The status of unstressed lax-mid vowels in northern dialects of Brazilian Portuguese

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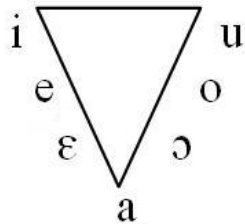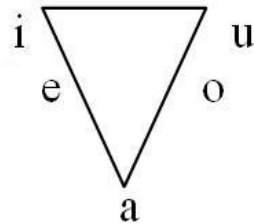
Overview of the talk

1. The problem
2. Questions
3. Methods
4. Results
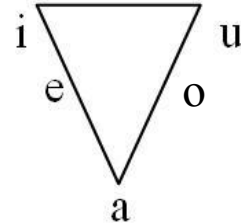5. Formal analysis of the pattern
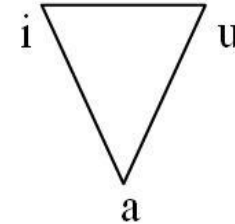6. Conclusion

The problem

	Stressed	Pre-tonic	Non-final post-tonic	Final post-tonic

SD

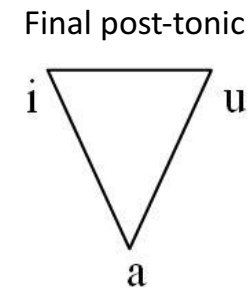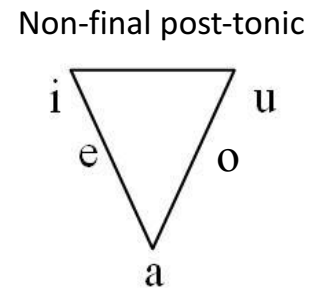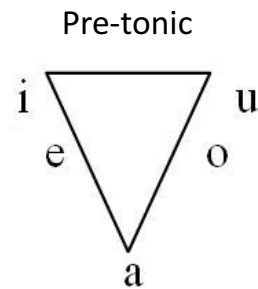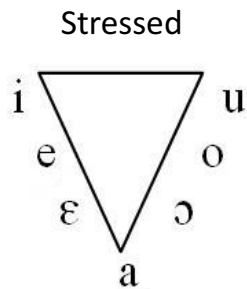S[i]co   'foot bug'
S[e]co   'dry'
S[ɛ]co   'I dry'
S[a]co   'bag'
S[ɔ]co   'I punch'
S[o]co   'punch'
S[u]co   'juice'

P[i]cado 'chopped'
P[e]lado 'naked'
P[a]letra 'talk n.'
P[o]lar   'polar'
P[u]dor   'modesty'

Inéd[i]to   'unseen'
Câm[e]ra   'camera'
Ác[a]ro   'mite'
Abób[o]ra   'pumpkin'
Vocáb[u]lo 'word'

Bat[i]   'I hit *past*'
Bat[a]   'hit *imp.*'
Bat[u] 'I hit *pres.*'

3

The problem

Stressed	Pre-tonic	Non-final post-tonic	Final post-tonic

ND

Stressed		Pre-tonic		Non-final post-tonic		Final post-tonic	
S[i]co	'foot bug'	P[i]cado	'chopped'	Inéd[i]to	'unseen'	Bat[i]	'I hit *past*'
S[e]co	'dry'	P[ɛ]lado	'naked'	Câm[ɛ]ra	'camera'	Bat[a]	'hit *imp.*'
S[ɛ]co	'I dry'	P[a]letra	'talk n.'	Ác[a]ro	'mite'	Bat[u]	'I hit *pres.*'
S[a]co	'bag'	P[ɔ]lar	'polar'	Abób[ɔ]ra	'pumpkin'		
S[ɔ]co	'I punch'	P[u]dor	'modesty'	Vocáb[u]lo	'word'		
S[o]co	'punch'						
S[u]co	'juice'						

Previous studies

- Non-final postonic (abɔ́bɔrɐ 'pumpkin')

    [ɛ, ɔ] result from harmony. No reduction via laxing

    Experimental study – Santana, 2016

- Pretonic (pɛhfúmɪ 'perfume')

    [ɛ, ɔ] cannot be fully accounted for via harmony. Reduction via laxing

    Sociolinguistic studies – Barbosa da Silva (1988), Silva (2008)

Questions

- Is there really reduction via laxing in northern dialects of Brazilian Portuguese?

- How can this be accounted for?

Methodology

- 80 trisyllabic words (**σˈσσ**) words in a carrier sentence randomly repeated 3 times throughout the experiment

- 20 participants from São Luís (northern dialect);

- Total: 4800 tokens

- Variables: Height of the stressed vowel

  Syllable weight

  Preceding context

  Place of articulation of the stressed vowel

- Chi-square and ANOVA

General distribution

Front vowel			Back vowel		
[ɛ]	[e]	[i]	[ɔ]	[o]	[u]
926 (38,6%)	1.314 54,7%	160 (6,7%)	1.003 (41,8%)	1.283 (53,4%)	114 (4,8%)
2.400 tokens			2.400 tokens		
Total: 4.800					

General distribution (without nasal context)

- Nasal in coda position triggers nasalization. As *[ɛ̃, ɔ̃] in Portuguese, this bias the result

Front vowel			Back vowel		
[ɛ]	[e]	[i]	[ɔ]	[o]	[u]
926 (55%)	700 (41,7%)	55 (3,3%)	1.002 (62%)	609 (37,5%)	9 (0,5%)
1.680 tokens			1.620 tokens		
Total: 3.300					

Pretonic X Stressed

Pretonic Stressed	[ɛ]	[e]	[i]	Pretonic Stressed	[ɔ]	[o]	[u]
high (480)	173 (36%)	306 (63,8%)	1 (0,2%)	high (360)	165 (45,8%)	192 (53,3%)	3 (0,9%)
tense-mid (420)	120 (28,6%)	300 (71,4%)	0 (0%)	tense-mid (420)	55 (13%)	362 (86,2%)	3 (0,8%)
lax-mid (480)	458 (95,4%)	22 (4,6%)	0 (0%)	lax-mid (360)	342 (95%)	18 (5%)	0 (0%)
low (300)	175 (58,3%)	71 (23,7%)	54 (18%)	low (480)	440 (91,7%)	37 (7,7%)	3 (0,6%)
Total: 3300 tokens							
p-value < 0.001							

Pretonic X Syllable Weight

Pretonic Syll. Weight	[ε]	[e]	[i]	Pretonic Syll. Weight	[ɔ]	[o]	[u]
light (840)	518 (61,6%)	322 (38,4%)	0 (0%)	light (780)	474 (60,8%)	303 (38,8%)	3 (0,4%)
heavy (660)	396 (60%)	263 (39,8%)	1 (0,2%)	heavy (720)	468 (65%)	246 (34,1%)	6 (0,9%)
heavy by nasal (0)	0 (0%)	0 (0%)	0 (0%)	heavy by nasal (0)	0 (0%)	0 (0%)	0 (0%)
heavy by cor. fric. (180)	12 (6,7%)	114 (63,3%)	54 (30%)	heavy by cor. fric. (120)	60 (50%)	60 (50%)	0 (%)
Total: 3300							
p-value < 0.001							

Coarticulation effect

Task Dynamics Application – TaDA (Nam et al, 2004)

eʃˈtake 'stake'

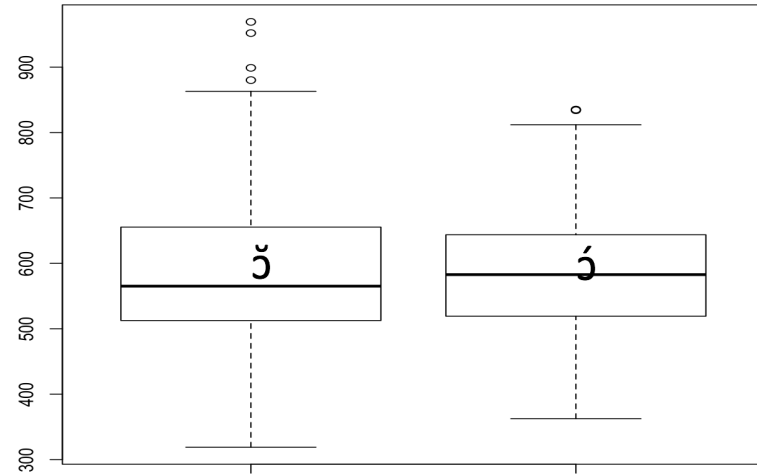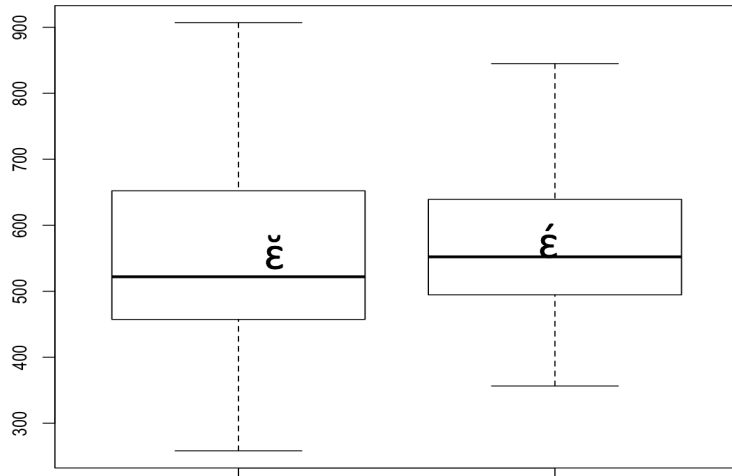[e]   [ʃ]
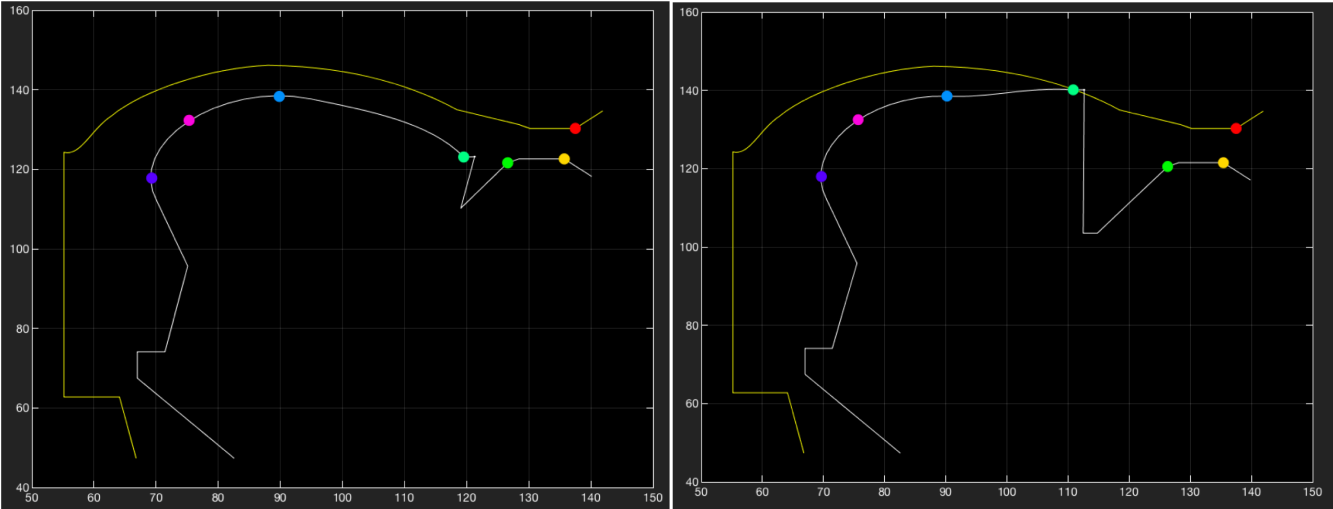
Disharmonic contexts

- Cases of [e, o] outside harmonic contexts are much less frequent.

Pretonic / Stressed	[ɛ]	[ɔ]	Pretonic / Stressed	[e]	[o]
high	173	165	lax-mid	22	18
tense-mid	120	55	low	10	37

- [ɛ, ɔ] cannot be fully accounted for through harmony.

"True" lax-mid vowels?

Paired t-test. No significant difference (*p-value* = 0.9)

Reduction via laxing?

- Yes. Evidence from sociolinguistic and experimental studies.

- But not across the board:

Pretonic:	/i, ɛ, a, ɔ, u/
Non-final postonic	/i, e, a, o, u/

What is different?

Claim: prominence

How can this be accounted for?

- Two types of neutralization (Crosswhite, 2004)

      Constrast enhancement   /i, u, a/

      Prominence alignment   /i, u, ə/

- Prominence alignment selects the mid vowels:

$$*a/\boldsymbol{\sigma}_{NFP} \gg *\varepsilon,\mathit{\flat}/\boldsymbol{\sigma}_{NFP} \gg e,o/\boldsymbol{\sigma}_{NFP} \gg i,u/\boldsymbol{\sigma}_{NFP}$$

$$*i,u/\boldsymbol{\sigma}_1 \gg *e,o/\boldsymbol{\sigma}_1 \gg *\varepsilon,\mathit{\flat}/\boldsymbol{\sigma}_1 \gg *a/\boldsymbol{\sigma}_1$$

But what about /a, i, u/? They're never affected by this alignment

How can this be accounted for?

- Corner vowels are special due to their contrastive power.

    Contrast enhancement: protects corner vowels

    Prominence alignment: selects mid vowels

- Reduction via laxing can be accounted for with an interaction between costrast enhancement and prominence alignment

Contrast enhancement in OT (Padgett, 1997)

- N-way contrast: maintain a number of n contrasts
- Space constraints: two segments contrasting in F1 differ by at least 1/nth of the F1 range

	3-way Cont.	Space F1≥3	4-way Cont.
a. i, a	*!W	L	*
b. i, ɛ, e, a		**!*W	L
c.☞ i, e, a		*	*
d.☞i, ɛ, a		*	*

Contrast enhancement + Prominence alignment

Prominence alignment selects the set of mid vowels to be produced

	$*\{i, u\}/\sigma_1$	$*\{e, o\}/\sigma_1$	$*\{\varepsilon, \jmath\}/\sigma_1$	$*\{a\}/\sigma_1$
a. ☞i, ɛ, a	*		*	*
b. i, e, a	*	*!W	L	*

In Non-final postonic context, the reverse constraint order selects (b).

Next steps…

- Extend the analysis:

    -Non-final postonic and pretconic syllables that do not bear secondary stress and are not in word-infial position: **/i, e, a, o, u/**

    - Pretonic in word-intial position and syllables bearing secondary stress: **/i, ɛ, a, ɔ, u/**

This predicts that the following should not be attested:

    *[xi.<u>kɔ</u>.ˈʃe.tʃɪ]   'rebound'

Conclusion

- Reduction via laxing is the neutralization strategy used in northern dialects of Brazilian Portuguese.

- This pattern, however, is not observed across the board. It occurs in pretonic context (word-initial) but not in non-final postonic contexts

- An interaction between contrast enahancement and prominence alignment types of neutralizatin is able to capture reduction via laxing and the difference that exists between the two contexts

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