

ON OPTIONAL AND OBLIGATORY PRENASALIZATION IN NCHUFIE REDUPLICATION*

Daniel Silverman

izzys80@uclamvs.bitnet

0. Introduction

In this paper I analyze a productive process of total segmental reduplication affecting Nchufie adjectives. We will see that an optional process of prenasalization which conditionally applies under reduplication is blocked when the stem begins with a voiceless fricative. However, in other morphological environments, prenasalization is obligatory regardless of the quality of the stem-initial consonant. We will attempt to motivate this patterning in the context of Structure Preservation (Kiparsky 1982, 1985), and Harmonic Phonology (Goldsmith 1991, Prince and Smolensky 1992, McCarthy and Prince 1992).

In Section 1 I present the preliminaries: the consonant inventory, and relevant lexical segmental processes. In Section 2 I present the process of total adjectival reduplication, as well as a morphologically-triggered phenomenon of optional prenasalization which conditionally affects the process. I consider the systematic gap in prenasalization: voiceless fricative-initial stems do not undergo the process. I will additionally discuss an instance of obligatory, across-the-board prenasalization. In Section 3, two approaches to Structure Preservation are discussed in an attempt to account for the patterning of both optional and obligatory prenasalization. I ultimately embrace elements of both. Finally, in Section 4, I consider the data in the context of Harmonic Phonology.

1. Preliminaries

1.1. Consonant Inventory

In (1) is the underlying consonant inventory of Nchufie.

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- (1)
- | | | | |
|----------------|----------------|---|----------------|
| p | t | c | |
| p ^h | t ^h | | k ^h |
| f | s | | |
| (v) | z | | ʎ |
| m | n | | ŋ |
| | l | | |
| | | y | w |
| | | | N |

The status of /v/ is questionable, as it has been found in only one form. /c/ is the voiceless palato-alveolar affricate. /N/ is the nasal glide. As /k/ is missing from the inventory, we might interpret [ʎ] as underlying /k/.

1.2. Relevant Segmental Processes

The relevant segmental phonology involves derived prenasalization, in which the concatenation of morphemes may bring together a nasal and another segment. Both voiced and voiceless prenasalized plosives are attested, both in underived and derived environments. However, prenasalized fricatives are not attested in underived environments, though they may be derived under certain circumstances (to be discussed in section 3). In (2) is a sampling of underived prenasalized forms, indicating that voiceless as well as voiced plosives may follow nasals.

- (2)
- | | | |
|----|-------------------|--------------------|
| a. | ŋk ^h u | (back (body part)) |
| b. | ŋgəu | (go) |
| c. | ndugɔ | (glass) |
| d. | ŋjo: | (steal) |
| e. | ŋgwæ | (book) |

Following Herbert (1986) and Jun (to appear), I assume prenasalized plosives are underlying sequences. Nasals which are not underlyingly prevocalic acquire the place node of the following segment, and thus we may assume that these underlying nasals are the placeless glide (see Trigo 1988).

- (3)
- | | | |
|---------|---|---------|
| NP | | NP |
| | → | \ |
| [place] | | [place] |
- (where N = nasal, P = plosive)

Important for the present investigation is the process of post-nasal hardening, in which the second member of a derived nasal-consonant sequence hardens to a plosive. This occurs among the glides, the liquid, and the voiced fricatives. In (4) are examples of

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post-nasal hardening.

(4)	yə ^{HL}	(cold)	-	ŋgə ^L	(was cold)
	zɔŋg ^{HL}	(dry)	-	njɔŋg ^L	(was dry)
	lyɛ ^{HL}	(clean)	-	ndyɛ ^L	(was clean)
	wu: ^{HL}	(short)	-	ngu: ^L	(was short)
	yiɛ ^{HL}	(say)	-	njiɛ ^L	(said)

Note that when /z/ undergoes the process, it palatalizes as well, presumably so that Structure Preservation is maintained (Kiparsky 1982, 1985): the segment inventory possesses the post-alveolar affricate, while lacking its alveolar counterpart. Indeed, the structure preserving nature of this segmental process will be shown to play a crucial role in our discussion of reduplication vis-a-vis prenasalization.

As already noted, we may assume that nasals acquire place features from the following consonant. Upon the acquisition of place features, the nasals harden to stops. Now, the nasals' stricture features spread to the following consonant. If further modifications are required in order to preserve structure, these now apply. Thus laterality is lost from prenasalized /l/, and the derived alveolar affricate becomes post-alveolar. The patterns in (5) emerge.

(5)		<u>underlying</u>	<u>assimilation</u>	<u>hardening</u>	<u>S.P.</u>
	y:	Ny	ŋy	ŋg	ŋg
	z:	Nz	nz	ndz	nj
	l:	Nl	nl	ndl	nd
	w:	Nw	ŋw	ŋgw	ŋgw
	y:	Ny	ny	ndy	ndy

See Jun (to appear) for a fully formalized account of these processes.

2. Adjectives and Adjectival Reduplication

In this section I present the process of total adjectival reduplication, as well a syntactically-triggered process of optional prenasalization which conditionally affects the process. We will consider a systematic gap in this optional process, as well as a distinct process of across-the-board prenasalization.

2.1. Tone Classes

The tonal patterning of Nchufie adjectives falls into two classes. On the surface, adjectives possess either a High-Low tonal pattern (Class A), or a Low-High-Low tonal pattern (Class B). Examples follow.

(6)	<u>Class A (HL)</u>		<u>Class B (LHL)</u>	
	fye ^{HL}	(split)	fye ^{LHL}	(tall)
	wu: ^{HL}	(short)	wu: ^{LHL}	(amazing)
	puɪguɪ ^{HL} ([puɪ ^H guɪ ^L])	(red)	pɔgo ^{LHL} ([pɔ ^L go ^{HL}])	(good)

The minimal and near-minimal pairs in (6) confirm the existence of an underlying tonal contrast.

2.2. Adjectival Reduplication

Adjectival reduplication occurs in adjectives which modify predicate nominals:

(7)	a.	a ^L k ^h a: ^{HL}	(it is small)
		a ^H ye ^L k ^h a: ^{HL} k ^h a: ^{HL}	(it is a small one)
	b.	a ^L fu ^{HL}	(it is white)
		a ^H ye ^L fu ^{HL} fu ^{HL}	(it is a white one)
	c.	a ^L ɣə ^{HL}	(it is cold)
		a ^H ye ^L ɣə ^{HL} ɣə ^{HL}	(it is a cold one)
		a ^L zɔng ^{HL}	(it is dry)
		a ^H ye ^L zɔng ^{HL} zɔng ^{HL}	(it is a clean one)
	d.	pɪi ^{LH} ncu ^M lyɛ ^{HL}	(Pinchu is clean)
		pɪi ^{LH} ncu ^M mɛ ^{HL} lyɛ ^{HL} lyɛ ^{HL}	(Pinchu is a clean child)
	e.	a ^L wu: ^{HL}	(it's short)
		a ^H ŋɔ ^L wu: ^{HL} wu: ^{HL}	(he's a short man)

I have arranged the data so that the initial segment of the adjective increases in sonority as the list progresses, thus providing tokens of each distinct manner type, if attested. In (a) we see voiceless stop-initial adjectives undergoing the process. In (b) we see voiceless fricatives. In (c) we see the voiced velar fricative, as well as the voiced coronal fricative. (d) shows a liquid-initial adjective, and (e) shows a glide-initial adjective. There thus far seems nothing peculiar about the process: any adjective of any segmental shape appears to be able to reduplicate freely, suggesting the input undergoes an ordinary process of full reduplication.

2.3. Optional Prenasalization

The reduplication picture becomes somewhat more complex when considering overtly tensed constructions. The Past and Future morphemes consist of nasality lexically associated with tonal material: High for Future (^H), SuperHigh for Past (^{sH}). These

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morphemes prefix to verbal stems. We thus observe the patterns in (8).

- (8) a. a^L tung^{HL} (he kicks)
 a:^{LH}ntung^M (he will kick)
 a:^{LsH}ntung^L (he kicked)
- b. a^L k^ha:^{HL} (he runs)
 a:^{LH}ŋk^ha:^M (he will run)
 a:^{LsH}ŋk^ha:^L (he ran)

Now observe how tense marking affects of reduplication.

- (9) a. a:^L - s^H m - bə^L - ye^L - ŋgə^{HL} - ŋgə^{HL} (it was a cold one)
 it - tense - copula - one - N-cold - N-cold
 a:^{LsH}mbə^L ye^L γə^{HL} γə^{HL} (it was a cold one)
- b. a:^{LsH}mbə^L ye^L ŋk^ha:^{HL} ŋk^ha:^{HL} (it was a small one)
 a:^{LsH}mbə^L ye^L k^ha:^{HL} k^ha:^{HL} (it was a small one)
- c. a:^{LsH}mbə^L ye^L ndye^{HL} ndye^{HL} (it was a clean one)
 a:^{LsH}mbə^L ye^L lye^{HL} lye^{HL} (it was a clean one)
- d. a:^{LM}mbə^M ye^L mbɔ^Lgo^L mbɔ^Lgo^{HL} (it will be a good one)
 a:^{LH}mbə^M ye^L pɔ^Lgo^L pɔ^Lgo^{HL} (it will be a good one)
- e. a:^{LsH}mbə^L ye^L njong^{HL} njong^{HL} (it was a dry one)
 a:^{LsH}mbə^L ye^L zong^{HL} zong^{HL} (it was a dry one)

Nasality optionally -- though preferably -- appears on both copies of the adjective.

2.4. The Exception

Despite nasality's optional though preferred appearance on predicate nominal-modifying adjectives in overtly tensed constructions, there is a systematic exception in the data, exemplified in (10).

- (10) a. a:^{LsH}mbə^L ye^L fɔ^L fɔ^{HL} (it was a tall one)
 *a:^{LsH}mbə^L ye^L n^fɔ^L n^fɔ^{HL}
- b. a:^{LsH}mbə^L ye^L fye^{HL} fye^{HL} (it was a split one)
 *a:^{LsH}mbə^L ye^L n^fye^{HL} n^fye^{HL}
- c. a:^{LsH}mbə^L ye^L fuo^{HL} fuo^H (it was a bright one)
 *a:^{LsH}mbə^L ye^L m^fuo^{HL} m^fuo^{HL}

- d. a:^LsH_{mbə}^L yɛ^L fu^{HL} fu^{HL} (it was a white one)
 *a:^LsH_{mbə}^L yɛ^L mfu^{HL} mfu^{HL}

Otherwise optional prenasalization is disallowed in all instances of voiceless fricative-initial adjectives.

2.5. Obligatory Prenasalization

Note that in the following forms voiceless fricative-initial adjectives and verbs regularly *do* take prenasalization when its presence is obligatory.

- (11) a. a:^LsH_n fɹɛ^L (it was split) (*a:^LsH_fɹɛ^L)
 | V |
 it Past split
- b. a:^LsH_n fɹɛ^L (it was tall) (*a:^LsH_fɹɛ^L)
 c. a:^LsH_{mfu}o^L (it was bright) (*a:^LsH_fu^Lo^L)
 d. a:^LsH_{mfu}^L (it was white) (*a:^LsH_fu^L)

These data indicate that the prenasalization of voiceless fricatives is *not* disallowed categorically. It seems that in morphological operations which are required either by the grammar, or by a recoverability requirement, as in tense marking in predicate adjective constructions, prenasalization may indeed result in a non-structure-preserving output.

3. Approaches to Structure Preservation

In this section I attempt to explain the asymmetry between optional prenasalization and obligatory prenasalization by invoking Structure Preservation in the context of Lexical Phonology (Kiparsky 1982, 1985).

Lexical rules are claimed to be structure preserving, in that their application may not produce new segments, or, under certain analyses, new sequences of segments (Borowski 1986). Thus throughout the lexical phonology, the output of rules may only result in segments and sequences present in the underlying inventory. Structure Preservation does not hold in the post-lexical phonology, however. Post-lexical rules may create novel segments, i.e., segments not found in the underlying inventory, and non-underlying sequences of segments.

There are, however, different possible ways to invoke Structure Preservation. The first approach to the process we will discuss might be termed Static Structure Preservation, as the principle holds blindly within the lexical phonology: any lexical process that produces a non-structure-preserving output is blocked from applying,

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presumably through feature co-occurrence constraints, or, as in the case at hand, phonotactic constraints. These are traditionally referred to as *constraints* or *filters* (Clements and Keyser 1983, Borowsky 1986, Myers 1991).

The second approach to Structure Preservation we might call Active Structure Preservation, as the principle may itself be the trigger of particular phonological rules. Specifically, Active Structure Preservation may not have the power of preventing rules from applying when their output is non-structure-preserving. However, the principle may re-impose Structure Preservation on such an output by triggering further phonological processes. Myers (1991) refers to such processes as *persistent rules*.

Having presented these two approaches to Structure Preservation, let us recall the prenasalization facts from Nchufie. First, recall the morpheme-internal segment sequencing constraints of Nchufie presented in Section 1. While nasals may precede any plosive, they may not precede fricatives. Now recall the prenasalization facts from adjectival reduplication: nasality optionally though preferably appears on both copies of object modifying adjectives in the Past and Future. Voiced fricative-initial adjectives harden upon prenasalization, while voiceless fricative-initial adjectives may not be prenasalized.

Let us now consider the two approaches to Structure Preservation, and see if either can account for the facts.

Static Structure Preservation forbids lexical rules from applying if their output violates Structure Preservation. This approach will obviously fail to account for the data, as the process of optional prenasalization -- more often than not -- obviously results in an intermediate violation of Structure Preservation. Consider the attested alternations alongside those predicted to obtain with Static Structure Preservation:

(12)	<u>Predicted</u>	<u>Attested</u>
i.	N+p *mp	mb
ii.	N+s *ns	s (*ns)
ii.	N+z *nz	nj
iii.	N+y *ny	ng
iv.	N+l *nl	nd
iv.	N+w *nw	ngw

Only in the case of voiceless fricative-initial forms does Static Structure Preservation make the right prediction. In all other cases, the process is able to apply, though in every successful application are there additional rules required in order that

Structure Preservation is re-achieved. These facts would strongly indicate that it is Active Structure Preservation that may successfully account for the data.

Unfortunately, Active Structure Preservation would additionally predict that voiceless fricative-initial forms should be able to undergo the process of prenasalization, resulting in an intermediate violation which is subsequently repaired by rules triggered by the principle:

(14)	<u>Predicted</u>	<u>Attested</u>
i.	mf	f (*mf)
ii.	ns	s (*ns)

Active Structure Preservation predicts that voiceless fricative-initial forms should just as readily optionally take prenasalization as other forms do.

It thus seems that neither Static nor Active Structure Preservation will fully account for the data. We might preliminarily investigate a third alternative, something falling in-between the two aforementioned approaches. It might be the case that Structure Preservation possesses reparative powers on an intermediate violation, but only to a limited extent. That is, if an intermediate lexical violation requires the application of X number of rules, or type Y rule, Structure Preservation may trigger their application. However, if an intermediate violation requires X+1 number of rules, or type Z rule, in order for Structure Preservation to be re-achieved, the entire process fails. While the data from Nchufie are seemingly insufficient to confidently zero in on the value of X, or rule type Z, a quick glance at the data would suggest that such a hypothesis is tenable. Specifically, attested prenasalized forms are far less distinct from their underlying forms than those otherwise predicted to surface in unattested forms.

4. Harmonic Phonology

In the theory of Harmonic Phonology (or Optimality Theory) (Goldsmith 1991, Prince and Smolensky 1992, McCarthy and Prince 1992), the phonological component consists of a ranked, violable set of constraints which determine well-formedness. While a given input may be subject to a potentially infinite number of grammatical analyses, the output form is that which best satisfies the well-formedness constraints. At different grammatical levels, constraints may be differently ranked.

For present purposes, the relevant constraints are PARSE (which incorporates each phonological/morphological element into hierarchical prosodic structure), and *NF (which disallows nasal - voiceless fricative sequences).

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In the case of obligatory prenasalization, PARSE is ranked higher than *NF, (indicated in (14) by its columnar precedence).

(14) Obligatory Prenasalization

input: N+F

<u>Candidates</u>	<u>PARSE</u>	<u>*NF</u>
NF		*
F	*!	

While a structure of the form [NF] violates *NF (indicated by '*'), [F] violates the higher ranked PARSE. This higher-ranked violation thus rules out [F] (indicated by '!'). [NF] is thus the best-formed candidate, i.e., the output form (indicated by '~~NF~~').

In the case of optional prenasalization, *NF is ranked higher than PARSE.

(15) Optional Prenasalization

input: N+F

<u>Candidates</u>	<u>*NF</u>	<u>PARSE</u>
NF	*!	
F		*

In (15), while [F] violates PARSE, [NF] violates higher-ranked *NF.

5. Conclusion

Within the theory of Lexical Phonology, optional prenasalization in Nchufie suggests that two types of Structure Preservation may play a role within a single phonological system. Similarly, within the theory of Harmonic Phonology, the Nchufie data may be analyzed as being subject to two distinct constraint rankings, depending on the grammatical level at which prenasalization takes place.

Appendix: Elicited Adjectives

<u>Class A</u>	<u>Class B</u>
wu: (short)	wu: (amazing)
la: (sticky)	ʃye (long/tall)
lye (clean)	zɔ (itchy)
lwi (bitter)	pu: (left over)
zɔng (dry)	pɔgo (good)
ɣə (cold)	puɾpu (spoiled)
ɣoɣo (foolish)	
fufu (white)	
fuo (bright)	
ji (black)	
ʃye (split)	
k ^h a: (small)	
p ^h u: (ugly)	
puɾgu (red)	

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