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A note on the strength of vowels

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Abstract: This paper is a modest contribution to the understanding of vocalic strength. Our aim is to show that the strength of consonants and the strength of vowels can be unified. For this, we propose that the only factor of strength is length. More precisely: branching segments are stronger and segments sharing their positions with other segments are weaker. We discuss several examples of phenomena related to vowels which illustrate this strength hierarchy.

Keywords: vowels; lenition; fortition; branching; contour

1. Introduction

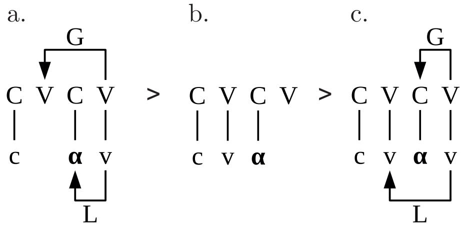
The analysis in this paper is part of a larger project to develop a Strict CV framework without the lateral relations inherited from Government Phonology. In Enguehard (2018; 2019), Enguehard & Luo (2019), and Luo & Enguehard (2019), we proposed that positional phenomena can be represented with already existing concepts in classical autosegmental theory. In this paper, we specifically focus on our account of fortition and lenition. We argue that our proposal makes valid predictions concerning the strength of vowels.

In section 2, we briefly summarize how the fortition and the lenition of consonants can be derived from branchings and contours. Then, we show that these two notions can also derive the strength of vowels. In section 3, we address studies showing that branching vowels are stronger. In section 4, we argue that vowels sharing their positions are weaker.

2. Strength is length

Coda Mirror Theory was introduced in Ségéral & Scheer (1999) and developed in Scheer & Ziková (2010) in order to account for the lenition and fortition of consonants. Assuming that Government allows for inhibition and Licensing allows for strengthening, the authors predict the three configurations in (1). A consonant α is strong when licensed (1a), it is weak when unlicensed (1b), and it is **more than weak** when governed (1c).

(1)



In Enguehard & Luo (2019) and Luo & Enguehard (2019), we showed that the configurations in (1) are not sufficient to account for the inalterability of geminates. Provided that geminates and post-coda onsets involve an empty nucleus in Strict CV, Coda Mirror Theory predicts that they both correspond to the lateral configuration in (1a). However, based on three unrelated languages (i.e., Tamazight, Old Norse and Koalib), we argued that geminates can be stronger than post-coda onsets. For instance, Tamazight obstruents are always realized as plosives in geminates (e.g., fe**tt**el 'to roll couscous' **intensive form**) but they are realized as fricatives in other positions (e.g., ef**θ**el 'to roll couscous' **zero form**).

In order to account for the specificity of geminates, it is necessary to refer to their length.[1] For this reason, we hypothesized that length is the only cause of strength. Of course, there is no relevant duration contrast between post-coda onsets, intervocalic onsets and codas. Our definition of length is not phonetic but phonological. For instance, Barillot and Ségéral (2005) show that intervocalic /t/ is spirantized and voiced in Somali (e.g., /daqn-a**t**-aa/ : [daqna**ð**aa] 'I feel pain'), but if /t/ is morphologically concatenated with another /t/, these are realized as a short [t] which does not undergo spirantization and voicing (e.g., /daqn-a**t**-**t**-aa/ : [daqna**t**aa] 'you feel pain'). Here, length is motivated by morphology but it is not realized as phonetic duration. Instead, it is manifested by strength.

[1] See also Ulfsbjorninn and Lahrouchi (2016) who propose that the inalterability of Tamazight geminates is due to a correlation between stopness and bipositionality.

Assuming that length can be "virtual", we proposed the principles in (2).

(2) a. Consonants branch onto each other's position[2]
b. Branching provides strength
c. Contours diminish strength

A few comments are necessary to understand the motivation of these three principles. The idea that branching provides strength is based on the observation of geminates. The other two principles are mainly theoretical but they are not *ad hoc*. First, we think it is reasonable to assume that contours (i.e., a position associated with two segments) provide weakness since they are the mirror image of branching (i.e., a segment associated with two positions).[3] Second, by assuming that consonants branch onto each other's position, we are simply applying the principle that every empty position of an autosegmental line needs to be filled in. The only difference is that, where the classical model regards branching as a parametric choice leading to assimilation, we assume that it is a systematic process which may or may not be interpreted as an assimilation.

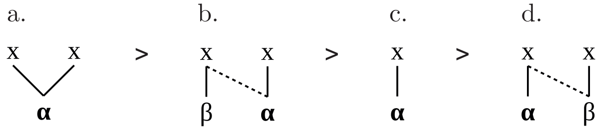
These principles predict the four configurations in (3). Geminates are strong because they branch (3a).[4] Post-coda onsets cannot be stronger than geminates because they branch but also share one of their two positions with a preceding coda (3b). Intervocalic onsets cannot be stronger than post-codas because they cannot branch (3c). Internal codas cannot be stronger than intervocalic onsets because they share their only position with a following onset (3d). These four main configurations can then be divided into subcategories according to the nature of branching features within a segment. For instance, stopness corresponds to (3a) in /nd/ because it belongs to both /n/ and /d/, but it corresponds to (3b) in /rd/ because it does not belong to /r/.

[2] In Enguehard & Luo (2019), we proposed that the direction of spreading depends on the sonority scale: less sonorous consonants branch onto the position of more sonorous consonants. Following Harris (1990), we assume that codas can be more sonorous than post-coda onsets but they cannot be less sonorous. For that reason, we here focus on leftward spreading. Concerning rightward spreading, see Enguehard & Luo (2019).

[3] We call "segment" a set of features that are realized simultaneously **via** an operation called "fusion".

[4] Due to the representation of the stress and the left edge in Strict CV, pre-tonic, post-tonic and initial consonants may be concerned by this configuration. See Luo & Enguehard (2019) for more details.

(3)



One might wonder what happens to affricates which generally have a specific representation in the form of contours. In our approach, affricates are not fundamentally different from multipositional consonant clusters except that they do not have any embedded empty nucleus (see Enguehard 2019 for the argumentation).

In this paper, we focus on a specific prediction which follows from these assumptions. If we accept that strength is exclusively conditioned by branchingness, we expect vowels to be concerned by lenition and fortition in the same way as consonants are. By "vowel strength" we mean a clear-cut and non-substantial definition. We define the term "lenition" as a type of "neutralization". In this respect, lenition processes always lead to the neutralization of phonemic contrasts. Provided that neutralized segments are underspecified, we follow Harris (1990; 2005) in assuming that the lenition of a segment is represented by a loss of features.

An attempt to represent vowel reduction with lateral relations is proposed in Dabouis et al. (2020). That study supposes that the lateral relations do not have the same consequences for consonants and vowels. In contrast, the proposal outlined in (2) predicts exactly the same consequence for consonants and vowels.

In the following sections, we aim to show that this strength hierarchy is verified in several languages. We start by pointing out that branching provides strength.

3. Branching provides strength

The simplest prediction of our hypothesis is that long vowels can resist neutralizations. Synchronically, this phenomenon can be observed in Palauan (Malayo-Polynesian, Palau). Zuraw (2003) points out that Palauan has short and long vowels in stressed contexts. Unlike short vowels (4a), long vowels are not centralized in unstressed contexts (4b). Instead, they are shortened. Zuraw (2003) analyses this shortening as a shift in the sonority scale comparable to vowel reduction. But the definition of lenition adopted in this paper supposes a clear distinction between the vowel reduction in (4a) and the shortening in (4b). In the first case, vowel reduction triggers neutralization. In the second case, vowel shortening does not trigger any neutralization. In that sense, vowel shortening is not a lenition process in (4). Provided that non-neutralizing segments do not lose their distinctive features, we might assume that long vowels never cease to be branching. The length contrast becoming useless in the context of vowel reduction, branchingness is only realized as an absence of reduction (see Lowenstamm 1991 for a similar analysis in Moroccan Arabic).

(4)		Stressed	Unstressed	Gloss
a.	/a/	[ɾ**a**kt^h]	[ɾ**ə**kt-ɛl]	'sickness'
	/ɛ/	[s**ɛ**səb]	[s**ə**səb-ɛl]	'fire'
	/o/	[b**o**tk^h]	[b**ə**tk-ɛl]	'operation'
	/i/	[ɾ**i**ŋəl]	[ɾ**ə**ŋəl-ɛl]	'pain'
	/u/	[k**u**k-]	[k**ə**ku-l]	'nail'
b.	/ɛɛ/	[ɾ**ɛj**k^h]	[ɾ**ɛ**k-ɛl]	'rustling sound'
	/oo/	[ðək**ow**l]	[ðək**o**l-ɛl]	'cigarette'
	/ii/	[ʔ**ij**s]	[ʔ**i**s-ɛl]	'escape'
	/uu/	[b**uw**ʔə]	[b**u**ʔ-ɛl]	'betel nut'

A second example of the strength hierarchy between short and long vowels can be found in Charette's (1989) analysis of the inalterability of branching nuclei.[5] The author points out that some Korean suffixes containing /i/ trigger a fronting of preceding back vowels (5a). However, if the back vowel is long, the assimilation does not apply (5b). As in the vowel reduction case, the contrast between back vowels and front vowels is neutralized due to front harmony. Following our terminology, this phenomenon might be considered as a case of lenition (i.e., the loss of distinctive features) affecting only short vowels.

(5)		Radical	Subject	Gloss
	a.	[p**a**m]	[p**æ**m-i]	'night'
		[c**a**ɲ]	[c**æ**ɲ-i]	'fare'
		[t**a**m]	[t**æ**m-i]	'wall'
		[s**ə**m]	[s**e**m-i]	'a measure'
	b.	[p**aː**m]	[p**aː**m-i]	'chestnut'
		[c**aː**ɲ]	[c**aː**ɲ-i]	'sauce'
		[t**aː**m]	[t**aː**m-i]	'energy'
		[s**əː**m]	[s**əː**m-i]	'island'

[5] We are aware that Charette (1989) provides a different conclusion from the one argued in this paper. Where we say that all branching segments have the same potential strength, Charette argues that branching vowels can have a specific inalterability compared to geminates. Actually, this conclusion is not in contradiction with ours.

We now move on to a case studied by D'Introno and Weston (2000) and Bucci (2013), where the branchingness of vowels is not interpreted as length phonetically. In the Barese dialect of Corato, back and front vowels are reduced to schwa in unstressed contexts (6a). Only /a/ always resists this process (6b).

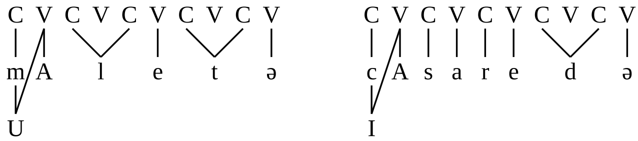
(6)		Stressed	Unstressed	Gloss
	a.	[r**o**tə]	[r**ə**teddə]	'wheel'; *diminutive*
		[fən**u**ccə]	[fən**ə**cceddə]	'fennel'; *diminutive*
		[m**e**lə]	[m**ə**leddə]	'apple'; *diminutive*
		[v**i**ndə]	[v**ə**ndətʃiəddə]	'wind'; *diminutive*
	b.	[f**a**və]	[f**a**vettə]	'bean'; *diminutive*

However, Bucci (2013) shows that back vowels and front vowels avoid vowel reduction in the following cases. First, if a back vowel is adjacent to a velar or a labial consonant, it is not reduced (7a). Second, if a front vowel is adjacent to a palatal consonant, it is not reduced (7b). Third, no vowel is reduced in the initial position (7c). And finally, if a vowel is stressed, it is not reduced (first column of (6) and (7)).

(7)		Stressed	Unstressed	Gloss
	a.	[*m* **o** llə]	[*m* **o** llettə]	'elastic'; *diminutive*
		[l**u** *m* ə]	[l**u** *m* inə]	'lamp'; *diminutive*
		[a *g* **u** stə]	[a *g* **u** stənellə]	'august'; 'August mullet'
	b.	[s**e** *cc* ə]	[s**e** *cc* ətiəddə]	'seal'; *diminutive*
		[*c* **e** sə]	[*c* **e** sareddə]	'church'; *diminutive*
		[v**i** *ɲɲ* ə]	[v**i** *ɲɲ* əteddə]	'vine'; *diminutive*
		[*ʃ* **i** mmjə]	[*ʃ* **i** mmjettə]	'monkey'; *diminutive*
	c.	[**o**rə]	[**o**rettə]	'hour'; *diminutive*
		[**u**ccə]	[**u**ccətʃiəddə]	'eye'; 'little eye'
		[**e**rvə]	[**e**rvətʃeddə]	'grass'; *diminutive*
		[**i**wtə]	[**i**wtətʃiəddə]	'height'; 'tall person'

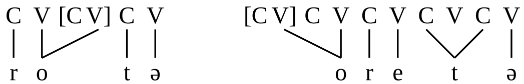
D'Introno and Weston (2000) argued that the vowels in (7a) share a place feature with the neighbouring consonant. Bucci (2013) generalized this observation to the vowels in (7b). He proposed that velars and labials share an element |U| with back vowels (8a) and palatals share an element |I| with front vowels (8b).

(8) a. b.



Based on the insights of Honeybone (2005), Bucci (2013) suggested that these branching structures are responsible for the absence of reduction in Coratino. Moreover, the author recalled that both stress and the left edge are represented by an empty slot in Strict CV (see Larsen 1995 and Lowenstamm 1999 respectively). Due to the presence of an empty CV, the same kind of spreading is expected in stressed and initial positions. In Coratino, this spreading accurately predicts that the vowels of these two contexts should behave like the branching vowels in (8).

(9) a. b.



In sum, we showed that that the strength hierarchies between (3a) and (3c) and between (3b) and (3c) are attested. We now aim to argue that contours can be responsible for weakening effects.

4. Contours diminish strength

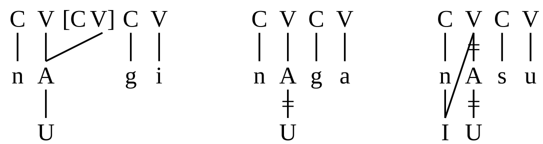
Russian is a well-known example of vowel reduction depending on several factors. For a precise description, the reader is referred to Avanesov (1949; 1968). A basic outline is provided in (10). Unstressed non-high vowels are centralized after a non-palatalized consonant (10a), but they are reduced to [i] after a palatalized consonant (10b).[6]

(10)		Stressed	Gloss	Unstressed	Gloss
	a.	gl[**a**]z	‘eye’	gl[**ɐ**]z-a	‘eye’ (GEN.SG)
		n[**ɔ**]g-i	‘legs, feet’	n[**ɐ**]g-a	‘leg, foot’
	b.	p’[**a**]t’	‘five’	p’[**i**]t-ok	‘set of five’
		n’[**ɔ**]s	‘carried’ (M)	n’[**i**]s-u	‘I carry’
		l’[**ɛ**]s	‘forest’	l’[**i**]s-ok	‘wood’

[6] The phoneme /ɛ/ does not occur after a non-palatalized consonant in the Russian native vocabulary.

Provided that stress inserts an extra CV-slot (see Larsen 1995), the vowel /o/ in (11a) is supposed to be strong and its features can be maintained. In contrast, the non-spreading counterpart of this vowel in (11b) is weak and its |U| element drops, leading to the realization [ɐ]. But what happens after a palatalized consonant? Since the Element |I| is not shared by /a,e,o/, there is no doubt that the unstressed vowel [i] in (10b) results from an assimilation triggered by the preceding consonant. In autosegmental representations, this assimilation is a spreading of the Element |I| to the position of the following vowel (11c). As consequence, a contour configuration involving |I| and the vowel undergoing assimilation results. In this configuration, the vowel undergoing assimilation is supposed to be weaker than a simple short vowel because it belongs to a contour. This is verified by the fact that /o/ loses only |U| in (11b) but both |U| and |A| in (11c). Here, the weakest context shows the strongest neutralization.

(11) a. b. c.



A similar phenomenon can be observed in some exceptions in the Coratino data (Bucci 2013). Unlike e.g., [m**o**llettə] 'elastic-dim.', an unstressed /o/ is raised to [u] when preceded or followed by a velar consonant (12).

(12)

Stressed	Gloss	Unstressed	Gloss
[k**o**nʤə]	'dyeing'	[k**u**nʤatorə]	'tanner'
[nəg**o**dʤə]	'store'	[nəg**u**dʤjandə]	'merchant'
[k**o**rnə]	'horn'	[k**u**rnəʧiəddə]	*diminutive*
[vərg**o**ŋŋə]	'shame'	[vərg**u**ŋŋusə]	'shameful'
[k**o**ppuə]	'cap'	[k**u**ppuɛccə]	*diminutive*

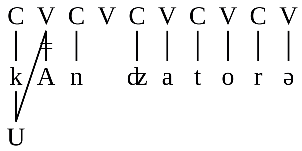
This raising can be interpreted as a loss of the Element |A|, but |A| is not supposed to drop in unstressed positions (see 6). We suggest that this unexpected loss of |A| is due to the contrast between (13a) and (13b). Unlike (13a), the unstressed |A| of (13b) belongs to a contour. Thus its position is weaker and |A| can be dropped next to a velar.[7] As for |U|,

[7] The reason why this does not occur next to a labial is unclear, but the theory does not state that such a dropping is necessary. This is just one of the possible realizations of the weak context.

it also belongs to a contour (since it shares a position with |A|), but its association to two positions provides it with a strength that prevents it from dropping.

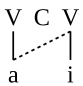
(13) a.

b.

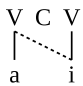


So far, we discussed the vocalic parallel of (2b, c), but we have not seen such a parallel for (2a). The idea that a virtual spreading can apply between vowels was proposed in Caratini (2009) and Luo (2013) for diphthongs.[8] Caratini (2009) assumes that the lowest vowel branches onto the other position (14a) and Luo (2013) argues that the highest vowel branches onto the other position (14b). These two representations have opposite implications for our proposal. In the first case, the stronger vowel is the lower one. In the second case, the stronger vowel is the higher one.

(14) a.



b.



We address this issue with the monophthongization of Palauan diphthongs illustrated in (15). Following Zuraw (2003) Palauan rising and falling diphthongs always lose the same portion in unstressed context. For instance, both /ia/ and /ai/ alternate with /i/. Following our assumptions, this supposes that the maintained part of the diphthong is a branching (i.e., stronger) segment and the lost part of the diphthong is a non-branching (i.e., weaker) segment sharing its position. In the present case, the branching part is the fronter vowel (15a), and, if there is no front vowel, the branching part is the higher vowel (15b). In the terms of Element Theory, this can be formulated as follows: |I| is more likely to branch than |U|, and |U| is more likely to branch than |A|.

[8] This hypothesis concerns bipositional diphthongs. If one wants to represent short diphthongs in the form of a monopositional contour, the prediction made by the theory is that the two components are weak.

(15)		Stressed	Unstressed	Gloss
a.	/iɛ/	[bab**jɛ**ɾ]	[bab**i**lŋ-ɛl]	‘paper’
	/ɛi/	———	———	———
	/iu/	[ʔ**ju**kl]	[ʔ**i**kl-ɛl]	‘good voice’
	/ui/	[t**uj**ʔ]	[t**i**ʔ-ɛl]	‘torch’
	/io/	[ŋ**jo**kl-]	[ŋ**i**kl-ɛl]	‘cooking starchy food’
	/oi/	[b**oj**ð]	[b**i**ð-ɛl]	‘chant about travelers’
	/ia/	[ð**ja**llə]	[ð**i**ll-ɛl]	‘ship’
	/ai/	[b**aj**s]	[b**i**s-ɛl]	‘wandering around’
	/ɛu/	[t**ɛw**]	[t**ɛ**ŋ-ɛl]	‘width’
	/uɛ/	———	———	———
	/ɛo/	[oɾ**ɛo**məl]	[oɾ**ɛ**məl-ɛl]	‘forest’
	/oɛ/	[bəɾ**oɛ**l]	[bəɾ**ɛ**l-ɛl]	‘spears’
	/ɛa/	[b**ɛa**ʔəð]	[b**ɛ**ʔəð-ɛl]	‘tin’
	/aɛ/	[b**aɛ**b]	[b**ɛ**b-ɛl]	‘pipe’
b.	/uo/	[ʔ**wo**ðəl]	[ʔ**u**ðəl-ɛl]	‘older sister of female’
	/ou/	[ɾ**ow**s-]	[ɾ**u**s-ɛl]	‘distribution’
	/ua/	[t**wa**ŋ-əl]	[t**u**ŋəl-ɛl]	‘door’
	/au/	[s**aw**l]	[s**u**l-ɛl]	‘tiredness, trouble’
	/oa/	[om**oa**ʔəl]	[om**o**ʔəl-ɛl]	‘river’
	/ao/	[t**ao**ð]	[t**o**ð-ɛl]	‘fork’

In footnote 2, we recalled one of our claims: less sonorous consonants spread to more sonorous consonants. If we consider the sonority hierarchy put forward by Selkirk (1984), |I| and |U| are supposed to be less sonorous than |A| (see Carvalho 1993; 1994; 2002 concerning the assymetry between A, I and U). In this respect, vowels seem to behave like consonants.

5. Conclusion

In this paper, we have showed that our hypotheses concerning the strength of consonants can be adapted to the strength of vowels. We addressed the impact of branching configurations on the strength of vowels and we argued that vowels sharing their position are more likely to be reduced than simple short vowels. As a conclusion, we showed that the major part of the predicted strength hierarchy is empirically attested. Finally, we mentioned that the direction of intervocalic branching is conditioned by the sonority scale, just like in the case of consonants. In the case of consonants, we do not really need to use “sonority” because this empirical notion is related to the segmental complexity. However, in the case of vowels, what we know about segmental complexity does not match yet with what we know about their sonority. For this reason, we have chosen to adopt the notion of sonority as an informal description tool common to consonants and vowels. These insights need to be developed in further studies, but we believe that the present note can already contribute to our understanding of vocalic strength.

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