of North Welsh illustrated in (8).

(24) Intervocalic Spirantization in North Welsh
 /i + brand/ ----> [i.brɨnd] 'brother'

/i brand/ [cont] [cont]	VowCont	License[cont]	Ident[cont]
a. i brand [cont] [cont]		*!*	
b. i brand	*!*		
c. i v rand \ / [cont]			*

Candidate (a) is faithful to its input, but fatally violates License[cont] since a redundant feature cannot license its anchor. Candidate (b) without the feature [continuant] specification fatally violates VowCont. Candidate (c) violates Ident[continuant] but respects the two higher-ranking constraints VowCont and License[cont] by having [continuant] associated to the intervening consonant. Thus intervocalic spirantization results, and candidate (c) emerges as the optimal output.

In the next section, I will explore one-step weakening as in the examples in (8), using the same constraints used so far.

3.3. One-Step Lowering and Constraint Conjunction

As described earlier, various Celtic languages exhibit both patterns of lenition, that is voicing and spirantization. What is noteworthy in the phenomena is that, even if voiceless stops were to become voiced intervocalically, and voiced stops were weakened to voiced fricatives, voiceless stops are never weakened to voiced fricatives. This means that an intervocalic stop is weakened to just one step lower in the strength hierarchy. This phenomenon, where an output heavily depends on the status of its input, might be problematic in OT since in OT, constraint evaluation applies in parallel, and the status of an input with respect to phonological constraints is not crucial ([18]). Namely, as addressed earlier, if voicing is the consequence of License[voice] and SonVoi interaction, and if spirantization is the result of License[cont] and VowCont interaction, we would expect both voicing and spirantization to apply simultaneously to a voiceless stop since the languages such as Celtic must have these four constraints which are ranked high. In order to account for the absence of this phenomenon of two-step weakening, I propose that the correspondence constraint, Ident[voi] ^ Ident[cont], which is a conjunctive constraint ([1], [12], [23], [24], [25]), dominates the License and feature specification constraints. In principle, in a constraint hierarchy, A ^ B >> C >> A, B, even though the constraint is ranked over both A and B, violating both of them simultaneously in a local domain is considered to be fatal even though the candidate satisfies the constraint C. As has been proposed ([23], [24], [25]), this local conjunction is part of UG in that such a conjunction rules out the worst of the worst by means of the ranking A ^ B >> A, B, but conjunction of specific constraint is language-specific.

The tableau in (25) shows how this constraint conjunction can handle the one-level weakening with the example of voiceless stop becoming a voiced stop rather than a voiced fricative.

(25) Intervocalic voicing in North Welsh
 /i + pen/ → [i.ben] 'head'

/ i + pen / voi voi cont cont	Ident[voi] ^ Ident[cont]	Vow Cont(1) Son Voi(2)	License [voi]	License [cont]	Ident [cont]	Ident [voi]
a. i pen voi voi cont cont			*!*	**		
b. i ben ^ ^ cont voi cont				**		*
c. i ven \ / voi cont	*!				*	*
d. i fen ^ ^ voi cont voi			**		*!	
e. i pen		*!*(1) ** (2)				

North Welsh has both intervocalic voicing and spirantization, which means that VowCont, SonVoi, License[voice] and License[continuant] are ranked very high as shown in (25). Candidate (c) with an intervocalic voiced fricative, derived from a voiceless stop, respects all constraints on the License and feature specification for both voicing and spirantization. However, it crucially violates the conjunctive constraint, Ident[voice] ^ Ident[continuant] since it violates both constraints simultaneously. On the other hand, candidate (a) is the most faithful candidate to the input but at the expense of violating License constraints. Candidate (e) with no [voice] and [continuant] feature specification is an interesting attempt to avoid License[voice] and License[continuant]. This move, however, fatally violates SonVoi and VowCont. Thus, candidate (e) is ruled out. Between candidates (b) and (d), candidate (b) violates Ident[voice] while candidate (d) violates Ident[cont]. Given that Ident[continuant] is ranked higher than Ident[voice], candidate (b) which undergoes voicing emerges as the best.

3.4. Full Weakening

Two-level lowering in a strength hierarchy (voiceless stop > voiced fricative), nevertheless, is not completely impossible. In fact, there are some languages where both License[cont], License[voi] and SonVoi, VowCont are ranked high, thus resulting in a two-step weakening. An interesting case of two-step weakening is found in Panamint ([15]). In Panamint, an underlying voiceless stop is fully weakened and thus is parsed as its voiced fricative counterpart intervocalically as in (26).

(26) Intervocalic two-stop weakening in Panamint

UR	SR	gloss
a) tipa	[tiβa]	pine nut
b) tokoa	[toyoa]	snake
c) toya-pi	[toyaβi]	pinyon pine-abs.

The tableau in (27) lacking a conjunctive constraint accounts for this two-step lowering in Panamint.

(27) Intervocalic weakening in Panamint

/t i p a/ ----> [t i .β a] 'pine nut'

/t i p a/ voi voi cont cont	Son Voi	Vow Cont	License [voice]	License [cont]	Ident [voi]	Ident [cont]
a. t i p a voi voi cont cont			*!*	**		
b. t i b a ^ ^ cont voi cont				*!*		
c. t i φ a ^ ^ voi cont voi			*!*			
d. t i β a \ / voi cont					*	*

Without a conjunctive constraint prohibiting simultaneous application of the two lenition processes, an optimal output, as seen above, can undergo both voicing and spirantization. Candidates (a), (b) and (c) fatally violate License constraints. Namely, candidate (a) violates both License[voice] and License[cont] by having single-linked features [voice] and [continuant]. Candidate (b) violates License[cont], and candidate (c) violates License[voice]. Therefore, candidate (d) is the winner since it satisfies License, SonVoi and VowCont. The comparison between Panamint in (27) and North Welsh in (25) crucially shows the language-specific nature of the constraints involved in constraint conjunction.

In sum, along with high-ranking License[voice], License[continuant], SonVoi and VowCont, the following constraint hierarchy accounts for the typology of intervocalic weakening.

(28) Typology of lenition by constraint interaction

- a) Intervocalic voicing: SonVoi, Ident[cont] >> License[voice] >> Ident[voice]
--- Korean, Old English, Modern Dutch, Akan etc.
- b) Intervocalic spirantization: VowCont, Ident[voice] >> License[cont] >> Ident[cont]
---Tiberian Hebrew, Tamil etc.
- c) Intervocalic weakening with both voicing and spirantization:
SonVoi, VowCont >> License[voice], License[cont] >> Ident[voice], Ident[cont]
---Panamint, Tamil /t/ etc.
- d) One-level lowering (either intervocalic voicing or spirantization depending on the input)
Ident[voice] ^ Ident[continuant] >> VowCont, SonVoi >> License[voice],
License[continuant] >> Ident[continuant] >> Ident[voice]
--- North Welsh, Portuguese etc.
- e) No weakening: Ident[voi], Ident[cont], SonVoi, VowCont >> License[voi], License[cont]

As the constraint ranking in (28a) shows, the interaction of License[voice] with SonVoi accounts for intervocalic voicing, while the interaction of License[continuant] with VowCont explains intervocalic spirantization as the constraint ranking in (28b) illustrates. With the same constraints, languages do still display their own phonology depending on the relation of such constraints and their constraint ranking as given in (28c) and (28d). Hence, if a language has the undominated constraints Ident[voice] and Ident[continuant] in a conjunctive relation, it will allow only one-step weakening. However, without the conjunctive constraint, both voicing and spirantization will apply simultaneously. This means that interaction of License[voice] with SonVoi and of License[continuant] with VowCont explains two common phonological phenomena, intervocalic voicing and spirantization, respectively. However, each language still retains their own phonology depending on the relation of such constraints and their constraint ranking.

4. SUMMARY AND CONCLUSION

In the paper, I have discussed three issues: how License works in the process of voicing and spirantization, how the special behavior of redundant features is handled in OT, and how conjunctive constraints work in the process of one-level weakening. Consequently, I first proposed that inherently redundant features such as [voice] of sonorants and [continuant] of vowels trigger voicing and spirantization, respectively since cross-linguistically redundant features unlike other features cannot license their syllable constituents and thus must seek other anchors to attach to and license. Hence, voicing results from the interaction of License[voice] and SonVoi. Similarly, the interaction of License[continuant] and VowCont give rise to spirantization.

I have also shown that North Welsh has interesting case of chain shift where an intervocalic consonant is only one-step weakened. I further argue that this chain shift, depending on the input, is the consequence of high-ranking conjunctive constraint rather than the consequence of underspecification.

To conclude, an intervocalic obstruent is cross-linguistically either voiced or spirantized by means of License[voice] and License[cont], respectively. Two-step weakening applies in some languages and only one-step weakening applies in other languages depending on constraint relations such as conjunction. As has been shown above, several patterns of consonantal weakening is the consequence of these license constraints and of ranking and relations of such license constraints.

5. REFERENCES

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