

Silence, nasality and laryngeality in Brazilian indigenous languages.

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1. Introduction

The South America lowlands, meaning, the largest part of this continent, which extends east from the Andean mountain range and within which the entire territory of Brazil lies, was and still is one of the regions with the greatest linguistic diversity in the world. In the territory of today's Brazil alone there are still about 180 indigenous languages distributed over 40 genetic families. Due to the historical and social circumstances that have affected not only Brazil, but also the other South American countries, the scientific study of indigenous languages here has developed very slowly. On the other hand, also due to historical and social circumstances, the indigenous peoples have mostly lost the conditions for survival, and their languages have disappeared and are still being extinguished. The great number of languages, the small number of researchers, the lack of opportunities for them to dedicate themselves more to scientific work, and the continued existence of strong factors that threaten the continuity of indigenous languages make up the present situation of social and scientific challenge that Brazilian linguists are currently facing. Documenting, analyzing, comparing and interpreting

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the data on indigenous languages which are disappearing before our eyes and, at the same time, fighting for a better organization of the teaching and administration of scientific research in order to make possible to train and sustain a large number of researchers required for a few years of intensive work and to contribute to attenuate and, if possible, to reverse the process of language extermination, this is the challenge to which we must respond and for which the cooperation of researchers from here and abroad who predominantly dedicate to theoretical linguistics or to other more specific fields is indispensable.

I want to take the opportunity of this meeting of high-level phonologists to expose some phonetic and phonological aspects in the indigenous languages of Brazil which have called my attention over the years and which still constitute problems that have not been satisfactorily solved, at least for a researcher like me, who after the SPE, did not have the occasion to assiduously follow the development of phonology, especially the multiple non-linear developments in which some of my former students have become experts, as is the case of Leda Bisol, the great promoter of this meeting, to whose generosity I owe the honor of having been invited to speak to you.

2. Silence, pause, and nasalization

Years ago I presented an essay on “silence, pause and nasalization” at a linguists’ conference, in Rio de Janeiro, which was published in the respective proceedings (Rodrigues, 1986) and, to my knowledge, had no repercussion (independently of the merit of what I wrote then, which may have been very little, the material was in Portuguese and the volume of the proceedings was so small and poorly distributed that I myself did not have access to any copy and I only have a photocopy of my contribution made by a colleague). However, the subject still seems interesting, and I am unaware that it has been adequately considered in the phonological literature. For this reason, I want to restate here the essentials of that essay.

Silence, as the absence of sounds or noises produced by the vocal tract is acoustically null and can be considered articulatorily neutral. However, the neutral posture of the vocal tract necessarily coincides, as far as the *soft palate* is concerned, with nasality’s very own posture, meaning, of the production of nasal resonance: the *soft palate* is lowered to allow normal breathing through the nasal cavity. A consequence of this banal fact is that, when in any language one is to utter a sentence that begins with a non-nasal sound, one of the first articulations to be

activated is the raising of the *soft palate*; analogously, when one has just uttered a sentence ending in a non-nasal sound, one has to lower the *soft palate* (see Brosnahan and Malmberg, 1970, p. 69-71).

In general, the synchronization of the actuation of the soft palate with the beginning or the end of the utterance is satisfactory, that is, the margin of variation that can occur is so small that it is not perceived even by phoneticists.² It is conceivable, however, that in speakers of any language large and clearly perceptible desynchronizations may accidentally occur, which as a rule will be interpreted (...) as failures of individual performance (Rodrigues, 1986, p. 153).

If the *soft palate* is raised with less or more delay at the beginning of an utterance, an initial sound, that must be oral, results partially or completely nasal; and if, at the end of an utterance, the palatine is lowered early, the oral sounds become nasal.

Although it is only rarely mentioned in phonetic textbooks³ and not considered in phonology studies, the nasality introduced by desynchronization of *soft palate* movements at the beginning and end of utterances seems to be the most plausible explanation for phonological phenomena found in several South American lowlands languages, more particularly from Brazil.

2.1 At the Beginning of Statements

In Pirahã (Mura family) voiced stops have nasal allophones at the beginning of utterances:

Pirahã (Heinrichs, 1964; Everett, 1980; Rodrigues, 1984)

			Middle of utterance	Beginning of utterance
(1)	/baí/	‘rain’	[baí]	[maí]
(2)	/bigápoi/	‘cloud’	[bigápoi]	[migápoi]

² For the discussion of some problems of synchronization with initial and final segments of utterances, see Heffner 1950, p. 165-173.

³ It is not considered, for example, in any of the following works: Abercrombie (1967), Anderson (1974), Battisti (1938), Brosnahan e Malmberg (1970), Catford (1977), Chomsky and Halle (1968), Dieth (1950), von Essen (1957), Gili Gaya (1950), Hockett (1955), Hyman (1975), Jakobson et al. (1952), Jakobson and Waugh (1979), Kaiser (1957), Ladefoged (1971), Malmberg (1970), O’Connor (1973), Pike (1942, 1947), Trubetzkoy (1939), Heffner (1950, p. 167), mentions the possibility of desynchronization of the palatine veil in the articulation of initial vowels, but dismisses it as considers its effect practically inaudible.

- (3) /giópai/ ‘dog’ [giópai] [niópai]
 (4) /gáʔai/ ‘you’ [gáʔai] [náʔai]

However, if in the middle of the utterance there is a silent pause (for example, of hesitation), it is the nasal allophone that occurs there:

- (5) /peboe baí/ [peboebái] ‘a lot of rain’
 (6) /peboe...baí/ [peboe...maí] ‘a lot of...rain’

These examples make it clear that silence conditions the introduction of the [+nasal] property in the voiced consonant that follows it.

In the language of the Paíter (or Suruí) people (Mondé family, Tupi stock) it is the non-sonorant stops (this is, voiceless) that become nasal when they occur at the beginning of utterance:

Paíter (van der Meer 1981, 1982)

- (7a) o-paag ‘my own corn’ (7b) maag ‘corn’
 (8a) o-tábea ‘my own axe’ (8b) nábea ‘axe’
 (9a) ma-káo-mi ‘in the next year’ (9b) ɲáo ‘year, dry season’

In Cayapa (Barbacoa subfamily of the Chibcha family), a language of northeastern Ecuador, at utterance onset the voiced bilabial, alveolar, and alveopalatal stops have little frequent free variants with delayed closure of the nasopharyngeal passage:

Cayapa (data from Lindskoog and Brend, 1962)

- (10) /bǐʃu/ [ˈbǐʃu] or [ˈmbǐʃu] ‘shrimp’
 (11) /dáanu/ [ˈdaanu] or [ˈndaanu] ‘to cut off’
 (12) /dǐálǐa/ [ˈdǐalǐa] or [ˈndǐalǐa] ‘stretch of river’

2.2 At word-initial position

In Mawé (or Sateré, Mawé family, Tupi trunk) the same occurs as in Paíter, nevertheless in more restricted way, namely, when possessable nouns beginning with stops occur without their possessor, but not necessarily at the beginning of utterances:

Mawé (data from Franceschini, 1999)

- (13a) e-py ‘your foot’ (13b) my ‘foot’
 (14a) e-ti ‘your mother’ (14b) ni ‘mother’ (14c) Paulo ti ‘Paulo’s mother’
 (15a) e-ko ‘your field’ (15b) ŋo ‘field’ (15c) mani ŋo pe ‘cassava in the field’

Unlike Pirahã, where nasality obligatorily and entirely affects the consonant, Maxakali (Maxakali family, Macro-Jê trunk) voiced consonants word-initially are optionally and only partially affected, that is, they can be realized as simple oral sounds or as pre-nasalized:

Maxakali (Popovich, 1971; Gudschinsky et al., 1970; Rodrigues, 1981)

- (16) /dac/ [daj] or [ndaj] ‘pan’
 (17) /bac/ [baj] or [mbaj] ‘good’
 (18) /gahap/ [gahaë^p] or [ŋgahaë^p] ‘bottle’

This is also the situation described for the voiced labial stops in Iranxe (Iranxe family):

Iranxe (Meader, 1967)

- (19) /bóku/ [‘boku] or [‘mboku] ‘arch’
 (20) /bijĩ/ [‘bijĩ] or [‘mbijĩ] ‘breast’
 (21) /biúhu/ [‘biúhu] or [‘mbiúhu] ‘tooth’

In Paíter, in addition to nasalization at the beginning of utterances (exs. 7 to 9), word-initial voiceless stops are also converted into nasals when they are preceded by voiced consonant of the antecedent word:

Paíter (van der Meer, 1981, 1982; Rodrigues, 1984, 1986)

- (22) waled píg → waled míg ‘little woman, girl’
 (23) omálód tír oka → omálód ní^r oka ‘I will cook my food’
 (24) opopíd kar oka → opopíd ŋar oka ‘I will look for my game’

The nasality thus generated optionally extends to the final voiced stop of the antecedent word:

- (25) $\eta\acute{o}b\ k\acute{a}b \rightarrow \eta\acute{o}b\ \eta\acute{a}b\ \text{ou}\ \eta\acute{o}m\ \eta\acute{a}b$ 'the cotton seed'
 (26) $d\acute{z}\acute{i}k\acute{i}b\ k\acute{a}t\acute{a} \rightarrow d\acute{z}\acute{i}k\acute{i}b\ \eta\acute{a}t\acute{a}\ \text{ou}\ d\acute{z}\acute{i}k\acute{i}m\ \eta\acute{a}t\acute{a}$ 'cutting rubber trees'
 (new activity)

The nasalization exemplified in (22)-(26) only occurs across word boundaries, but not across morphological boundaries within a word:

- (27) $\eta\acute{o}b+k\acute{a}b+a \rightarrow \eta\acute{o}b\acute{k}\acute{a}b\acute{a}$ 'cotton little ball'
 (28) $\acute{i}b+k\acute{a}t\acute{a} \rightarrow \acute{i}b\acute{k}\acute{a}t\acute{a}$ 'to cut trees' (traditional activity)

In situations where comparative studies and reconstruction of protolanguages are already available, nasalization in word-initial boundary can also be observed as a result of diachronic change. This is the case of the Xetá language of the Tupi-Guarani family, in which the Proto-Tupi-Guarani phonemes *j and *w have oral reflexes, dʒ and gʷ, respectively, within words, and nasal reflexes, η and ηʷ, respectively, word-initially:

Xetá (data from Rodrigues, 1978 and fieldwork)

- (29) *ju > ηo 'thorn'
 (30) *jujĩ > ηódʒa '(tree of) heart of palm'
 (31) *jaʔwár > ηágʷa 'jaguar'
 (32) *wirápár > ηʷarápa 'bow'
 (33) *wirá > ηʷíra 'bird'
 (34) *e+jór > édʒo 'come!'
 (35) *o+wéβ+páβ > ɔgʷépa '(the fire) is over'

In the Jê language family some languages have nasals at the beginning of words where other languages have voiceless stops:

- (36) Xavante pa Timbira pa Apinajé ma Suyá ma 'liver'
 (37) Xavante tɔ Timbira tɔ Apinajé nɔ Suyá nɔ 'eye'
 (38) Xavante ʔu Timbira ko Apinajé ηo Suyá ηo 'lice'
 (39) Xavante ʔre Timbira kɾe Apinajé ηɾe Suyá ηɾe 'egg'

Although Davis (1966), who made the first essay reconstructing Proto-Jê, proposed nasal proto-phonemes in these cases, comparisons with more historically distant languages in other families of the Macro-Jê trunk indicate that oral phonemes are older and that these are the ones most likely to be in Proto-Jê words. Compare Ofayé ϕa , Guato pe ‘liver’; Yatê t^ho ‘eye’; Menien $k\epsilon$, Malalí kir, Ofayé kite ‘egg’. Thus, it is possible that nasality in the Apinajé and Suyá initial segments is another case of nasalization word-initially.

2.3 At word-final position

In Maxakali the voiced stops are nasal at word-final and their nasality spreads to the voiced phonemes to their left. This spreadness is only blocked by the voiceless obstruents, but not by the laryngeal glides (? h):

Maxakali (Rodrigues, 1981)

- (40) bídíd → mĩnĩn ‘ant’
 (41) kokod → kokõn ‘breath with difficulty’
 (42) bihib → mĩhĩm ‘tree’

In Asurini from Tocantins (Akuawa, Tupi-Guarani family of the Tupi trunk) the themes ending in w and r, which alternate with p and r, respectively, in certain morphological conditions, have these sounds replaced by word-final homorganic nasals:

Asurini from Tocantins (data from Ana Suelly A. C. Cabral, c.p.)

- (43a) n o-paw-ihí ‘he didn’t run out’
 (43b) o-kaj o-pap-a ‘he burnt and ran out’
 (43c) o-pam ‘he ran out’
 (44a) i-memir-a ‘her child(ren)’
 (44b) i-memín ‘she has child(ren)’

3. Complex nasal segments

I am calling complex nasal segments those in which two or three phases of realization can be distinguished, namely nasal-oral, oral-nasal, or oral-

nasal-oral. These, Wetzels (1995, p. 168) calls contour segments. Among South American indigenous languages there are a greater number that have segments of the nasal-oral type, a smaller number of languages with segments of the oral-nasal type, and very few with segments of the third type, oral-nasal-oral. The classic case of this type is the Paraná dialect of the Kaingang language (Wiesemann, 1972; Anderson, 1974; Cavalcante and Rodrigues, 1982; Cavalcante, 1987; Wetzels, 1995; d'Angelis, 1998). Without referring to the problems that these segments have posed for the various theoretical models of phonology, I want to point out the analogy in their phonetic behavior with respect to nasality of other segments and to the word boundaries.

In Kaingang from Paraná (Wiesemann, 1972; Cavalcante and Rodrigues, 1982; Cavalcante, 1987) the nasal phonemes have the following allophones (here illustrated by the labial): [m], [mb], [bm], [bmb], [Ḅ] and [b]. The latter three occur in oral contexts, the former three in the following contexts:

$$m / \left\{ \begin{array}{c} \tilde{V} \\ \# \end{array} \right\} \text{---} \left\{ \begin{array}{c} \# \\ \tilde{V} \end{array} \right\} \quad mb / \left\{ \begin{array}{c} \tilde{V} \\ \# \end{array} \right\} \text{---} V \quad bm / V \text{---} \left\{ \begin{array}{c} \tilde{V} \\ \# \end{array} \right\}$$

As can be seen, the nasal phases of these allophones are equally favored by the nasal vocoids and by the pauses that precede or follow the words. Note that in Kaingang there indeed has to be a pause, for the nasal phase to take place, because if there is no pause between words, the condition will be given by the immediate segment of the preceding or following word, as in (45b) and (45c):

- (45a) /mɛn/ [mɛdn] 'husband'
 (45b) /Ḅi mɛn/ [Ḅibmbɛdn] 'her husband'
 (45c) /Ḅi mɛn pẽn/ [Ḅibmbɛd_pẽn] 'her husband's foot'

The identification of the silence or word boundary with nasal vocoids as favoring the nasal phases of the complex nasal phonemes is found in several other languages, such as Apinajé and Kayapó (Mebegnokre, Xikrin) of the Jê family, Karitiana of the Arikém family, Juma of the Tupi-Guarani family, Munduruku of the Munduruku family, Yuhúp of the Maku family, etc.

Regardless of the theoretical treatments they may receive and whether they have an intrinsically nasal or intrinsically oral segment, all cases of complex nasal segments (or “contoured”) mentioned here can be understood as cases of partial or full assimilation of the [±nasal] property.

4. Nasality and laryngeality

Besides the association between nasality and silence, which is easy enough to understand as a product of articulatory mechanism, several indigenous Brazilian languages have yet another even more difficult to understand association – the one between nasality and laryngeality. James Matisoff pointed out several years ago cases of this association in languages of the Tai and Khmer families of Southeast Asia (Matisoff, 1975), in which word-final vowels preceded by one of the two glottal glides acquire nasality. This “mysterious connection between nasality and glottality,” as Matisoff termed it, is found here in more varied forms.

Baré (Aikhenvald, 1998)

In *Baré* (Aruak family) the situation is almost the same as observed in Southeast Asia, only more reduced, since in this language there are no syllables beginning with glottal stop. There are also no intrinsically nasal vowels, but in final syllables consisted by glottal fricative and vowel, the latter, apparently with any quality, is nasalized.

Pirahã (Sandalo, 1989)

In *Pirahã* (Mura family), a language in which there are also no intrinsically nasal vowels, vowels are nasalized when contiguous not only to the glottal stop and fricative, but also to the approximants *w* and *j*, thus to all glides (glides II and glides I of Chomsky & Halle, 1968), which have in common that they are asyllabic glottal segments. The nasality thus acquired spreads to other vowel segments contiguous to the first one, as in (46)-(49):

(46) [hõẽẽ] ‘ark’ (47) [ʔãwẽẽ] ‘ear’ (48) [ãpapãỹ] ‘head’

(49) [sapĩwã] ‘hat’ (borrowed from the Amazonian General Language *Japéwa*)

Mawé (data from Albert Graham)

The *Mawé* (or *Sateré*) language (*Mawé* family) presents a different phenomenon: the nasalization of a word-final stop in front of the glides *w* and *h*, as in (50) and (51):

(50) it + wakui → inwakui 'not good, bad'

(51) at + hakup → anhakup 'hot sun'

In all these cases, it is the contiguity with a glottal segment that causes the nasalization of a vocalic or consonantal segment. In Tupari, a language of the Tupari family of the Tupi trunk, we find, however, the opposite situation: Vocalic segments are laryngealized in contiguity with nasal segments. See examples (52)-(55):

Tupari (Rorigues and Alves, 1992)

(52) /pɛ̃n/ [pɛ̃n] 'bow' (53) /jam/ [ɲã̃:m] 'bench'

(54) /sĩ̃ŋ/ [tʃĩ̃:ŋ] 'smoke' (55) /jokan/ [juhk^hẽ̃n] 'toucan'

The laryngealization of vowels before nasals, although frequent, is optional, as we see in (56) and (57):

(56) /men/ [mẽ̃ñ] ~ [mẽñ] 'husband' (57) /sin/ [sĩ̃.ñ] ~ [tsĩ̃ñ] 'small'

We see that the relationship between nasality and laryngeality, although difficult to understand, is a very strong one: not only does it manifest itself in many languages of different genetic families, it operates in two directions: not only does laryngeality cause nasality, but nasality also causes laryngeality.

5. Nasalization at word-initial position

In Karajá (Karajá linguistic family, Macro-Jê trunk) the phoneme /a/ is systematically nasalized at word-initial position. A well-known particularity of this language is the phonological difference between female and male speech, which consists mainly in the absence in male speech (σ) of the velar phonemes present in female speech (♀): ♀kihi, σ̄hi 'wind'; ♀ijikura, σ̄ijura 'necklace'. The initial phoneme /a/ in male speech is [ã] even when it corresponds to the initial syllable /ka/ in female speech:

♀ awira σ̄ ãwira 'good, beautiful'

♀ a-ritjoko σ̄ ã-ritjoo 'your doll'

♀ karitjakre σ̄ ãriakre 'I will walk'

Thus, this systematic nasalization of the phoneme /a/ word-initially constitutes another case of nasality originating at a potential pause point.

6. Nasalization by vowel compression

We have also observed situations in which the low vowels become nasalized in a process of successive lowering, either as a function of a synchronic morphophonological rule, or as a function of a vowel shift chain. An example of the first situation is found in the Kaingang dialect of Paraná (Jê family) and an example of the second we have in the Tapirapé language (Tupi-Guarani family).

6.1 Kaingan of Paraná.

This language has the following vowels:

i	ĩ	u	ũ		
e	ɛ	o		ẽ	õ
ɛ	a	ɔ	ẽ	ã	

There are some morphosyntactic situations in which one grammatical form is derived from another by a phonological rule that affects only the middle and low oral final vowels, changing the middle ones into their corresponding low ones and the low ones into the central nasal low *ã*. One case is the derivation of the form 2 of nouns, which occurs when they are followed by a modifier (qualitative, quantifier or dubitative) or, optionally, when followed by a postposition or a postposed pronoun. Examples:

kre	‘quadril’	kre mənɣ	‘big hip’
hə	‘body’	ha ki	‘inside the body’
ɸo	‘pus’	ɸo kupri	‘white pus’
kre	‘burrow’	krã ?	‘burrow’ (is that what you said?)
ka	‘tree’	kã teɟ	‘tall tree’
pɔ	‘stone’	pã kuɸi.	‘heavy stone’

The modification these vowels undergo can be understood, in articulatory terms, as the result of a process of amplification of resonance in the cavities of the vocal tract:

e	ɔ	o	medium resonance in the oral cavity
↓	↓	↓	
ε	a	ɔ	maximum resonance in the oral cavity
↘	↓	↙	
	ã		maximum oral resonance amplified by nasal resonance

Vowels with greater resonance have the acoustic property [+compact], so the morphophonological process in question can be seen as one of gradual expansion of vocalic compactness and the creation of nasality in the last term of the process as a natural consequence of this expansion.

6.2 Tapirapé

The same phenomenon of nasality generation by increasing the compactness of the more compact oral vowel is also observed in process of diachronic change in the Tapirapé language. The reflections of the Proto-Tupi-Guarani (PTG) posterior oral vowels in this language characterize a shift chain:

PTG	*u	>	o
	*o	>	a
	*a	>	ã

Examples:

*ju	>	tʃo	‘thorn’
*po	>	pa	‘hand’
*apuka	>	ãpokã	‘I laughed’
*apo	>	ãpa	‘root’

As Leite and Soares (1991) observe, the actual phoneme /ã/ in Tapirapé is [ã̃], more closed than [a] and, therefore, less compact than this. It is possible that this more closed articulation is the result of a readjustment after the change by compactness, which, alongside the Kaingang morphophonological process, constitutes another evidence of the introduction of the [+nasal] property by amplification of vocalic compactness.

7. Conclusion

I hope this presentation has been clear enough to show the phonological scholars gathered here for this seminar that the numerous South American and Brazilian indigenous languages constitute a broad and diverse field of research, with phenomena that are still little known. As far as phonological theory is concerned, even languages that, from some point of view, can be considered reasonably documented and analyzed may reveal novelties to researchers when subjected to a more rigorous phonetic register or when observed with a more open eye for less familiar relations. I have cited about twenty Brazilian languages in this conference, only slightly more than one-tenth of the total number of such languages. The field of research is vast and diverse indeed, but it is, in a sense, a minefield. The “mines” are not on the researchers but on the languages themselves. As I said before, most indigenous languages are threatened with disappearance, and some are even disappearing before our very eyes. The research of indigenous languages is extremely urgent, much more serious than the research of zoological and botanical species that are also important and also threatened with extinction.

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