Nasality in Mẽbengokre and Apinayé

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Introduction

Apinayé and Mẽbengokre are two closely related languages belonging to the northern branch of the Jê family. Apinayé speakers are approximately 1000 in number, and live in a single contiguous area near the confluence of the Tocantins and Araguaia rivers. Mẽbengokre is spoken by two nations, the Xikrin and the Kayapó. The former number over 1000, and live in two unconnected areas of central Pará state, whereas the latter number approximately 4000, and occupy a vast region of rainforest and savanna between the Araguaia and Curuá rivers.

"Spreading of orality" in Apinayé and Mẽbengokre

The phonological process that we will be concerned with here can be descriptively characterized as the spreading of orality from an oral vowel to nasal segments in the periphery of the syllable. More precisely, all segments of a syllable (except voiceless stops, which are always oral) agree in nasality with the syllable nucleus.[1] "Denasalized nasal stops", however, do not surface as fully oral, but rather as contour segments where a nasal phase is peripheral, whereas the oral phase is contiguous to the other oral segments in the syllable. This can be seen clearly in the following data from Apinayé:[2]

(1) *Apinayé*

#_Ṽ	[m]	[mõ]	to go (plural)
Ṽ_#	[m]	[mr̃ũm]	ant
#_V	[mb]	[mbotʃ]	ox
V_#	[bm]	[obm]	dust
V_V	[mb]	[bumbu]	to see
V_Ṽ	[m]	[amõr̃]	you going

[1] The segments of Apinayé include the voiceless stops /p/, /t/, /k/, /c/ (usually realized as an affricate [tʃ], and the glottal stop /ʔ/; the "nasals" /m/, /n/, /ɲ/, /ŋ/, the rhotic /r/, usually realized as a tap [ɾ] or lateral [l], and the continuants /v/ and /z/, produced with varying degrees of friction, but patterning as sonorants as far as the processes described here are concerned.

[2] This phenomenon is attested in several languages. One of the better known examples is Kaingang, which is, like Apinayé, a member of the Jê language family. We will not address the Kaingang data here, since it has the added complication that orality spreads across syllables, creating in certain cases "circum-oralized segments" with oral phases both before and after a brief period of nasal airflow.

(1) *Kaingang*

#_Ṽ	[m]	[mãn]	to hold
Ṽ_#	[m]	[ŋãm]	to break
#_V	[mb]	[mba]	carrying
V_#	[bm]	[hɯbm]	toad
Ṽ_Ṽ	[m]	[mɔ̃mæ̃ŋ]	to fear
V_V	[bmb]	[kebmba]	to try
Ṽ_V	[mb]	[ɸũmbu]	tobacco
V_Ṽ	[bm]	[habmæ̃]	to listen

In Mẽbengokre, a three way contrast in stops occurs in onset position;[3] as a consequence, onset nasal stops do not suffer post-oralization. In codas, where the contrast is only between voiceless stops and nasals (like in Apinayé), pre-oralization occurs:

(2) *Onset contrasts in Mẽbengokre*

mĩ	alligator	ma	liver
bĩ	to kill	ba	to roam
pĩ	firewood	pa	arm

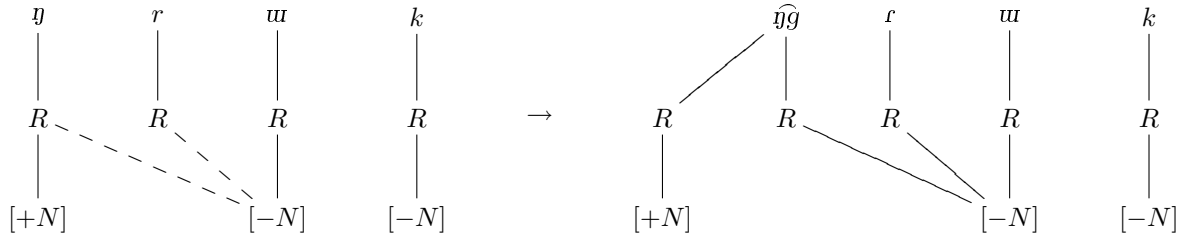
(3) *Mẽbengokre "nasal" codas*[4]

V_#	[dn]	[todn]	armadillo
Ṽ_#	[n]	[prĩn]	pequi fruit

Standard analyses

If we are to understand the process exemplified in (1) and (3) as spreading of orality from the vowel to the voiced segments in the periphery of the syllable, we need a special provision to create contour segments in voiced noncontinuants. A first attempt at this is made by Anderson (1976), who proposes that the span of features does not always line up with segment boundaries. Within autosegmental phonology, a possibility is suggested by Wetzels (1995), who substitutes the *Branch Pruning Convention* of autosegmental phonology by the *Root Node Fission Convention*, which requires Root nodes that dominate conflicting feature specifications to split into as many Root nodes as necessary to hold non-contradictory features.[5] Thus:

(4) *Spreading of orality in Apinayé*



In this representation, it is crucial that /r/ not be specified for [nasal], since this would both block spreading of [nasal] to the initial consonant and create a "contour /r/", a segment that is presumably impossible.

This is a problem in an optimality-theoretic framework, if inputs are allowed to be fully specified. We will attempt such an implementation here, using the following constraints:

(5)

(6) *Constraints for assimilation of orality*

IDENT-V The featural specification of the nucleus is unchanged.

$*\begin{bmatrix}+nasal\\-voice\end{bmatrix}$ No nasalized voiceless segments.

SPREAD$_\sigma$ [nasal] All segments in the syllable agree with the [nasal] specification of the nucleus.

MAX$_C$ [nasal] Preserve the [nasal] specification of noncontinuant segments.

INTEGRITY Do not split root nodes.

[3] The segmental inventory of Mẽbengokre includes the voiceless obstruents /p/, /t/, /tʃ/, /k/, the glottal stop /ʔ/, the nasals /m/, /n/, /ɲ/, /ŋ/, the voiced obstruents /b/, /d/, /dʒ/, /g/, the approximants /w/, /j/, and the tap /r/.

[4] Properly speaking, coda "nasals" in the V_# environments often surface also as [dtˀ]; thus, [todn] below alternates with [todtˀ]. We will refer to this realization again below.

[5] It would be fair to say that this proposal is inspired on Poser (1979), with root nodes serving as Poser's segment, and the prosodic segments that appear higher in (4) constituting a level of phonological organization not available at the time of his writing.

MAX$_{/r/}$ [nasal] Preserve the [nasal] specification of /r/ (and other continuant sonorants).

The following rankings are necessary:

$$*\begin{bmatrix}+nasal\\-voice\end{bmatrix},\ \textsc{Ident-V} \gg \textsc{Spread}_\sigma[\text{nasal}] \gg \textsc{Max}_C[\text{nasal}] \gg *\textsc{Root fission} \gg \textsc{Max}_{/r/}[\text{nasal}]$$

This is how /ŋrɯk/ is mapped to [ŋgɾɯk]:

(7)

	ŋrɯk	* [+nasal, −voice]	IDENT-V	SPREAD$_\sigma$[nasal]	MAX$_C$[nasal]	INTEGRITY
	ŋr̃ɯ̃k		*!	*		
	ŋɾɯk			*!		
	gɾɯk				*!	
☞	ŋ͡gɾɯk					*

And here is /ŋrẽk/ → [ŋr̃ẽk]:

(8)

	ŋrẽk	* [+nasal, −voice]	IDENT-V	SPREAD$_\sigma$[nasal]	MAX$_C$[nasal]	INTEGRITY
	ŋr̃ẽŋ̊	*!			*	
	gɾek		*!		*	
☞	ŋr̃ẽk			*		
	gŋr̃ẽk			*		*!

Candidates such as [ŋr̃ẽŋ] or [ŋr̃ẽŋ͡k] would presumably be ruled out by a high-ranking FAITH-[voice].

Besides the *ad hoc* nature of Root Node Fission as a replacement for the BPC (or, in the constraint implementation, the fact that the MAX-[nasal] refers to melodic segments, whereas SPREAD-[nasal] refers to prosodic segments), we will see some empirical arguments against the approach sketched here in the following section.

[nasal] might not be present in these nasals

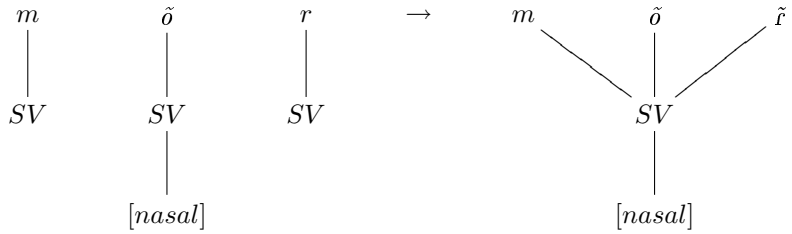
Steriade (1993b) attempts to exclude [–nasal] from the feature set, since there are few cases where one could say that this feature is phonologically active. On the other hand, nasality in the "nasals" of Apinayé, as well as in Mẽbengokre codas, seems to be always "recessive", making us suspicious that no [+nasal] feature is present. We might resolve this double contradiction if we allow the "nasal" segments above to be noncontinuant sonorants unspecified for nasality. A proposal like this is made in Piggott (1992).[6]

The nasal consonants described above are imagined by Piggott (1992) to be sonorants without any specification of nasality. The process exemplified above thus becomes the fusion of a SV ([sonorant]) class node, which dominates a privative [nasal] feature in contrastively nasal vowels. This is represented as follows for the Apinayé words /om/ and /mõr/:

(9) *Fusion of SV nodes in oral syllables*

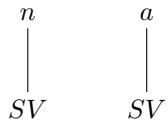
[6] Non-nasal sonorant stops are also discussed in Rice (1993).

(10) *Fusion of SV nodes in nasal syllables*



In Apinayé stressless syllables, there is no contrast between oral and nasal vowels, and as a consequence fusion of SV nodes fails to take place; thus, the following would be a representation for the surface form of the stressless clitic /na/:

(11) *No fusion of SV nodes takes place in stressless syllables*



Before we discuss the phonetic implementation of the phonological representations above, we will attempt to represent a realization we find in coda consonants in medial clusters in Apinayé and Mẽbengokre, also found optionally in word final consonants in Mẽbengokre (cf. fn. 4). The relevant data are the following (cf. also p. 445 in Steriade (1993a)):

(12) *Apinayé*

a. /ton/ + /mã/ → [todmã] (V d m Ṽ)

b. /ton/ + /ma/ → [todmba] (V d mb V)[7]

(13) *Mẽbengokre*

a. /ton/ → [todn] ∞ [todt˺]

Arguably, these realizations for coda sonorants follow from them being unreleased in the contexts in which they appear above. Mẽbengokre differs from Apinayé in that codas in word-final position can be unreleased, whereas in Apinayé they are only unreleased preceding another noncontinuant. The difference in voicing ([todt˺] vs. [tod]) might be simply due to the greater duration of the final segment over the medial one.

We can now state the rules for the phonetic implementation of SV in the multiple configurations in which it appears:

(14) *The phonetic implementation of SV in [–cont] segments*

a. A segment with SV and [nasal] is implemented as fully nasal, whether the SV node is shared or not (example 10).

b. A segment with no [nasal] feature and SV shared with a vowel will surface as a partly oral and partly nasal segment, with the oral phase aligned to be closest to the vowel[8] (example 9).

c. A segment with an SV node that is not shared will surface as fully nasal (example 11).

d. An unreleased segment with no [nasal] feature and SV shared with a vowel will surface as fully oral, with partial devoicing if of sufficient duration for spontaneous voicing to cease (examples 12 and 13).

If we are to implement this approach in a surface-oriented constraint approach, we will need at least the following constraints:[9]

[7] Our data don't agree with Steriade's sources on this point, which state that the realization is [V d b V]; this difference is irrelevant to our discussion here.

[8] Not necessarily contiguous, since up to two continuant sonorants can intervene, as in [ŋgʊɾa] '*Mauritia vinifera* palm'.

[9] We assume that if [nasal] is privative, we will get no inputs with a binary-valued [nasal] feature.

(15)

(16) *Constraints with a privative [nasal] feature*

Ident-V The featural specification of the nucleus is unchanged.

$*\begin{bmatrix}+nasal\\-voice\end{bmatrix}$ No nasalized voiceless segments.

Fuse$_\sigma$SV All sonorant segments in the syllable are linked to the nucleus's SV node.

Implementation of SV Defined as in (14) for noncontinuant segments.

Max$_C$ [nasal] For maintaining the identity of [nasal] in segments other than the syllable nucleus.

The ranking that we need in this case is:

$$\text{Implement SV} \gg *\begin{bmatrix}+nasal\\-voice\end{bmatrix},\ \text{Ident-V} \gg \text{Spread}_\sigma\text{[nasal]} \gg \text{Max}_C\ \text{[nasal]}$$

This is how /ŋrɯk/ is mapped to [ŋgɾɯk]:

(17)

	ŋrɯk	$*\begin{bmatrix}+nasal\\-voice\end{bmatrix}$	Ident-V	Implement SV	Fuse$_\sigma$SV	Max$_C$[nasal]
	ŋr̃ɯ̃k		*!			(*)
	ŋɾɯk			(*!)	(*!)	(*)
	gɾɯk			*!		(*)
☞	ŋ͡gɾɯk					(*)

And here is /ŋrẽk/ → [ŋr̃ẽk]:

(18)

	ŋrɯk	$*\begin{bmatrix}+nasal\\-voice\end{bmatrix}$	Ident-V	Implement SV	Spread$_\sigma$[nasal]	Max$_C$[nasal]
	ŋr̃ẽn̥	*!				(*)
	ŋgɾek		*!		*	(*)
☞	ŋr̃ẽk					(*)
	gŋr̃ẽk			*!		(*)

[nasal] might be present in Apinayé nasals

So far, it seems that we have been able to adequately represent the core facts of Apinayé and Mẽbengokre denasalization without appealing to a binary feature [nasal]. Some facts from Apinayé suggest that we might need [–nasal] after all. Let us consider them now:

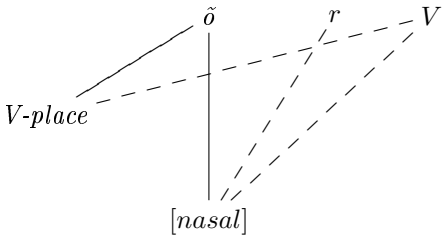
(19) *Noncontinuants block nasal spreading*

a.	/pijaʌm/	['pi.ja.ʌ.mʌ]	shame
b.	/ʌk/	['ʌ.gʌ]	bird
c.	/rĩt/	['rĩ.ti]	see
d.	/pʌ̃m/	['pʌ̃.mʌ]	father
e.	/ŋõr/	['ŋõr̃õ]	sleep

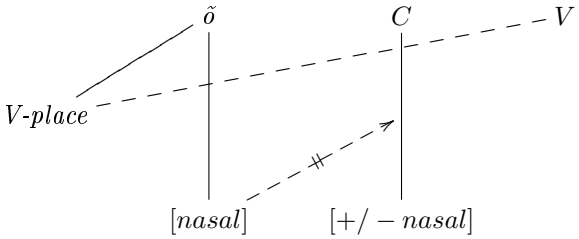
In a traditional autosegmental framework with underspecification, one could explain these facts in the following manner: in the process of epenthesis exemplified in (19), the features of the epenthetic vowel are filled from the preceding one. Features that are present in an intervening consonant block the spread of the vowel features.

Thus, continuant sonorants, which don't contrast for nasality, are transparent to spreading of [nasal]. For this explanation to go through with the noncontinuant segments, though, we not only need the sonorant stops to be [+nasal] (spreading of [nasal] is blocked in (19d)), but we also need voiceless stops to be [–nasal], since spreading of [nasal] is also blocked in (19c).

(20) a. *Feature filling across /r/*



b. *Feature spread is blocked when intervening C is noncontinuant*



Another phenomenon found in Apinayé that challenges the idea that [nasal] is not present in the noncontinuant sonorants is the permanence of nasality in cases where a noncontinuant sonorant in coda position is deleted. Codas are generally deleted before other noncontinuants that agree in major place of articulation, as can be seen in the following examples:

(21) *Nasality persists after debuccalization*

a.	/kwɤɾ/ + /ɾatʃ/ → [kwɤːˈɾa.dʒi]	large yuca
b.	/kwɤɾ/ + /jare/ → [kwɤː.jaˈɾe]	to uproot yuca
c.	/kwɤɾ/ + /ti/ → [kwɤː.ˈdi]	large yuca
d.	/motʃ/ + /tʃva/ → [mboːˈtʃwa]	ox's tooth
e.	/rɔp/ + /pa/ → [ɾɔːˈpa]	dog's paw
f.	/ton/ + /ti/ → [toː.ˈⁿdi]	large armadillo
g.	/tɔm/ + /pitʃ/ → [ˈtɔː.ᵐbitʃi]	just freckles

That deletion has taken place is reflected in the compensatory lengthening of the vowel that precedes the deleted segment. When the deleted segment is a noncontinuant sonorant, as in (21f) and (21g), the following stop receives a brief prenasalization.[10]

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[10] Voicing of the following obstruent occurs independently of the deleted segment in a certain class of enclitics (which include /ti/ and /pitʃ/), so that we cannot argue that the SV node of the deleted segment is associated to the following stop.

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