LING 312: Phonology Anuk Centellas

Alternations in Brazilian Portuguese

Brazilian Portuguese is a language spoken in Brazil and is a variation of European Portuguese. It has been influenced by the native languages of the area, so there are differences between Brazilian and European Portuguese, but they are generally understood by speakers of the other variation. In this paper, we will investigate some alternations in Brazilian Portuguese. Google Translate was occasionally used to select data and confirm pronunciation (https:// translate.google.com/?sl=auto&tl=en&op=translate). The first two alternations we will look at are a non-nasal vowel/nasal vowel alternation and a nasal consonant/Ø alternation. These are present in the following data:

Surface Form	Orthographic	Gloss		
	Representation			
sõu	sou	ʻI am'		
ˈsõ.mus	somos	'we are'		
dou	dou	'I give'		
'dē.mus	damos	'we give'		
sei	sei	'I know'		
sa.'bẽ.mus	sabemos	'we know'		
se. 'mẽ.nɐ	semana	'week'		
'õ.teĩ	ontem	'yesterday'		
'aw.bũ	álbum	'album'		
'kõ.mi	come	'eat'		
'kẽ.mɐ	cama	'bed'		
'kẽ.pe	campa	'gravestone'		
plẽ. 'tah	plantar	'to plant'		

Notice that in most of the cases where a nasal vowel surfaces, it is followed by a nasal consonant. This leads to the hypothesis that vowels assimilate to match the nasalization of the consonant they precede, described in the following rule:

Vowel Nasalization

 $V \rightarrow [+nas] / _ [-syll, +nas]$

Vowels followed by a nasal consonant are nasalized.

(Theory 1.2)

If we take a closer look at the data, we may notice that in the word for 'week,' the first vowel is followed by an [m], but it is not nasalized. It is also not in a stressed syllable. Many of the nasalized vowels are in stressed syllables, which leads to the following revision of Vowel Nasalization:

Stressed Vowel Nasalization

 $V \rightarrow [+nas] / __{[+stress]} [-syll, +nas]$ (Theory 1.2)

Vowels followed by a nasal consonant are nasalized when in a stressed syllable.

An additional rule is needed to account for the instances of a nasalized vowel in a nonstressed syllable. Notice that in the words with a non-stressed nasalized vowel, the orthography has a nasal after that vowel. In Brazilian Portuguese, nasal vowels that are not followed by a nasal are marked with a tilde in the orthography. There are a few examples in the following data:

Surface Form	Orthographic	Gloss	
	Representation		
ka.pi'tẽo	capitão	'captain'	
seu	são	'are'	
mēi	mãe	'mother'	

Because of these orthographic representations, it is reasonable to assume that there are underlyingly nasal consonants following the nasal vowels in the original data, and those consonants are being deleted. If we consider the sonority of other sounds in these words and the Sonority Sequencing Principle, we can see that these underlying nasals are in coda position. They are deleted in the surface form, which is the second alternation we will look at for this data. Based on this, we can create another vowel nasalization rule, specifically for vowels in syllables closed by a nasal consonant:

Vowel Nasalization in Syllable Closed by Nasal (SCBN Vowel Nasalization)

 $V \rightarrow [+nas] / [-syll, +nas]]_{\sigma}$ (Theory 2)

Vowels in a syllable closed by a nasal consonant are nasalized.

Now, we must also create a rule to account for the deletion of certain nasal consonants. We have already discovered that all of these nasal consonants are in the coda position of syllables, so we can create the following rule:

Coda Nasal Deletion

/-syll, +nas/ $\rightarrow \emptyset$ / _]_{σ}

(Theory 3)

Nasal consonants are deleted when in coda position of a syllable.

Now that we have established rules for these two alternations, we need to test them through derivations to check if they accurately represent the data and also to see if there are any crucial rule orderings. We can already hypothesize that both vowel nasalization rules will need to go before *Coda Nasal Deletion*, since they require the nasal consonant to still be present in order to apply. We check this in the following derivation:

UR	/'dɐ.mus/	/'on.teim/	/'ke.me/	/'kem.pe/	/se'mv.nv/	/sa.'be.mus/
Stressed Vowel Nasalization	'dɐ̃.mus	'õn.teim	'kẽ.mɐ	'kẽm.pe	se'mẽ.nɐ	sa.'bẽ.mus
SCBN Vowel Nasalization	—	'õn.tejim	_	—	_	
Coda Nasal Deletion	_	'õ.teĩ	_	'kẽ.pe	—	—
SR	[ˈdɐ̃.mus]	['õ.teĩ]	['kɐ̃.mɐ]	[ˈkɐ̃.pɐ]	[seˈmɐ̃.nɐ]	[sa.'bẽ.mus]

With the above rule ordering, the outputs match the data. We must then consider if the two vowel nasalization rules have a crucial rule ordering between them, and we must also check if applying *Coda Nasal Deletion* first produces incorrect surface forms, to make sure the above derivation is the correct order. If we switch the vowel nasalization rules, the outputs also match the data, so there is no crucial rule ordering between those two rules:

UR	/'de.mus/	/'on.teim/	/'ke.me/	/'kem.pe/	/se'me.ne/	/sa.'be.mus/
Stressed Vowel Nasalization	—	'on.tejm	_	—	—	
SCBN Vowel Nasalization	'dɐ̃.mus	'õn.tejim	'kẽ.mɐ	'kẽm.pe	se'mẽ.nɐ	sa.'bē.mus
Coda Nasal Deletion		'õ.teĩ		'kẽ.pe	—	
SR	[ˈdɐ̃.mus]	['õ.teĵ]	[ˈkɐ̃.mɐ]	['kɐ̃.pɐ]	[seˈmɐ̃.nɐ]	[sa.'bẽ.mus]

However, if the nasal deletion rule is applied before either of the vowel nasalization rules, the outputs do not match the data:

UR	/'de.mus/	/'on.teim/	/'ke.me/	/'kem.pe/	/se'me.ne/	/sa.'be.mus/
Coda Nasal Deletion	_	'o.tei		'ke.pe	—	_
SCBN Vowel Nasalization	_	_	_	_		
Stressed Vowel Nasalization	'dɐ̃.mus		'kẽ.mɐ		se'mẽ.nɐ	sa.'bẽ.mus
SR	[ˈdɐ̃.mus]	*['o.tei]	[ˈkɐ̃.mɐ]	*['ke.pe]	[seˈmɐ̃.nɐ]	[sa.'bẽ.mus]

In this ordering, *Coda Nasal Deletion* is taking away environments in which the vowel nasalization rules would have applied, producing incorrect surface forms. We now know that *Coda Nasal Deletion* must apply last. In the third derivation, *Coda Nasal Deletion* is bleeding both vowel nasalization rules. However, this is not the correct rule ordering, so *Coda Nasal Deletion* counterbleeds both *SCBN Vowel Nasalization* and *Stressed Vowel Nasalization*. This can be represented in the following Hasse diagram:



Coda Nasal Deletion

We will now transition to new data with other alternations. This data presents the V/\emptyset alternation and [s]/[z] alternation that we will investigate.

1st/2nd person sg.	1st/2nd person pl.	Noun	Gloss
fe. 'rəis	fe.'rɔ.zis	fe.rə.si.'da.dzi	'fierce'
vo. 'rais	vo.'ra.zis	vo.ra.si.'da.dzi	'voracious'
a.gre. 'si.vu	a.gre.'si.vus	a.gre.si.vi'da.dzi	'aggressive'
ẽ. 'bi.gwu	ɐ̃.'bi.gwus	ẽ.bi.gwi.'da.dzi	'ambiguous'
Singular	Plural		Gloss
3a.po.'neīs	3a.po. 'ne.zes		'Japanese' (from Japan)
frē.'seīs	frē. 'se.zes		'French' (from France)

We will first discuss the V/ \emptyset alternation. The first two words in the data end in a consonant, and when the suffix [idad₃i] is added to the 1st/2nd person singular form, that consonant remains in the noun form. However, when the same suffix is attached to a 1st/2nd person singular form ending in a vowel (the next two words in the dataset), that word final vowel is no longer present in the noun form. We may then hypothesize that when there are two vowels in a row, the first one is deleted, as follows:

Vowel Deletion

 $V \rightarrow \emptyset / _ V$

(Theory 4)

A vowel preceding another vowel is deleted.

While this works for all of the data presented so far, it is a small amount of data, so it is possible that this rule does not correctly capture this alternation. For example, since the vowel at the beginning of the suffix is always [i] and the vowel at the end of the 1st/2nd person singular forms is always [u], this rule may actually need to be more specific. More data with different word final vowels and different suffixes would need to be gathered, if it exists, in order to figure out the true scope of this rule.

The other alternation in this data is an [s]/[z] alternation. In the first two words, the 1st/2nd person singular has an [s] at the end of the word, while the 1st/2nd person plural has a [z] in the same place. Notice that when this sound surfaces as [z], it is between two vowels, which are voiced. This indicates a possible voicing assimilation, in which the underlying sound is /s/ and it surfaces as [z] intervocalically, to match the voicing of the surrounding sounds. The alternative hypothesis is that /z/ is the underlying sound, and it surfaces as [s] word finally. While these both seem to work, if we look at the noun forms of these words, they have an [s] that is also in between vowels. This refutes the hypothesis of /z/ being underlying, and it also complicates the conditioning environment for the voicing assimilation hypothesis. One difference between the 1st/2nd person forms and the noun forms that could affect this is where the stress falls. In the 1st/2nd person forms, the stress is on the syllable before the sound in question, but in the noun forms, it is on a later syllable. This indicates that if we revise our rule to include stress in the conditioning environment, we can generate the correct surface forms. We now have the following rule:

/s/ Voicing

 $/s/ \rightarrow [z] / [\sigma, +stress] V __V$

(Theory 5)

/s/ surfaces as [z] when intervocalic and following a stressed syllable.

When applied to the rest of the data, this rule works correctly. Although it seems like *Vowel Deletion* could bleed or counterbleed /s/ *Voicing*, it only applies when there is another vowel, so /s/ *Voicing* would still have the necessary conditioning environment to apply. Because they do not affect each other, these two rules do not have a crucial rule ordering. This can be demonstrated in the following derivations:

UR	/fe.'rɔ.sis/	/fe.ro.si.'da.dzi/	/a.gre.'si.vus/	/a.gre.si.vui'da.d3i/	/ʒa.po.ˈne.sɐs/
/s/ voicing	fe.'rə.zis	_		_	3a.po. 'ne.zes
Vowel deletion				a.gre.si.vi'da.d3i	
SR	[fe.'rɔ.zis]	[ferosi'dadzi]	[a.gre.'si.vus]	[a.gre.si.vi'da.d3i]	[3a.po.'ne.zvs]

Additionally, there are no crucial rule orderings between these two rules and *Stressed Vowel Nasalization*, *SCBN Vowel Nasalization*, and *Coda Nasal Deletion*.

Unfortunately, there is data not presented previously, including words like ['to.si] (tosse, meaning 'cough'), which do not align with /s/ Voicing. This rule would produce ['to.zi] as the surface form, so we know there is something in its formulation that is incorrect. Although this is an intriguing discovery, further investigation is beyond the scope of this paper.

From the data presented and the hypotheses developed, we can see that *Stressed Vowel Nasalization, SCBN Vowel Nasalization, Coda Nasal Deletion*, and *Vowel Deletion* all produce the correct surface forms when applied to the data. We have also established that *Coda Nasal Deletion* must apply after both vowel nasalization rules, but there is no crucial order between the two vowel nasalization rules. To ensure that these rules are consistent across Brazilian Portuguese as a whole, much more data would need to be gathered and tested, ideally including other affixes, to see if they continue producing the correct surface forms.

References:

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