Pholia 2-1987

PHONETIC CONDITIONING FOR THE DEVELOPMENT OF NASALIZATION IN TEKE[1]

Jean-Marie HOMBERT

ABSTRACT

Diachronic generalizations concerning vowel nasalization have been made on the basis of very restricted data. The development of nasalized vowels is a current on-going process in Teke languages. Comparative data from three different languages of this group allow better understanding of the interaction of the various phonetic factors at work (e.g. vowel quality and length, place of articulation of nasal consonants, etc.)

UNIVERSAL TENDANCIES OF NASALIZATION

A number of fairly recent studies[2] propose generalizations concerning nasalized vowels both from a synchronic and a diachronic point of view. Synchronically, the number of nasal vowels ($\tilde{V}$) in a given language never exceeds the number of oral vowels (V). Among the languages which have $\tilde{V}$, approximately half of them have a number of $\tilde{V}$ equal to the number of V. Furthermore the quality of $\tilde{V}$ is generally more centralized than its oral counterpart.

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1 This paper will be published in the Proceedings of the Eleventh International Congress of Phonetic Sciences, Tallinn, Estonia, USSR August 1-7, 1987. A revised version of this paper has been presented at the "16ème Journées d'Etudes sur la Parole, Hammamet, Tunisie, Octobre 1987" under the title *A propos des "Universaux" de la nasalisation.*

2 Ferguson, Hyman and Ohala (1975), Ruhlen (1978), Crothers (1978), Maddieson (1984)

Diachronically it is claimed that vowel nasalization:

- originates from the loss of a nasal consonant (N) in postvocalic position more often than in prevocalic position, i.e. $VN > \tilde{V}N > \tilde{V}$ is more common than $NV > N\tilde{V} > \tilde{V}$.
- affects low vowels first and high vowels last.
- affects front vowels before back vowels of similar height (Chen (1975)) (i.e. [e] earlier than [o] and [i] earlier than [u]).
- occurs first before labial nasal consonants second before dental nasals and last before velar nasals.

It should be emphasized that if synchronic generalizations seem to be well founded because of the size of the language samples taken into consideration, the situation is quite different for diachronic generalizations. They have been made almost exclusively on the basis of two language groups: Chinese and Romance. In order to distinguish between language specific and language universal conditioning factors it is crucial to increase our diachronic data base by examining the development of nasalization in other language groups, either directly - through the use of written documents - or indirectly, through the study of closely related languages currently acquiring vowel nasalization. This second case is the one that we will now consider.

TEKE LANGUAGES

There are about 15 Teke languages spoken in Congo, Gabon and Zaïre. They belong to the Bantu branch (B70 Guthrie (1971)) of the Niger-Congo family. Some Teke languages have nasalized vowels (e.g. Ibali, Ndzindziu) while others lack them (e.g. Atege).

In Ibali, $\tilde{V}$ in noun and verb forms[3] are found only with long or double vowels: e.g. -t´a̰´a̰ (sole of foot), -gì´ɔ̰ (bat), -kú`ɔ̰ (to sweep). In Ndzindziu, $\tilde{V}$ can be short: -lõ̂ (husband), preceded by a glide: -k$^{j}$õ̂ (monkey), or double -táɔ̰ (sole of foot), -g`ıɔ̰́ (bat), -kúɔ̰̀ (to sweep).

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[3] For a more complete presentation see Hombert (1986)

Most Bantu nouns have a C_1 V_1 C_2 V_2 structure; verb forms have a similar structure with a V_2 = a in the infinitive. Table 1 summarizes the correspondences between nasalized vowels (in Ibali and Nzindziu) and non-nasalized forms (in Atege). Examples can be found in Annex A. It is clear from Table 1 that nasalization results from the loss of a labial nasal consonant in C_2 (intervocalic) position. This process is at a more advanced stage in Ndzindziu than in Ibali. Thus, the comparison between these languages[4] allows us to propose a relative chronology of nasalization development. The following parameters appear to play a significant role:

- vowel length: long vowels[5] (bottom half of Table 1) are more prone to nasalization than short ones; in Ibali short vowels have not been nasalized yet.
- vowel quality: close vowels nasalize last[6]. In Ibali [ii] and [uu] have not undergone nasalization.
- place of articulation of nasal consonant: only the labial nasal consonant [m] triggered nasalization, dental nasals are preserved in all three languages and do

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4 There is an apparently irregular correspondence between Ibali and Ndzindziu for three forms with [i] in V_1 position:

to dig	Ib.	-ts´ɪmà	Nd.	-tšúɔ̰
to think	Ib.	-ts`ɪmà	Nd.	-tšùɔ̰
to sing	Ib.	-y´ɪmà	Nd.	-yúɔ̰

Table 1 would lead us to expect Ndzindziu forms with ^{j}ɔ̰ This discrepancy is partially explained by the fact that, for these words, V_1 first changed to [u] before the loss of the nasal consonant as attested by the corresponding Atege forms tšúmà, tšùmà and yúúmà.

5 Historically these long vowels come from a lengthening of short vowels before prenasalized stops: C_1 V_1 mb V_2 > C_1 V_1ː mb V_2 > C_1 V_1ːm V_2 These prenasalized stops are still preserved in neighboring closely related (but non-Teke) languages such as Duma, Nzebi, Tsengui, Wandzi.

6 Atege i.e. [ie] et [uo] correspond to earlier [ee] et [oo] respectively.

not nasalize adjacent vowels as illustrated in Annex B. As for velar nasals, they have disappeared without leaving traces of nasalization.

Table 1. C_1 V_1 m V_2 in Atege and their correspondences in Ibali and Ndzindziu

ATEGE	IBALI	NDZINDZIU
C_1 i m V_2	C_1 i m V_2	C_1 i$\underline{ɔ}$
C_1 e m V_2	C_1 e m V_2	
C_1 a m V_2	C_1 a m V_2	C_1 $\underline{ɔ}$
C_1 o m V_2	C_1 o m V_2	
C_1 u m V_2	C_1 u m V_2	C_1 o$\underline{ɔ}$, C_1 $\underline{ɔ}$
C_1 ii m V_2	C_1 ii m V_2	C_1 i$\underline{ɔ}$
C_1 ie m V_2	C_1 i$\underline{ɔ}$	
C_1 aa m V_2	C_1 $\underline{aa}$	C_1 a$\underline{ɔ}$
C_1 uo m V_2	C_1 u$\underline{ɔ}$	C_1 u$\underline{ɔ}$
C_1 uu m V_2	C_1 uu m V_2	C_1 u$\underline{ɔ}$, C_1 u$\underline{ɔ}$

Two final remarks can be made concerning the quality of the resulting nasalized vowels:

- there are no instances in Ibali and in Ndzindziu of front unrounded nasalized vowels (i.e. ĩ̯, ɐ̃ or ɛ̃).
- when V_1 is [u] or [uu] in Atege and Ibali, we have two sets of correspondences in Ndzindziu ([oɔ̃] and [ɔ̃] correspond to [u] and [uɔ̃] and [uɔ̃] to [uu]).

A closer look at corresponding forms in Atege show that the less open nasalized vowels in Ndzindziu ([ɔ̃] (as opposed to [oɔ̃]) and [uɔ̃] as opposed to [uɔ̃]) are found when V_2 is a high vowel ([i] or [u]) in the non-nasalized Atege forms.

Table 2. Effect of V_2 on the quality of Ndzindziu nasalized vowels

	ATEGE	NDZINDZIU
chief	pfúmú	pfɔ́̃
powder (against rhumatisms)	bùmì	bɔ̀̃
name	kúúm´ı	kfúɔ́̃
middle part of body	lùùmù	lùɔ̀̃
to rumble	džùmà	dzòɔ̀̃
to send	túmà	tóɔ̀̃
to buy	súúmà	fúɔ̀̃
to rest	wúúmà	wúɔ̀̃

It is only when V_1 is [u] (or [uu]) that V_2 seems to play a role in the determination of the quality of the resulting nasalized vowel.

PHONETIC CONDITIONING

Numerous fiberscopic and X-ray studies of the velum position as a function of vowel quality have shown that low oral vowels are produced with a relatively low velum position. Consequently it is not surprising that a nasal leakage could occur

with these low oral vowels resulting in nasalized vowel quality. Our data showing that [i] and [u] are the last vowels to undergo nasalization are in agreement with this phonetic observation.

The fact that vowel length can play a determinant role in the development of nasalization has not been emphasized in the phonetic literature. It does, though, make perfect phonetic sense that, on a long vowel, the soft palate has more time to anticipate its lowering movement in preparation for the following nasal consonant. Moreover, the positive correlation between length and nasalization can also be linked to the role of vowel quality mentioned above: it could also be that it is because they are phonetically longer that low vowels are nasalized first.

The order proposed by Chen (1975) with respect to the role of the place of articulation of the nasal consonant is only partially followed in Teke; [m] is the first nasal to trigger vowel nasalization and [n] seems to follow as suggested by data recently collected by Paulian (in preparation) but [ŋ] has disappeared in Teke languages without nasalizing adjacent vowels.

It seems clear that in our data the quality of $\tilde{V}$ is strongly influenced by the triggering labial nasal consonant[7]: there is no unrounded $\tilde{V}$ even when the original vowel was (front) unrounded. The labiality of the consonant has been transferred onto the adjacent vowel.

It is extremely difficult at this point to decide whether the effect of the nasal consonant was perseveratory or anticipatory (i.e. whether intermediate stages between Atege and Ibali for instance, were $C_1\ V_1\ m\ V_2 > C_1\ V_1\ m\ \tilde{V} > C_1\ V_1\ \tilde{V}$ or rather $C_1\ V_1\ m\ V_2 > C_1\ \tilde{V}\ m\ V_2 > C_1\ \tilde{V}\ m > C_1\ \tilde{V}$.

The fact that V_2 played a role in the determination of the quality of $\tilde{V}$ (at least when V_1 was [u] or [uu]) pleads in favor of the first solution. On the other hand, though, the fact that V_1 quality and length also played a role in triggering nasalization favors

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7 In Ngungwel, when the triggering nasal consonant was n, the resulting quality of $\tilde{V}$ is [ɛ̃] dental consonants are well known to push the vowels towards the front of the vowel space.

the anticipatory solution[8]. It is also possible that perseveratory and anticipatory assimilations played a role simultaneously. Notice that if perseveratory assimilation is proposed one has to explain why it did not affect V_1 when C_1 was [m]. It seems that it is because in these languages[9] (as in most Bantu languages) the first syllable is accented and consequently is not subjected to a number of phonetic changes commonly found in pre or post-accented syllables (e.g. vowel reduction or loss). Only data from other Teke languages illustrating intermediate stages will allow us to get a better understanding of the respective role of perseveratory vs anticipatory assimilation.

CONCLUSION

Data presented in this paper:

- confirm the role of vowel height in the development of vowel nasalization;
- are in partial agreement with respect to the role of place of articulation of the nasal consonant (m before n);
- are unclear with respect to perseveratory vs anticipatory assimilation;
- do not make any claim concerning the role of front/back vowel quality;
- illustrate the role of a phonetic factor generally not mentioned: vowel length.

It is obvious that we need similar studies from other language groups in order to be able to sort out language specific conditioning factors from more universal phonetic constraints. It is from these universal phonetic constraints that sound changes can originate; whether or not they are actually activated depends on non-phonetic factors (e.g. phonological or sociolinguistic).

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8 To get a more complete picture, nasalization of prefixes should also be taken into account (see Hombert (1986)).

9 See for instance Paulian (1975).

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ANNEX A. Examples illustrating Table 1.

	ATEGE	IBALI	NDZINDZIU
monkey	-kímà	-kímà	-kʲɔ̰̀
hoe	-tém`ɪ	-témù	-tʲɔ̰̀
slowness	-lèmè	-lèmè	-lʲɔ̰̀
conversation	-sàm´ɪ		-sɔ̰̌
to shout	-yámà		-yɔ̰̀
python	-bòmò	-bòmò	-bɔ̰̀
to enter	-sòmò	-sòmò	-sɔ̰̀
husband	-lúm`ɪ	-lúm`ɪ	-lɔ̰̀
to climb	-kúmà	-kúmà	-kóɔ̰̀
to swell	-b´ɪ´ɪmà	-b´ɪ´ɪmà	-b´ɪ ɔ̰̀
debt	-b´ɪ´ɪm`ɪ		-b´ɪ ɔ̰̀
to touch	-b`ɪèmè	-b`ɪɔ̰̀	-b`ɪ ɔ̰̀
finger	-l´ɪém`ɪ	-l´ɪɔ̰̀	-l´ɪ ɔ̰̀
to patch	-bààmà	-bɔ̰̀ɔ̰̀	-bɔ̰̀ɔ̰̀
lizard (k.o)	-báám`ɪ	-bɔ̰́ɔ̰́	-bɔ̰́ɔ̰́
to sweep	-kúómò	-kúɔ̰̀	-kúɔ̰̀
musical bow	-gùòm´ɪ		-gùɔ̰́
buyer	-súúm`ɪ		-fúɔ̰̀
to buy	-súúmà	-fúúmà	-fúɔ̰̀

ANNEX B. Dental nasals in C_2 position in Atege, Ibali and Ndzindziu.

	ATEGE	IBALI	NDZINDZIU
to dance	-k´ɪnà	-k´ɪnà	-k´ɪnà
to finish	-mànà	-mànà	-mànà
to plant	-kúnà	-kúnà	-kúnà
to be black	-p`ɪ`ɪnà	-p`ɪ`ɪnà	-p`ɪ`ɪnà
rat (k.o.)	-b´ɪéné	-b´ɪéné	-b´ɪéné
to begin	-b´áánà	-b´áánà	-b´áánà