

Belo Horizonte

21-23 de maio 2009

© Leo Wetzels

Paris III, Sorbonne Nouvelle, CNRS/Laboratoire de Phonétique et Phonologie
Universidade Livre de Amsterdam

The Representation of Vowel Height and Vowel Neutralization in Brazilian Portuguese (Southern Dialects)

(Work in Progress, to appear (with some more prose) in

Elisabeth Hume, John Goldsmith, and Leo Wetzels (eds.) 2010. *Tones and Features*)

I. The Functional Load of the Contrast between Upper and Lower mid Vowels in Brazilian Portuguese

The oral vowel system of Brazilian Portuguese (BP) contains two contrastive series of mid vowels, the upper mid series /e, o/ and the lower mid series /ɔ, ε/, which are usually only contrastive when stressed. The following set of words illustrates the full inventory of BP contrastive oral vowels:

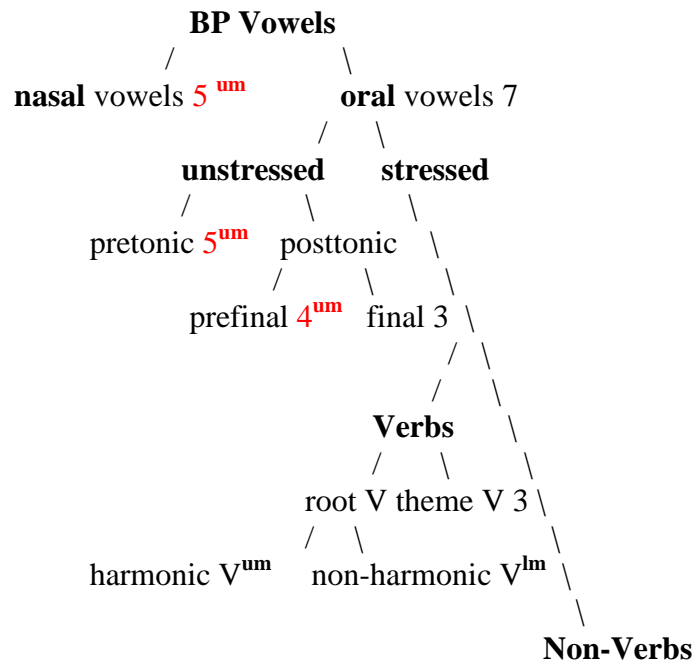
(1) 7 oral vowels in stressed syllables

abacaxí	[i]	pineapple	urubú	[u]	vulture
canjarê	[e]	voodoo ritual	camelô	[o]	street vendor
jacaré	[ɛ]	alligator	igapó	[ɔ]	swampland
			maracujá	[a]	passion fruit

The words in (1) all represent loans, mostly from Tupi languages. Yet, the choice for this word set was not made necessarily to evoke a tropical ‘couleur locale’. As it turns out, words with stressed final open syllables that are not loans - mostly from indigenous (Indian) languages, but also from African languages, and (originally) European languages, like French and English - are rare in BP.

In this talk we will address the question of what the functional load is of the contrast between upper and lower mid vowels in BP, establishing an inventory of the contexts in which the contrast is neutralized (or, in other words, in which the upper or lower quality of the mid vowel is predictable) and of the contexts in which the contrast is maintained and observe that it is fully functional in word-final stressed open syllables only. We will subsequently address the question of how the distinction between upper and lower mid vowels should be represented in terms of distinctive features and what the effect of neutralization is on the featural representation of the neutralized vowels.

The following diagram summarizes the contexts that are relevant from the perspective of mid vowel neutralization in the Southern dialects. The numbers refer to the number of vowels that are contrastive in the given context, such that 7 refers to the complete set of contrastive vowels given in (1), 5 to the same set with only one series of contrastive mid vowels, 4 to the vowel set with /o/ as the unique mid vowel, 3 to set without any mid vowels. The mid vowel quality that is realized phonetically in contexts of neutralization is indicated by one of the superscripts *um* (upper mid) or *lm* (lower mid).



The diagram above reflects the contexts in which the choice between upper and lower mid vowels is imposed by the grammar:

- nasal mid vowels are always **upper mid**
- unstressed mid vowels are always **upper mid**
- stressed vowels in verbs are always **lower mid**, except for (root) mid vowels that harmonize with the non-low theme vowels /i,e/

In order to determine the functionality of the upper/lower mid vowel opposition in non-verbs, we need to consider the position of the stressed syllable, syllable weight, the nature of the theme vowel, and, for stressed vowels in closed syllables, the nature of the coda consonant.

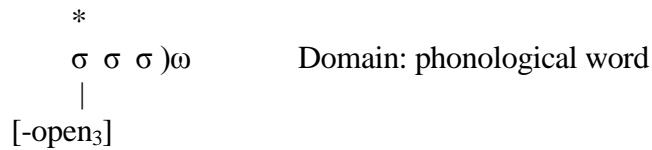
Stressed vowels in **Non-Verbs**

The BP rhyme has maximally two positions filled (except for /s/, which can be added as a third element morpheme-finally). A syllable may be closed by N, l [w], r [x, h, ø], s, j, w. Stress in BP can be final (*mulher* ‘woman’, *jacaré* ‘alligator’), penultimate (*bolo* ‘cake’, *próton* ‘proton’) and antepenultimate (*médico* ‘physician’, *íngreme* ‘steep’). In proparoxytonic position, mid vowels do not contrast in BP.

1. Antepenult stress:

'CVCV(C)V(C) m[é]dico 'physician' p[ó]voa 'village' 5 vowels^{lm}

Dactylic Lowering (DactyLow): Mid vowels must be lower mid in antepenultimate stressed syllables



(46)	amul[é]to	amulet	amul[é]tico	amuletic
	esquel[é]to	skeleton	esquel[é]tico	skeletal
	visig[ó]do	visigoth	visig[ó]tico	visigothic
	p[ó]vo	people	p[ó]voa	hamlet
	camel[ó]	street vender	camel[ó]dromo	covered market
	áspero		asp[é]rulo	

No contrast in antepenultimate stressed syllables (a handful of exceptions in nonderived words, no exceptions in derived words (Dactylic Lowering))

Similarly, in paroxytonic position, mid vowels do not contrast, if the word-final syllable is closed.

2. Penult stress

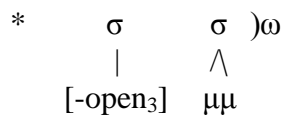
a. final syllable closed

i. prefinal syllable open

'CVCVC 5 vowels^{lm}

ii. prefinal syllable closed

'CVCCVC 5 vowels^{lm}



m[ɔ]vel	mobile	c[ɛ]sar	Caesar
c[ɔ]dex	codex	del[ɛ]vel	erasable
d[ɔ]lar	dollar	el[ɛ]tron	electron
rep[ɔ]rter	reporter	est[ɛ]ril	sterile
d[ɔ]cil	docile	[ɛ]ster	ester
d[ɔ]lmen	dolmen	F[ɛ]lix	Felix
D[ɔ]ris	Doris	h[ɛ]lix	helix
ign[ɔ]bil	ignobile	g[ɛ]rmen	germ
m[ɔ]rmon	Mormon	l[ɛ]men	Iemen
t[ɔ]raks	thorax	n[ɛ]ctar	nectar

p[ɔ]len	pollen	n[ɛ]on	neon
pr[ɔ]ton	proton	proj[ɛ]til	projectile
rev[ɔ]lver	revolver	r[ɛ]ptil	reptile
Boston		herpes	
cosmos		western	
oscar		polyester	

Exceptions are very rare:

t[ɛ]xtil	textile	p[ó]ster	poster
----------	---------	----------	--------

A productive word formation process constructs words with the learned suffix *on*, as in

bárion	(< bar(i)+on),
b[ó]son	(< Bose+on),
c[ó]don	(< code+on),
f[ó]non	(< fono+on), nasal raising!
f[ó]ton	(< foto+on),
magn[é]ton	(< magneto+on)

No contrast in penultimate stressed syllables, if the last syllable is closed (heavy) (a handful of exceptions in nonderived words, no exceptions in derived words (Spondaic Lowering), but see below for hiatus 'CVVC.

The functionality of the mid vowel opposition in paroxitonic words that end in a word-final open syllable is much more complex.

*b. final syllable open
prefinal syllable closed
...CVCCV*

i. ...CVNVCV → obligatory nasalization, no lower mid vowels

ii. ...CVICV

-If the theme vowel is /e/ the coronal and dorsal mid vowels are **lower mid**

reb[ɛ]lde	m[ɔ]lde
p[ɛ]lve	g[ɔ]lpe
G[ɛ]LNE	p[ɔ]lme

No contrast in penultimate stressed syllables with coda //, if the final syllable is open

-If the theme vowel is /o/, the coronal mid vowel can be both **lower mid and upper mid** (there are only a handful of words of this type), whereas the dorsal mid vowel is almost always **upper mid**

esv[ɛ]lto	s[o]lto	but: [ɔ]lmo
f[ɛ]lpo	b[o]lso	
su[ɛ]lto	c[o]lmo	
c[ɛ]lso	f[o]lgo	
	p[o]lvo	

-If theme vowel is /a /, the **coronal** mid vowel is almost always **lower mid**, whereas there is **no clear preference** for the aperture quality of the **dorsal mid** vowel

b[ɛ]lga	but f[ɛ]lpa	b[o]lsa
c[ɛ]lga		p[o]lpa
c[ɛ]lta		c[o]lza
d[ɛ]lta		f[ɔ]lga
s[ɛ]lva		v[ɔ]lta
r[ɛ]lva		p[ɔ]lca

iii. ...CVrCV

- If theme vowel is /e/, the coronal and dorsal mid vowels are almost always **lower mid**

imb[ɛ]rbe	but: v[ɛ]rde	c[ɔ]rte	but: t[o]rpe
in[ɛ]rte		m[ɔ]rte	
v[ɛ]rve		s[ɔ]rte	
v[ɛ]rme		sup[ɔ]rte	
		n[ɔ]rte	

-If the theme vowel is /o/, the coronal mid vowel **tends to be lower mid** (with a considerable number of exceptions), whereas the dorsal mid vowel is almost always **upper mid**.

adv[ɛ]rso	but: f[ɛ]rvo	c[o]rpo	but: c[ɔ]rdo
c[ɛ]rto	c[ɛ]rdo	f[o]rno	
mod[ɛ]rno	n[ɛ]rvo	h[o]rto	
ext[ɛ]rno		ret[o]rno	
v[ɛ]rbo		g[or]do	
alt[ɛ]rno		ad[o]rno	

- If the theme vowel is /a/, there is a strong tendency for both the coronal and dorsal mid vowels to be **upper mid**, although there is a handful exceptions for both vowels.

cad[ɛ]rna	but:	ac[ɛ]rca	p[ɔ]rta	but:	f[o]rça
p[ɛ]rla		p[ɛ]rda	[ɔ]rla		ref[o]rma
cons[ɛ]rva			[ɔ]rca		s[or]va
p[ɛ]rna			h[ɔ]rta		
of[ɛ]rta			c[ɔ]rda		
conv[ɛ]rsa			a[ɔ]rta		

iv. ...'CVsCV

- If the theme vowel is /e/, the coronal and dorsal mid vowels are **lower mid**

equ[ɛ]stre	p[ɔ]ste
sem[ɛ]stre	b[ɔ]sque
v[ɛ]ste	
t[ɛ]ste	
p[ɛ]ste	

No contrast in prefinal syllables closed by/s/ when the final open syllable contains the theme vowel /e/.

- If the theme is /o/, there is a tendency for the coronal mid vowel to be **upper mid** (with quite a few exceptions), the dorsal mid vowel is **upper mid**.

UN[ɛ]SCO	but	prot[ɛ]sto	ag[o]sto
p[ɛ]sto		ma[ɛ]stro	comp[o]sto
refr[ɛ]sco		sequ[ɛ]stro	g[o]sto
cr[ɛ]spo			m[o]sto
arr[ɛ]sto			p[o]sto
mol[ɛ]sto			
s[ɛ]sgo			

No contrast in prefinal syllables closed by/s/ when the final open syllable contains the theme vowel /o/ and the stressed mid vowel is dorsal. Quite some exceptions can be found if the stressed mid vowel is coronal.

- If the theme is /a/, the coronal mid vowel is **lower mid** (with some exceptions), but there is no clear preference for the lower or upper mid quality of the dorsal mid vowels.

f[ɛ]sta	but:	b[ɛ]sta	b[ɔ]sta	but:	cr[o]sta
pal[ɛ]stra		v[ɛ]spa	c[ɔ]sta		r[o]sca
p[ɛ]sca		c[ɛ]sta	pir[ɔ]sca		lag[o]sta
t[ɛ]sta			resp[ɔ]sta		m[o]sca
s[ɛ]sta 'siesta'					

Strong tendency for coronal mid vowels to be lower mid, when the theme vowel is /a/.

v. ...'CVjCV

No non-final tautosyllabic [éj]

leite	'milk'	l[éj]te
peito	'chest'	p[éj]to
receita	'income'	rec[éj]ta

No non-final tautosyllabic [ój]

oito	'eight'	[ój]to
noite	'night'	n[ój]te
loira	'blond-fem'	l[ój]ra

No contrast in prefinal syllables closed by /j/

vi....CVwCV

No non-final tautosyllabic [ów] (except from underlying (?) /ol/: v[ɔ]lta '(re)turn')

pouco	'little'	p[ow]ca
couve	'cabbage'	c[ow]ve
louça	'china'	l[ow]sa

No non-final tautosyllabic [éw] (except from underlying(?) /el/: b[ɛ]lga)

deusa	'goddess'	d[éw]sa
terapeuta		
pentateuco		

No contrast in prefinal syllables closed by /w/

2. Penult stress prefinal syllable open

i. hiatus ('C)VV(C)

No [óV] sequences:

coroa	'crown'	cor[ó]a
lagoa	'lagoon'	lag[ó]a
Alagoas	'idem, state of ~'	Alag[ó]as
boer	'boer'	b[ó]er

Observe the following pattern of contrasts:

/óa/	lag[ó]a	*/óa/
*/éa/		*/εa/
*/oja/		/ója/ jib[ó]ia
/eja/	ar[é]ia	/éja/ gel[é]ia

Let us assume that /eja/ does not exist phonologically. We then obtain the fully symmetrical system below:

/óa/	lag[ó]a	*/óa/
/éa/	ar[é]a/	*/εa/
*/oja/		/ója/ jib[ó]ia
*/eja/		/éja/ gel[é]ia

Consequently, glide insertion is triggered as a hiatus filler in a sequence /é [V-high]/: Compare *aréia* with the infinitive *arear*, without the glide.

- ii. ...'CVCV where the onset of the final syllable is one of the palatal sonorants /ɲ, ʎ/
- iii. ...'CVCV where the onset of the final syllable is /j/ (see above)
- iv. ...'CVCV Comparable tendencies, as when prefinal syllable is closed

3. Final stress

i. *final syllable closed* ...'CVC#

CVN#	obligatory nasalization, no lower mid vowels
CVl #	coquet[ɛ]l, m[ɛ]l (no contrast) s[ɔ]l, anz[ɔ]l (no contrast)
CVr#	talh[ɛ]r Xavi[ɛ]r (no contrast); verbs esquec[e]r (zíp[ɛ]r); except for su[ɔ]r, /Or/ is always upper mid : fl[o]r, te[o]r, ulteri[o]r.
CVj#	r[e]i, l[e]i (no contrast), great majority of final /Oi/ is lower mid her[ɔ]i, but b[o]i,
CVw#	contrastive : pigm[e]u, mus[e]w, c[ɛ]u, chap[ɛ]u (although few words with lower mid vowel are part of every day speech) /Ou/ only in words that are not in use, but always upper mid
CVs#	contrastive : atrav[ɛ]s, m[e]s; no contrast : v[ɔ]s, arr[ɔ]z

ii. *final syllable open* ...'CV# Contrast (see (1) above)

1992. 'Mid Vowel Neutralization in Brazilian Portuguese', in Wetzels & Abaurre (eds.), *Fonologia do Português, Numero Especial dos Cadernos de Estudos Lingüísticos*. IEL/ UNICAMP: 19-55.

Distinguishes between **prosodic** and **assimilatory/dissimilatory (melodic)** neutralization

Prosodic neutralization: **atonic** → mid vowels are **upper** mid
 tonic → mid vowels are **lower** mid

Melodic neutralization (triggered by segmental properties of the sequence in which the mid vowel appears)(**mostly tonic**) → **upper or lower**

4. On the Representation of Vowel Height and Vowel height Neutralization

Below the BP height distinctions in the stressed vowel system are represented in terms of Clements' model (applied to BP in W. Leo Wetzels 1995. 'Mid-Vowel Alternations in the Brazilian Portuguese Verb,' *Phonology* 12:281-304.)

(1a) (vowel systems with 2 degrees of aperture, also BP word-final)

aperture:	i/u	a
open ₁	-	+

(1b) (vowel systems with 3 degrees of aperture, also BP atonic)

aperture:	i/u	e/o	a
open ₁	-	-	+
open ₂	-	+	+

(1c) (vowel systems with 4 degrees of aperture, also BP tonic)

aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+
open ₂	-	+	+	+
open ₃	-	-	+	+

Neutralization e/o, ε/ɔ → e/o

(2a)

aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+
open ₂	-	+	+	+

Neutralization i/u/, e/o → i/u

(2b) aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+

BUT: tia, dia → tʃia, dʒia

t→s/ [-open?] in a 4-height vowel system, as the one used in BP

Shows that the representation of neutralization as proposed in Wetzels 1995 is problematic. Better: Wetzels 1992: neutralization triggers the insertion of unmarked feature values for [\pm open_x].

tonic system

(3a) aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+
open ₂	-	+	+	+
open ₃	-	-	+	+

pretonic system

(3b) aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+
open ₂	-	+	+	+
open ₃	-	-	-	+

word-final atonic system

(3c) aperture:	i/u	e/o	ε/ɔ	a
open ₁	-	-	-	+
open ₂	-	-	-	+
open ₃	-	-	-	+

(Global) Constraint Ordering:

I.

Faith: word-final stressed open syllables (stressed syllables closed by s????)

Faith: exceptions

atonic neutralizations (introduce [-open] features)

assimilation applying in both stressed and unstressed syllables

II. (assimilatory neutralizations in stressed syllables)

Harmony (Verbs), Assimilation (Nouns o-themes), Hiatus Raising, etc. which create high Vowels in Stressed syllables

III Tonic neutralization (introduce [+open] features)