Nasalization in Mọ̀bà*

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In Mọ̀bà, a dialect of Yorùbá, nasal feature spreads leftward on to sonorants from a vowel that is inherently nasalized. The phenomenon takes place lexically and post-lexically. This is also permitted by obstruent which are transparent. However, nasal spread is blocked by the non-high vowels that serve as opaque segments. The paper discusses the phenomenon of nasalization following the OT based analysis of Nasal Harmony (Walker 1998). I propose that the nasal feature spread observed in this dialect is accounted for through a phonetically grounded constraint hierarchy ranking segments according to their compatibility with nasality. Vocoids, glides, laterals and trills, all of which share the property [sonorant] show high degree of compatibility with nasality and therefore undergo nasalization whereas the obstruents do not. The resistance to nasal spread by the mid and low vowels is accounted by ranking the faithfulness constraints above the spread nasal constraint. I conclude that the kind of nasalization observed in this dialect is significant in understanding while certain lexical items in the dialect begin with nasal vowels unlike Standard Yorùbá where such occurrence of nasal vowel is prohibited.

1 Introduction

Cases related to nasal segments and their behaviour in phonology have been widely discussed in the literature. Some issues that have been discussed include vowel height and nasality (Padgett 1997), nasal harmony (Cole & Kisserberth 1994), Split nasal harmony systems (Stewart 2001), and nasalization, neutral segments and opacity effects (Walker 1998, 2000, 2001; Pulleyblank 1989, 2000; Hyman 1995, 1998). Bessell (1998) notes that in the consonant-induced nasal or emphasis harmony all segments in the harmony domain usually take the consonant feature. The most appealing of these works deals with the issue of nasal spreading. Even though an alternative approach has been proposed[1], my analysis of the kind of nasalization observable in Mọ̀bà is better accounted for in line with Walker (1998) and Pulleyblank (2000). The theoretical motivation for this paper therefore follows Walker's claim that cross-linguistic variation in nasal harmony is limited by a phonetically-grounded hierarchy which ranks segments in terms of their harmonicity under nasalization as well as issues related to the transparent segments in

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* Mọ̀bà is a dialect of Yorùbá that is spoken in Òkè-ẹ̀rọ́ and Èkìtì Local Government Areas of Kwara State and Mọ̀bà LGA in Èkìtì State, all in Nigeria. Not much work has been carried out on this dialect. This research has received support from the research grant granted to Rose Marie Déchaine by the SSHRC.

[1] Walker (to appear) in her analysis of Yaka Nasal Harmony has proposed an alternative to Spreading in what she calls 'Correspondence'. According to that analysis, the more similar a segment is to the trigger, the more likely it is to be targeted, and segments that are substantially dissimilar from the trigger pattern as neutral.

nasal harmony. The claim of nasal spread theory adopted by Walker is that languages could have representations in which feature linkage may gap across segments that do not partake in the spreading of the nasal feature. Such features are said to represent unitary and continuous entities (Walker 1998). Indeed the genesis of this theory could be traced to the concepts of Articulatory Phonology propounded by Browman and Goldstein (1986). Using the Featural approach, Piggott (1989, 1993) formulates three principles of how features can spread to neighbouring segments:

(1) The principles of spreading
  (a) An element (x) may spread only to a position not specified for (x)
  (b) The spreading of an element (x) may be arrested only by position Specified for (x)
  (c) A node may spread iff it is properly licensed.

In the application of these principles, according to Stewart (2001), a language could set its parameter positively whereby there is either a leftward or a rightward spreading. The negative application of the principles is for a language to prevent nasal spread from taking place. On how these principles apply in Èdó, see Stewart (2001). Mọ̀bà, as will be shown in this paper, sets its parameter positively but directionally; hence, it allows nasal spread to take place only leftward. However, my assumption about the nasal spread phenomenon is that given a domain for nasal spread to take place, the rule will apply across the board. If there are certain segments that remain oral, the claim is that there are some other constraints that are ranked higher than the constraint that allows nasal spread within such a domain. Indeed, as I will show in this paper the fact about this dialect is that nasal feature is not realized on obstruent consonants and certain vowels. Precisely, this nasal spread is blocked by mid vowels that are opaque to nasal spreading. In addition, they obstruct further spread of the nasal feature to any sonorant consonants to their left. The paper is organized as follows: §1 states the goals and the working hypothesis. In §2, I give a descriptive account of nasal harmony. §3 and §4 focus on the analysis of segmental behaviour in nasal spread within OT framework. In §5, I conclude with the findings and issues that remain to be resolved.

1.1 Goals

The goals of this paper are three fold. First is to show that Mọ̀bà allows nasal spread to take place only leftward. Second, it will be demonstrated that Nasal feature only spreads on to non-nasal sonorant segments. Following from the second point, it shall be established that certain restrictions are imposed on the spread of the nasal feature to segments in a nasal spread domain.

1.2 Hypothesis

My working hypothesis is as stated in (2):

(2) All sonorants must undergo a nasalization process in Mọ̀bà.

2 Mọ̀bà vowel system

Mọ̀bà (MB), one of the numerous dialects of the Yorùbá language of the Kwa language family, has a vowel system that is similar to the Standard Yorùbá (SY). Both speech forms have seven identical oral vowels, as shown in (3a). They marginally differ with respect to the nasal vowels.[2] While SY features five nasal vowels, MB features four (3b).

(3)	a.	i		u		b.	ĩ		ũ
		e		o					
		ɛ		ɔ					(ɔ̃)
			a					ã	

The front mid lax nasal vowel is not attested in MB and even in the SY where it is attested it occurs with a few lexical items. One other thing that is worth mentioning at this point is that the back mid lax [ɔ̃] and the low vowel [ã] are in complimentary distribution with the former occurring in a more restricted environment of labial consonants. Based on this [ã] has been favored as the phoneme with [ɔ̃] occurring as its allophone. Hence when we talk of nasal vowel in SY and MB the focus is usually among the two high and the only low nasal vowels, since the contrast among the nasal vowels is between the high and low vowels (Pulleyblank, 2000).

2.1 Assumption

My assumption is that there are three underlying nasal segments with respect to vowels that usually occur at the right periphery of the syllable or word. The three underlying nasal segments are: / ĩ ũ ã / . They show contrast as examples in (4) indicate.

(4) Contrastive nasality

	I.			II.		
	ɾ̃ĩ̀	'walk'		rì	'drown'
	ɾ̃ũ̀	'smell'		rù	'lean'
	ɾ̃ã̀	'spread'		rà	'rotten'

The data in (4) show a bi-directional approach to contrast among the nasal segments on the one hand (I) e.g [ɾ̃ĩ̀] ~ [ɾ̃ũ̀] and between the oral and nasal vowels (I & II) e.g. [ɾ̃ũ̀] ~ [rù] on the other.

[2] The bracketed front mid lax nasal vowel in (1b) is completely absent in both the phonetic and phonemic inventory of Mọ̀bà.

2.2 Generalization

Words of Mọ̀bà dialect are composed either of completely oral segments, nasal segments or a mixture of both oral and nasal segments. This generalization leads to the classification of all the segments into the following groups.

(i) Blockers: Mid vowels are opaque to nasalization.

(5)	a.	ogũ	ogũ	*õgũ	'war'
	b.	kpı̃ ekpo	kpı̃ kpo	*kpẽ̃kpo	'share oil'
	c.	ùrɔ̀rù̃	ùrɔ̀r̃ù̃	*ù̃r̃ɔ̃̀r̃ù̃	'peace of mind'

(ii) Targets: Liquids [l] and [r], glides [j] and [w] and vowels are the set of segments undergoing nasalization.

(6)	a.	rı̀ > ñı̀	'walk'	b.	l ı̃ > nı̃	'focus marker'
	c.	jú̃ >ɲú̃	'go'	d.	uwɔ̃́ >ũw̃ɔ̃́	'lie'

(iii) Transparents: Obstruents are not nasalised but they allow nasal spread to pass through them.

(7)	a.	ikı̃ > ı̃kı̃	'mucous'	b.	usı̃ > ũsı̃	'edible fruit'

(iv) Triggers: Nasality spreads from a vowel with inherent nasal feature.

(8)	a.	ìdũ > ı̀dũ	'bed-bug'	b.	idã́ > ı̃dã́	'magic'

(v) Domain: The domain of Nasal Harmony is the prosodic word which ranges from a syllable to two feet.

(vi) Direction: Mọ̀bà operates Leftward Nasal Harmony.

(9)	a.	ùrı̀ >ù̃ñı̀	'walk'
	b.	à-mũ-rì- mũ-tã́ > à-mũ-ñı̀-mũ-tã́	'inexhaustible drink'

2.3 Descriptive account of nasal harmony in Mọ̀bà

The data presented in (10) – (20) show the various contexts in which nasal harmony occurs or fails to occur.

The examples in (10a) show the monosyllabic verbs undergoing word formation through affixation of a prefix morpheme to the verb. The output of each of the verbs is a cognate noun. This class changing process of word formation, however, presents something fascinating in Mọ̀bà as the process leads to a leftward nasal spread. The

domain of nasal spreading in Mọ̀bà in this context is the whole word. The examples in (10b) are to show that nasalization can only take place during the derivational process if and only if the vowel of the verb has inherent nasality. The examples in (10c) show how the derived words in (10a) can further go into compounding through reduplication and the infixation of some grammatical morphemes such as kí, dé, etc. Like the case of disyllabic words in (10a), those in (10c) also permit leftward spread of nasal harmony up to the initial vowel in Mọ̀bà. The example in (10d) is similar to those in (10c); the only difference is that *ùrã̀* is a single morpheme even though it consists of two syllables like *ùrĩ̀*.

(10)		VERB	Pre+Verb	NS	Gloss
	a.	rĩ̀	ù + rĩ̀	ùrĩ̀	'walk'
		sì	ì + sì	ìsì	'worship'
	b.	lù	ùlù		'to beat, drum'
		rò	èrò		'to think, thought'
	c.	ùrì+kí+ùrì	ùrìkùrì		'aimless walk'
	d.	ùrã+dé+ùrã	ùrãdùrã̀		'generation to generation'

In (11), there is a partial reduplication that involves copying the initial consonant of the root and the insertion of a fixed segment /í/. However this fixed segment surfaces as [ĩ] whenever the vowel of the root is a nasal. The only way to account for this difference is to claim that there is leftward nasal spread (NS) as witnessed in (11a). This claim is borne out of evidence from SY where the same reduplication has oral front high vowel in most cases when the vowel of the base morpheme is nasal. Consider: díd̃ĩ 'frying', gígṹ 'pounding' etc. Indeed the examples in (11b) lend credit to the claim being made here as no NS takes place since the vowel of the root morpheme (namely the verb) is oral.

(11)	a.	dĩ́	dĩ́dĩ́	'to fry, frying'
		rã̀	rĩ́rã̀	'to spread, spreading'
	b.	tà	títà	'to sell, selling'
		kó	kíkó	'to gather, gathering'

The set of examples in (12a) and (12b) are similar, yet different phonological processes are evident. Interestingly in (12b) there is vowel deletion. It does not stop there. What one would expect is for the leftward NS to take place, but this is not the case as the output in (12c) shows. See my explanation in section 4.1

(12)	a.	egigũ	egĩgũ	'bone'
		àtìtã́	àtĩtã́	'refuse ground'
	b.	egigũ	eigũ	'bone'
		àtìtã̀	àìtã̀	'refuse ground'
	c.	egigũ	*eĩgũ	'bone'
		àtìtã	*àĩtã̀	'refuse ground'

The examples in (13) also divide into two. We observe that MB allows leftward spread of the nasal feature up to word initial when the initial vowel is /i/ or /u/ in disyllabic words, as in (13a). Elsewhere, as in (12b), Nasal Spreading fails to apply.

(13)	a.	ikǎ̃	ĩkǎ̃	'termite'	ikĩ	ĩkĩ	'mucus'
		ùgbḯ	ù̃gbḯ	'snail'	ìdĩ	ì̃dĩ	'maggot'
	b.	ogũ	ogũ	'war'	ɔ̀kã	ɔ̀kã	'one'
	c.	ogũ	*õgũ	'war'	ɔ̀kã	*ɔ̃̀kã	'one'

What we observe in (14) is that there is again a leftward NS in Mọ̀bà. The context here is nominal expression derived by /à/ and /rì/ 'not' prefixed to a simple verb as in (14a) or a complex verb as in (14b).

(14)	a.	à+rì+gbɔ́̃ >	àr̃ĩgbɔ́̃
		Act+neg+wise	
		'lack of intelligence'	
	b.	à+gbɔ́̃+rì+gbɛ >	àgbɔ́̃rìgbɛ
		Act+bale out water+neg+dry	
		'that which cannot be drained'	

The examples in (15) show the VP context where the vowel of the verb is a nasal. In (a) the nasal vowel is deleted whereas in (b) the nasal vowel of the verb is retained. In both cases however there is NS. However, in (15a), the nasal spread does not exceed the consonant of the final syllable whereas in (15b), nasal spread extends up to the initial vowel of the derived compound word.

(15)	a.	rù̃+ orĩ	roĩ̃ĩ	'to chew chewing stick'
	b.	rí+ùgbḯ	r̃ũgb̰ḯ	'to see snail'

What we have in (16) is slightly different from what we pointed out in (15). The deletion that takes place here affects the nasal segment, hence there is nothing to spread.

(16)	a.	jũ+oko	jóko	'to go to farm'
	b.	jà̰+ɛkɔ	jɛkɔ	'to buy cold pap'

In (17) there is full reduplication in words that end in a nasal vowel. One expects a rightward NS since the final vowel of the base is a nasal but this is not the case. The explanation for this is that allowing progressive vowel assimilation to take place together with rightward NS will produce an output *[ogũũgũ], which is not attested. On the other hand, if rightward NS follows regressive vowel assimilation we will equally end up having *[ogõõgũ] which is equally ill formed since there is nowhere in the dialect where the mid-vowel is nasalized.

(17) a. ogũ+ogũ > ogoogũ 'in group of twenties'
RED twenty

b. ɔ̀sá+ ɔ̀sá > ɔ̀sɔ̀ɔ̀sá 'every afternoon'
RED afternoon

The examples in (18) range from echoed speech as in (18a) to comparatives as in (18b), imperatives as in (18c) and reported speech in (18d). What they all have in common is that they exhibit NS that is leftward.

(18) a. kí+ũ dúró > kṹũ dúró 'that s/he (should) wait'
kí+ĩ wá > kĩ́ ĩ á 'that you-PL (should) come'
kí+ùwɔ lɔ > kúùwɔ lɔ 'that you (should) go'

b. bí+ù̃ũ > bṹù̃ũ 'like him/her'
bí+ì̃ĩ > bî̃ĩ 'like you-PL'
bí+èmĩ > béèmĩ 'like me'

c. bá+ã+ dʒà > bã́ã dʒà 'fight with them'
with them fight

d. é+wí+ù̃ũ lĩ > é w̃ṹ ù̃ũ nĩ 'He said he is the one'
3sg-say-3sg Foc

Whenever [lì̃] is selected, the vowel(s) of the wh-word are nasalized as shown in (19a) and (19c). This is brought about through the leftward NS from the vowel of the particle /ì̃/. By contrast the vowels of the wh-word remain oral when it is followed by [à] as in (19b) and (19d)

(19) a. kí lì̃ > kĩ́nì̃ 'What is it? c. kí à > kí à 'what is it?
b. ìsí lì̃ > ì̃sĩ́ nì̃ 'who is s/he? d. ìsí à > ìsí à 'who is s/he?

The set of examples in (20) is unique in the sense that each of the examples has at least one obstruent. Second, though there is nasal spread, these obsturents remain oral.

(20) a. ĩbù̃mĩ 'personal name' f. ì̃fũ 'intestine'
b. ì̃tã̀ 'story' g. ũdù̃ 'lover of sweet things'
c. ì̃sĩ́ 'small fish' h. ĩkĩ 'mucous'
d. ɛ̀gĩgũ ' a kind of tree' i. ù̃kpĩ́ 'one's share/destiny'
e. ù̃gbĩ́ 'snail'

From the data presented above, the generalization about nasalization in Mọ̀bà can be made to the effect that the phenomenon, apart from being widely attested, also shows

uniqueness in manner of occurrence as the spread is usually leftward. What the rest of the paper is devoted to is the analysis of how this nasal spread takes place within the OT framework.

3 Analysis of segmental behavior in NS within the OT framework

Following Cole & Kisseberth (1994) and Walker (1998), one can generalize that there are four categories of segments with respect to their behaviour in nasal harmony (NH) in MB. They are the triggers, targets, transparent and blockers. These categories will unfold as I go on with the analysis.

3.1 Prohibition on nasalized vowels

The constraints prohibiting vowels from assimilating nasal feature in this dialect is as contained in Pulleyblank (2000).

(21) *MID/ NAS: Mid vowels cannot be nasal
*LO/ NAS: Low vowels cannot be nasal
*FRHI/ NAS: High front vowel cannot be nasal
*BKHI/ NAS: High back vowel cannot be nasal

The *MID/NAS constraint forbids [e, o ɛ ɔ] from assimilating nasal feature from neighbouring nasal segments. Similarly *Lo/NAS does not allow [a] to undergo nasalization. In the same vein, [i] is barred from undergoing nasal assimilation by the *FRHI/NAS constraint. By the same token, [u] will be prevented from becoming nasalized whenever the *BKHI constraint is in force. As noted of Kwa languages in general by Hyman (1972) and of Yorùbá in particular by Pulleyblank (2000), Mọ̀bà dialect also does not exhibit mid tensed nasal vowels. In other words the constraints in (22) must be ranked in such a way that *MID/ NAS is ranked higher than others. The observation I made in (3), which is in line with Pulleyblank (2000), is that Mọ̀bà oral and nasal vowel contrasts necessitates a nasal faithfulness constraint as developed in Pulleyblank (2000):

(22) MAX/NAS: Every nasal specification in the input has a correspondent in the output

The constraints in (21) and (22) must be ranked as in:

(23) *MID/ NAS>> MAX/NAS>>*LO/ NAS>>*FRHI/ NAS, *BKHI/ NAS

3.2 Prohibition on nasalized consonants

(24) *NASOBS: Prevent obstruent from being nasalized
*NASFRIC: Prohibit a continuant from undergoing nasalization
*NASLIQ: Prevent liquids from being nasalized
*NASGLI: Prohibit an approximant from being nasalized.

The four faithfulness constraints are ranked as follows:

(25) *NASOBS, * NASFRIC >>*NASLIQ, NASGLI

The generalization captured by theses constraints is revealed through their ranking. As shown in (26), *NASOBS and *NASFRIC are undominated and inviolable hence they are ranked above other constraints to have the correct output. We can however reduce the number of the constraints in (25) to just two as *NASOBS adequately takes care of *NASFRI while *NASSON will take care of *NASLIQ, *NASGLI. In this case we have the ranking in (26).

(26) *NASOBS >> *NASSONC

The notion created above is that the less compatible a segment is with nasality, the higher ranked the constraint against it.

3.3 Directionality

The issue of directionality is very crucial to the goal of this paper. First is the generalization that there are certain segments that have inherent nasal features, which they spread to segments in their vicinity. According to Walker (1998), directionality is needed in the spreading constraint to be able to capture all the attested type of nasalization. Consideration of the data presented in (18) and (19) shows that nasal spread goes beyond syllable limit and usually it is the vowel that bears the inherent nasal feature which it spreads to the preceding consonant.[3]
One point that also needs to be emphasised at this point has to deal with the issue of the nasal feature spread and the constraint that guides the spread of such a feature. Walker's (1998) general spreading constraint is given here as (27):

(27) SPREAD ([F], D)
Let f be a variable ranging over occurrences of the feature specification F, and S be the ordered set of segments $s_{i....}s_k$ in a domain D. Let Assoc(f, s_i) mean that f is associated to s_i, where $s_i \Sigma$ S.

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[3] Let me also say that it is possible for nasal spread to operate within the syllable in this dialect. For example in monosyllabic word such as /rĩ̀/ the nasal feature of the vowel spreads on /r/ to give the phonetic form [r̃ĩ̀]. This is in line with Pulleyblank's observation in SY. In his own analysis, he put forward two Nasal Harmony (ALIGNLEFT [NASAL] and ALIGNRIGHT [NASAL]) constraints to capture the observable spread. However, for two reasons I decline to use these constraints and opt for Walker's SPREAD ([+NASAL]), M. First, the examples presented which informed the Alignment constraint do not exceed the syllable. As I will show in the next section, the kind of data within our reach in Mọ̀bà show that NH can occur within the syllable, word and phrase. However, rather than treating these cases separately, I am going to propose that the nasal domain in this dialect is the prosodic word (Ola 1995). Second, the ALIGNLEFT [NASAL] constraint will not be needed since there are cases where the segment at the left edge of the prosodic word does not necessarily have to be nasal.

Then SPREAD([F], D) holds iff

i. $\forall s_i \Sigma S)$ [[$\exists$f (Assoc (f, s_i))]→ [($\forall s_j \Sigma$ S) [j>i→(Assoc(f, s_j))]]]
where 1≤i, j,≤k.

ii. For each feature occurrence f associated to some segment in D, a violation for every $s_j \Sigma S$ for which (i) is false.

The constraint in (27) according to Walker's application stipulates the requirement needed for NS to the effect 'that for any segment linked to an occurrence of a feature specification F in some domain D, it must be the case that all other segments in D are also linked to the same occurrence of F.' The D(omain) in Mọ̀bà is as discussed in 4.1, and the constraint for the actual nasal spread phenomenon is as given in (28):

(28) SPREAD-L ([+NAS], PrWd): Spread the nasal feature to the left of the prosodic word.

4 Analysis of nasal spread in Mọ̀bà

4.1 Domain of nasal spread

The kind of nasal harmony (NH) observed in the SY, as mentioned earlier, is syllable bound. Pulleyblank (2000) indeed observes that the size of domain determines the cohesiveness of nasal harmony. According to him the smaller domains are more cohesive whereas the larger domains are less so. There are two important things that are worthy of note in his discussion of domain of NH in SY. First is the distinction between lexical and post-lexical domains. Pulleyblank notes that while nasalized mid vowels are impossible lexically, they are attested post lexically as a result of vowel deletion. For example, [dɛ̃] is not an attested lexical item in SY but the language has [dɛ̃ɟa] 'fry fish' which is derived from /dĩ ɛɟa/. This fact is at variance with what operates in Mọ̀bà. Even though NH occurs post lexically, this does not take place whenever there is deletion. Second, with or without deletion, there are no cases of nasal spread on mid nasal vowels, thus the modification of the [*MIDNAS] to [*MIDNAS]$_{\text{WORD}}$ as proposed for SY (Pulleyblank 2000) does not arise in this dialect.

(29)

		*MIDNAS	MAXNAS
/dɛ/	a. [dɛ̃]	*!	
	b. ☞ [dɛ]		
/dĩ eɟò/	c. ☞ [dĩɟò]		
	d. [dɛ̃ɟò]	*!	

From the tableau in (29) we see that both at lexical and post-lexical domains the dialect does not permit nasality on mid vowels. Hence the constraint *MIDNAS need not be further constrained by the domain of application.

Next to consider is other post-lexical domain where NS is in full operation. One of such contexts is the wh-word /ìsí/ and the focus marker /lĩ/. What we observe is that the nasal feature of the focus marker spreads as far as the initial vowel of the wh-word.

(30)

ìsí lĩ	*NAS FRI	SPREAD L ([+NAS] Pr Wd)	*NAS LIQ	*NAS VOW
a. ☞ [ĩsĩ̀n̄]		*	*	***
b. [ìsĩ́nĩ̀]		**!	*	**
c. [ìsílĩ̀]		***!		*
d. [ĩ̀sĩ́nĩ̀]	*!		*	***

Again, the tableau in (30) is an example of post-lexical context where NS takes place. The claim that post-lexically, mid vowel will resist NS is found in the wh-word context in (31) below:

(31) Kí ròű 'what is that?'

Here, the nasal spread not only fails to apply to [o] but also to the vowel of the wh-word, which is always susceptible to NS. Other cases are in VP such as /rũ+ orĩ/ which becomes [rorĩ] 'to chew chewing stick'. In the example just cited, the nasal feature is deleted alongside the segment that bears it.
It is equally important to talk of the size of the domain. First let me present you a representation of the types of domains of NS already examined in this paper:

(32)	a.	[rĩ̀]	'walk'	d.	[ĩ̀fũ]	'intestine'
	b.	[dĩ́dĩ̄]	'frying'	e.	[egĩgũ]	'bone'
	c.	[ù̀rĩ̀kũrĩ̀]	'careless walk'	f.	[enĩgù̀rĩgù̀]	'fungus'

Cole and Kisseberth (1994) note that phonological features are parsed in domains and a given feature's domain is encoded in phonological representation that is the same status as the structural domains of Prosodic Word, Foot or Syllable. In Mọ̀bà, Nasal spread operates within the prosodic word. The Prosodic Word as used here ranges from a CV syllable to two feet. One other thing to mention again is that the prosodic word is not restricted to word or morpheme. For example [$_{SS}$ [$_{PrWd}$ [kĩ́nĩ̀]] is a syntactic structure. In essence the entire string that allows nasal spread is considered a prosodic word irrespective of whether it is a syllable, word, phrase or sentence.

4.2 Targets

The target segments are sonorants. First to be considered are the vowels. Having made this general statement, there remain two issues to be discussed along the discussion

on this phenomenon. First is the limitation of nasal spread to certain vowels in certain contexts and second is why is it that there are certain intervening consonants that remain oral. With this background information I shall proceed to account for the nasal spread that affects vowels.

4.2.1 Accounting for vowel nasalization

From the vowel inventory presented in the introductory part of this paper, it was made clear that there are only three phonemic nasal vowels in this dialect namely, /ĩ/, /ũ/ and /ã/. Each of these vowels has the capability of spreading its nasal feature to the segments to its left. There are however two important issues that need be addressed here. First is the issue of the intervening segments that remain oral. The second is the effect of this on oral vowels within the same prosodic word. On the first issue, it follows that if the constraint in (28) will have to apply[2], the nasal feature will spread to all the segments to the left of the segment bearing the inherent nasal feature. Thus in the word for 'termite', the optimal candidate will be ĩkã́, which is ill formed. The optimal candidate must be the one that permits nasal feature spread on high vowels and sonorant consonants but disallowing the obstruents, mid and low vowels from becoming nasalized. In this way, the obstruent consonant is made transparent by the constraint that forbids it from absorbing NS. The constraints needed are ranked as in (33):

(33) *MIDNAS,*NASOBS>> SPREAD L([+NAS]PrWd>>MAXNAS

(34)

/ikã́/	*MID NAS	*NASOB	SPREAD L ([+NAS] Pr Wd)	MAX NAS	*HINAS	*LONAS
a. ☞ [ĩkã́]			*		*	*
b. [ikã́]			**			*
c. [ĩkã́]		*				*

But what happens when the initial vowel is non-high? The prediction is that the optimal output must not nasalize the initial vowel. In this case, the optimal candidate will be the one that obeys the *MIDNAS constraint.

[2] Other alternative constraints that have been proposed in the literature which I have not considered in this paper are the "Gapping" which allows skipping over non-compatible segment with nasal feature and "NoGapping" which forbids nasal spread from skipping target segments.

(35)

/ ɔ̀kã/	*MIDNAS	*NASOB	SPREAD L([+NAS] Pr WD)	MAXNAS	*LONAS
a. [ɔ̃̀kã]	*!		*		* *
b. ☞ [ɔ̀kã]			**		*
c. [ɔ̀ɤ̃kã]		!*	*		*

One interesting thing with the NS within vowels is the one that affects the VCVCV lexical items. While nasal spread takes place when we have the full forms, an optional deletion process that deletes the first C blocks the NS. Thus there are two realizations of the word that means 'bone'.

(36) /egigũ/
[egĩgũ]
[eigũ]
*[eĩgũ]

The observation above is still mysterious. It is mysterious in the sense that we cannot claim that when there are two contiguous vowels that nasal spread is blocked. This seems to be a weak argument because the occurrence of two vowels should not be an impediment to NS since the vowel from which NS ought to take place is not affected by the deletion process. Similarly if I uphold that claim, then it will be difficult to explain why there is NS in examples in (18) and (19). However, it might be that the dialect does not allow nasal assimilation so that what we have in the input segmentally is also realized in the output. The last reason may be considered strong when we consider a case like reduplication that involves nasal vowel. One example is taken from (17) reproduced here for easy reference:

(37) ogű́+ogű́ > ogoogũ
RED twenty
'all twenties'

However this argument is weak for two reasons. First, consider a critical look at the output, which is a mid vowel. Note that *MIDNAS is ranked higher in this dialect. This is what prevents the NS after vowel assimilation to the preceding vowels that all share [+MID] feature. Second and more important is the fact that the dialect allows assimilation to take place as in:

(38) bá ã wí > bãã wí
with-3pl-rebuke
'rebuke them'

There seems to be one thing unique to the examples in (36) - (38), namely they agree with respect to nasality. While the contiguous vowels in the examples in (36) and (37) are oral, those in (38) are nasal. This phenomenon is captured in (39):

(39)

This observation compels one to look at a principled way of capturing the seeming opposition. The constraint in (40) is needed to account for the two types of agreement with respect to nasality.

(40) No-Hiatus Nas: Within a Nasal spread domain, it is ill formed to have two contiguous vowels linked to separate nasal features.

With this additional constraint, I will proceed to accounting for the disparity noted above.

(41)

I /bá ã wí/	*MIDNAS	*NASOB	NOHIATUS NAS	SPREAD L([+NAS] Pr WD)	*LONAS
a. bá ã wí			*	*	*
b.☞bããwí					**
II /eigũ/					
a. ☞ eigũ					
b. eĩgũ			*	**	
c. ẽĩgũ	*!				

4.2.2 Consonant nasalization

As indicated in the basic assumption in 2.1, the sets of consonants that attract NS are the sonorants (using Pulleyblank's term): [l, r, j, w]. These are the undergoers (Walker 1998). These segments receive nasality from the vowel they precede. I will now take them in turns. First to be considered for discussion is the lateral [l].

4.2.2.1 Laterals

It has been established in the literature that a lateral will nasalize when the following vowel can also nasalize. For details of this assumption see Pulleyblank (2000) and the references therein. Thus in Mọ̀bà, whenever the lateral precedes any of the two high vowels and the only low vowel, there is nasal harmony. For example, as discussed in Pulleyblank (2000) for SY, for an input like /li/, the optimal output would nasalize the consonant and extend the nasality throughout the syllable. However the analysis being proposed here differs from that of Pulleyblank in the sense that I have already claimed that whenever the lateral is followed by a nasal vowel, this vowel will nasalize the lateral through leftward spread of its nasal feature. In this regard the underlying structure in (42) gives the output to its right:

(42) /lù̃/ > [nù̃] 'to feed (a child)'
/lĩ/ > [nĩ] 'focus marker'
/lã́/ > [nã́] 'to spend'

The first example is used below to show how the optimal candidate is selected:

(43)

/lù̃/	*MIDNAS	SPREAD L([+NAS] Pr WD	MAX NAS	*HINAS	*NAS SONC
a. [lù̃]		*!		*	*
b. [lù]		*	*!	*	
c. ☞ [nù̃]				*	**

Under the proposal that the vowel has an inherent nasal feature, the NASHARM & NASPHASE constraints, which insert nasality, are not needed to account for the optimal candidate. So the deciding constraint to pick the optimal output is SPREADL ([+NAS] Pr WD).

One advantage of assuming an underlying nasal feature becomes obvious when the case of [lù] 'to beat' and [là] 'to split' is considered. It will be difficult to assume that once [ù] and [à] are harmonic with nasality (as in Pulleyblank's analysis for [lĩ]), then [à] and [ù] should be nasal and they in turn should extend this to the lateral consonant. Doing so will derive an output that is not intended. The conclusion reached here is at variance with Puleyblank's analysis of /l/ in SY. In that analysis, whenever the consonant is a lateral, nasality will only appear when the vowel that follows is [ĩ]. With other vowel, the appropriate markedness constraint will rule out nasalization.

4.2.2.2 Others: /r/, /j/, /w/

Like the case of /l/, these segments, being sonorant undergo nasalization through spreading whenever any of them precedes any of the three identified nasal vowels. Thus

there is phonetic contrast between [r] and [ɾ̃] based on the environment of occurrence. Since the analysis follows the same pattern, I am not presenting any tableaux for them.

4.3 The transparent segments

Segments are said to be transparent to NH when they allow nasality to spread through them even though they themselves do not undergo nasalization. All consonants except the sonorant are in this category. In the case under review, the class of obstruents is the transparent segments in Mọ̀bà in the sense that they allow nasal spread. This is what Walker (1998) calls 'antagonistic transparency', a term drawn from Archangeli and Pulleyblank (1994). For details see Walker (1998) and the references cited therein.

(44) a. [ĩ̀fũ] 'intestine' d. [ĩ̀sĩ̀] 'service'
b. [ĩkĩ] 'mucus' e. [ĩdã́] 'magic'
c. [egĩgũ] 'bone' f. [ĩdĩ̀dĩ̀ɾ̃ĩ] 'imbecile'

For purpose of clarity I am going to use the example in (44f) to illustrate the effect of transparency on NS. Note that the word for 'imbecile' consists of two types of consonants, namely the transparent represented by [d] and the undergoer/target represented by [r].

(45)

/idìdĩ̀ĩ/	MID NAS	*NAS OBS	SPREAD [+NAS]	*HINA S
a.☞[ĩd ĩ̀dĩ̀ɾ̃ ĩ]			**	****
b. [idìdɾ̃ĩ]			*!	*
c. [ĩdĩ̀dĩ̀ɾ̃ĩ]		!		*
d. [ĩd ĩ̀dĩ̀r ĩ]			***!	****

4.4 The blockers

The focus of this section is the discussion related to those segments that neither undergo nasalization nor allow nasalization to pass through them. They are the opaque segments since they are not transparent to NS. I have identified the mid vowels and the low vowel as the major class of this group. The position of the obstruent is indecisive in the sense that though they do not nasalize, they allow NS to the next harmonic segment. For the purpose of this discussion I am going to regard them as transparent rather than blockers. In a word such as [ogũ] 'twenty', and its reduplication form [ogoogũ] 'all twenties' the NS is disallowed simply because the initial vowel, being a mid vowel, is not compatible with nasality. Compare this with [ũɾ̃ĩ] 'walk' which is derived from /u+rĩ/. In this latter case, /u/ is not a ɬlocker hence it is able to undergo nasalization. In the

following twin tableau, I present the two inputs: /ogũ/ and /urĩ/, each with a set of candidates from which the same set of constraints select the optimal candidate.

(46)

/ogũ/	*MID NAS	SPREAD L([+NAS] Pr Wd)	MAXNAS	*NASSONC	*HINAS	*LONAS
a.☞ [ogũ]		**			*	
b. [õgũ]	*!	*			*	
/ùrɔ̀rũ̀/	*MID NAS	SPREAD L([+NAS] Pr Wd)	MAXNAS	*NASSONC	*HINAS	*LONAS
a. [ũ̀r̃ɔ̀r̃ũ̀]	*!			**	* *	
b.☞ [ùrɔ̀r̃ũ̀]		****		*	*	

4.4 Issues that need further attention

There remains a number of issues that have yet to be resolved. One of those is the need to have a well-defined domain of nasal spread. Not only this, there seems to be exception to the claim that the maximum domain for nasal spread is two feet. There is also the need for further research in order to be able to offer explanation for the resistance of /a/ to nasal spread in word initial position, as in [agùtã̀] 'sheep'. It might be necessary to carry out a test to (in)validate the transparency claim for the obstruents in words such as: [ũ̀gbĩ́] 'snail'. Finally, there is no explanation yet as to why nasal spreading fails to apply whenever there is deletion, which creates an input for nasal spread as in (47).

(47) tú okũ̀ > túkũ̀ *tṹkũ̀ 'untie rope'
dì okũ̀ > dikũ̀ *dĩkũ̀ 'tie rope'

5 Conclusion

In this paper an attempt has been made to look at the case of nasalization in Mọ̀bà, a dialect of Yorùbá. It has been established that the minimal domain for NS is the CV syllable whereas the maximal domain is two feet. Apart from this, we also observe that the nasal spread is only leftward. Although this is not a comparative study, it has shown us that the reason why lexical items in SY do not begin with a nasal vowel, since the latter does not allow leftward spread.

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