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CONSONANTAL LABIALIZATION AND CONSONANT CLUSTERS IN GÃ

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LABIALIZATION:

In the first part of this paper, I shall attempt to show that previous analyses of the Gã phonemic system have not fully captured some obvious generalizations. I shall limit my discussion specifically to the labialized consonants which have been treated as systematic by other investigators. For example Kropp[1] has observed that Gã has the following labialized consonants: **tʃw, dzw, ʃw, jw, kw, gw, hw, ŋw**. Berry and Kotei[2] have also given an identical inventory. It is my contention that the labialized consonants in Gã are predictable.

If one follows the 'taxonomic' method of determining which sounds in a language are phonemes, the 'minimal pair' test establishes that most of the labialized consonants in Gã are phonemes just as their non-labialized counterparts are also phonemes. For example:

Ex. 1

dzw	dzwà	broke	dz	dzà	distributed
tʃw	tʃwà	knocked	tʃ	tʃà	dug
ʃw	ʃwã́	scatter!	ʃ	ʃã́	fart!
kw	kwá	forsake!	k	ká	nail!
gw	Gwàŋ̀nyò	a Guan	g	Gã̀nyò	a Gã
hw	hwàŋ̀	to sprain	h	hã́	give!
ŋw	ŋwɛ̀ɛ̀	heaven	ŋ	ŋɛ̀ɛ̀	coal

High tone is marked [´], low tone [`] and mid tone is marked [¯] in this paper. In the first four examples it is obvious that the labialized consonants contrast with their non-labialized counterparts. If we restrict our analysis to this type of corpus and this type of reasoning, we add a large number of phonological units to our inventory. On the other hand if in our analysis we aim at making an inventory of all segments which would distinguish one formative from another, then we must consider other contrasts as well. We may for example ask whether there is a contrast between non-labialized consonants followed by /u/ and their labialized counterparts and also if the appropriate labialized consonant followed by /u/ contrasts with either. For example:

Ex. 2

A		B		C	
/dzwà/	broke	/dzùà/	broke	/dzwùà/	broke
/tʃwà/	knocked	/tʃùà/	knocked	/tʃwùà/	knocked
/ʃwã́/	scatter	/ʃṹã́/	scatter	/ʃwṹã́/	scatter
/kwá/	forsake	/kúá/	forsake	/kwúá/	forsake
/Gwàŋ̀nyò	a Guan	/Gùàŋ̀nyò/	a Guan	/Gwùàŋ̀nyò/	a Guan
/hwàŋ̀/	to sprain	/hùàŋ̀/	to sprain	/hwùàŋ̀/	to sprain
/ŋwɛ̀ɛ̀/	heaven	/ŋ̀ɛ̀ɛ̀/	heaven	/ŋwɛ̀ɛ̀/	heaven

1 Kropp, M. E. (January 1968). 'An Analysis of the Consonant System of Gã', JOURNAL OF WEST AFRICAN LANGUAGES, vol. V, no. 1.
2 Berry, Jack, and Kotei, Nii Amon (1969). AN INTRODUCTORY COURSE IN GÃ. Washington, D.C.: Government Printing Office.

In Ex. 2 the forms under A are the labialized forms followed by a vowel which is not /u/. The forms under 2B are non-labialized consonants followed immediately by /u/ and another vowel and 2C exemplifies labialized forms immediately followed by /u/ and another vowel. As can be seen the insertion of /u/ after both labialized and non labialized consonants does not result in a different meaning. This can be explained if we posit an underlying form for the labialized consonants because it is the 'roundness' of the /u/ which labialized non-round consonants in Gã. With this in mind a two part phonological rule[3] is proposed. The first part of the rule is:

P1

$$[\text{cons}] \rightarrow [+\text{round}] \;/\; \_\_ \begin{bmatrix} +\text{voc} \\ +\text{high} \\ +\text{back} \\ +\text{round} \end{bmatrix} \quad \begin{bmatrix} +\text{voc} \\ -\text{cons} \end{bmatrix}$$

By this rule a consonant is rounded (labialized) if it is followed by two vowels, the first being /u/. Since sounds tend to influence adjacent sounds, it is only natural that some degree of roundness (labialization) should occur even if no vowel followed the /u/. However, labialization is very noticeable if /u/ is followed by another vowel. A diphthong /uV/ has not been set up just to account for labialization. Diphthongs with or without initial /u/ occur elsewhere in the language. It is this occurrence which is utilized in the explanation.

The second part of the labialization rule optionally deletes /u/ after a round consonant.

P2

$$\begin{bmatrix} +\text{voc} \\ +\text{high} \\ +\text{back} \\ +\text{round} \end{bmatrix} \rightarrow \emptyset \;/\; \begin{bmatrix} +\text{cons} \\ +\text{round} \end{bmatrix} \_\_\_\_$$

The deletion rule applies after the labialization rule. It should be stressed that phonological rules like these operate on a syntactic input to give a phonetic output. I stress this because I do recognize the validity of labialized forms though as I have shown such forms are 'phonetic' rather than 'phonemic'.

CONSONANT CLUSTERS:

In this section of the paper,[4] I shall discuss some of the rules which affect the morpheme structure of Gã. I shall not, for example, discuss constraints which affect the combination of phonological features which occur within a given segment, i.e. 'segment structure' conditions, and I shall only partially discuss the set of rules which affect sequences of segments. Since my concern is with the type of constraints which occur on the linear combination of non-vocalic segments, I shall say very little about constraints on vocalic segments. Thus I shall limit myself to only a small fraction of

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[3] A similar rule operates in Akan. Akan and Gã belong to the same language family. See Paul Schachter and Victoria Fromkin, A PHONOLOGY OF AKAN: AKUAPEM, ASANTE AND FANTE. Working Papers in Phonetics No. 9. University of Califonia, Los Angeles.

[4] This part of the paper is a revision of a section of my doctoral dissertation. See Paul F. Amon Kotey (May 1969). SYNTACTIC ASPECTS OF THE GA NOMINAL PHRASE. Unpublished Ph.D. dissertation, University of Wisconsin.

morpheme (formative) structure rules. Furthermore since the majority of verbs in Gã have the structure CV (CV), the rules I shall discuss will deal mainly with nominals. In 1965 M. E. Kropp observed that:

> "Except across morpheme boundary there may not be more than two consonants, the second of which must be /l/, unless the first is nasal. . . There may also be clusters of three consonants, in which the first is nasal and the third /l/. Thus the possibilities are CL, NC, NL, NCL."[5]

Thus, it has been postulated that in Gã one can find phonemic clusters of two or three consonants. The following are representative of the *phonetic* realizations which have led to this view.

Ex. 3

NC	[àm̀pèmá]	type of plantain	CL	[k`làŋ̀]	wolf
	[ǹʃɔ̀]	ocean		[f'là]	sore
NL	[m̀lé]	mushroom	NCL	[kp`lɛ̀ŋm̀kp'lɛ̀]	rabbit
	[ŋm̀lɛ̀]	bell			

I hold the view that on the systematic phonetic level such clusters are possible in Gã, but that there is no justification for such clusters on the systematic phonemic level. I shall therefore show that initially or medially within a morpheme, only two consonants i.e. NC can occur. Following Schachter and Fromkin,[6] I shall use 'If' (I) to refer to the description in the lexicon to which a given condition applies, and 'Then' (T) to refer to the result of the application of that condition.

SqS 1

$$\begin{array}{lll} \text{I} & \neq & [+\text{seg}]^{7} \\ & & \| \\ & & \text{v} \\ \text{T} & & [\pm \text{voc}] \end{array}$$

This rule states that the first segment after a morpheme boundary is either a vocalic or a non-vocalic element. Vocalic segments in Gã are the vowels /i, e, ɛ, u, o, ɔ, a/ and the lateral /l/ .[8] Non-vocalic segments are the glides /w, y, h/ and the true consonants. Since not all vowels can occur initially in Gã, [+voc] in SqS 1 has to be exactly specified.

SqS 2

$$\begin{array}{lll} \text{I} & \neq & [+\text{voc}] \\ & & \| \\ & & \text{v} \\ \text{T} & & \left\{ \begin{array}{l} [+\text{low}\ ] \\ [+\text{cons}\ ] \\ [+\text{tense}] \end{array} \right\} \end{array}$$

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[5] Kropp, M. E. (1965). 'European Loan Words in Accra Gã'. Paper presented to the Fifth West African Languages Congress. Accra: University of Ghana, Legon.

[6] Schachter, Paul, and Fromkin, Victoria. A PHONOLOGY OF AKAN: AKUAPEM, ASANTE, AND FANTE. Working Papers in Phonetics No. 9. University of California, Los Angeles.

[7] The symbol ≠ refers to morpheme boundary.

[8] /l/ includes [r]. [r] does not occur initially.

SqS 2 therefore states that only the low vowel /a/, /ɪ/ or a tense vowel /e, o/ can occur initially after a morpheme boundary.

The next sequence structure rule is:

SqS 3 $\quad I \neq X_o \quad [-voc] \quad [\_\_\_\_]$

$\qquad\qquad\qquad\qquad\qquad\qquad\quad \Downarrow$

$\qquad\qquad\qquad\qquad\qquad\qquad\quad v$

$\qquad T \qquad\qquad\qquad\qquad [\pm voc]$

This rule claims that a non-vocalic segment may be followed by either a vocalic or a non-vocalic segment. Since my initial concern is with the non-vocalic segment, the vocalic segment will not be further defined. The X in this and subsequent rules represents a syllable. The subscript $_o$ indicates that X may have a minimum value of Zero. In Gã the normal structure of the syllable is

$\left\{\begin{matrix} CV \\ V \\ N \end{matrix}\right\}$ with the appropriate tone indicated on the V or N.

SqS 4 $\quad I \neq X_o \quad [-voc] \quad [-voc]$

$\qquad\qquad\qquad\quad \Downarrow$

$\qquad\qquad\qquad\quad v$

$\qquad T \qquad\quad [+nas]$

This rule establishes the first non-vocalic segment in a non-vocalic cluster.

SqS 5 $\quad I \neq X_o \quad [+nas] \quad [-voc]$

$\qquad\qquad\qquad\qquad\quad \Downarrow$

$\qquad\qquad\qquad\qquad\quad v$

$\qquad T \qquad\qquad\quad \begin{bmatrix} -voc \\ -nas \end{bmatrix}$

Rule 4 of the sequence structure series indicates that the first segment in a non-vocalic cluster is a nasal consonant and rule 5 of the same series indicates that the second segment in such a cluster is a non-nasal consonant.

SqS 6 $\quad I \neq X_o \quad [+nas] \quad \begin{bmatrix} -nas \\ -voc \end{bmatrix} \quad [\_\_\_\_] \quad X_o \quad \neq$

$\qquad\qquad\qquad\qquad\qquad\qquad\quad \Downarrow$

$\qquad\qquad\qquad\qquad\qquad\qquad\quad v$

$\qquad T \qquad\qquad\qquad\qquad\quad \begin{bmatrix} +voc \\ -cons \end{bmatrix}$

According to sequence structure rule 6, after a cluster of two non-vocalic segments, only a vowel can occur. The rule therefore rules out three-consonant clusters within a morpheme in Gã. By implication both SqS 5 and 6 rule out the linear occurrence of two consonants with identical phonological features initially or medially.

At this stage, someone not familiar with Gã may question the status of kp, gb, ŋm. These labio-velars are co-articulated stops and as such are not sequences of consonants. They are "labials with extreme velarization".[9]

A phonological rule will specify the phonetic nature of the nasal consonant in the cluster. A set of rules called homorganic rules explain this:

P3 (First part of homorganic rule)

$$\begin{bmatrix} +\text{nas} \\ -\text{voc} \end{bmatrix} \longrightarrow [\,\alpha\,F\,] \;/\; \underline{\quad}(+) \begin{bmatrix} -\text{voc} \\ -\text{nas} \\ \alpha F \end{bmatrix}$$

The F is an abbreviation for the 'place of articulation features'. The rule therefore indicates that the nasal consonant in a cluster is homorganic. I shall discuss examples like m̀lé 'mushroom', ŋm̀lɛ̀ 'bell' where the initial nasal is clearly not homorganic, when I explain surface structure clusters involving the lateral. The homorganic nasal always carries tone, thus making it syllabic. The tone on the nasal is conditioned by the preceding environment. The rule which assigns tone to the nasal forms the second part of the homorganic rule.

P4 (Second part of homorganic nasal rule)

$$\begin{bmatrix} +\text{nas} \\ -\text{voc} \\ \alpha F \end{bmatrix} \longrightarrow \begin{bmatrix} [\beta\ \text{tone}\,] \\ \\ [\,+\,\text{Ltone}\,] \end{bmatrix} \;/\; \begin{bmatrix} \begin{bmatrix} +\text{voc} \\ \beta\text{tone} \end{bmatrix} \\ \\ [\;\neq\;] \end{bmatrix} \underline{\quad}(+) \begin{bmatrix} -\text{voc} \\ -\text{nas} \\ \alpha F \end{bmatrix}$$

The first part of the rule states that the tone on the homorganic nasal is the same as the tone on the preceding vowel. That is, if the vowel which precedes the homorganic nasal has high tone, the homorganic nasal has high tone and if the vowel which precedes the homorganic nasal has low tone, the hormorganic nasal has low tone. The second part of the rule states that if the homorganic nasal is preceded by a word boundary, then the tone on the homorganic nasal is low. If we find such odd forms like ɲ́lá 'to be scorched' it should be kept in mind that [ŋl] does not constitute a cluster on the systematic phonemic level. Forms like [ɲ́lá] are explained later. Illustrations of P3 and P4 are:

Ex. 4

[ŋm̀kpál]	libation	[ámṕé]	girls' game
[m̀fòníní]	picture	[àm̀pèmá]	type of plantain
[ǹtáŋ]	net	[màŋkɛ̀]	midnight
[ŋkétlɛ̀]	pea nut	[kàláńtè]	machete

The last four examples also illustrate medial homorganic nasals.

For our discussion, the last rule in the sequence structure series (SqS) stipulates the final segment in a morpheme:

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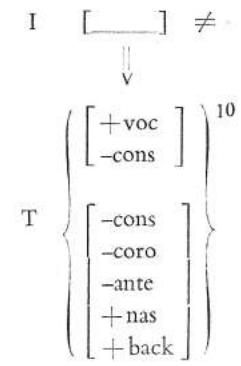
[9] Chomsky, Noam, and Halle, Morris (1968). THE SOUND PATTERN OF ENGLISH. New York: Harper and Row. P. 311.

SqS 7



This rule observes that the final segment in a morpheme is either a vowel or [ŋ]. Bearing in mind that a final non-vocalic segment in a morpheme is [ŋ] one may ask whether there will be assimilation when the morpheme final [ŋ] is followed by a morpheme initial consonant. The answer is 'yes'. It is possible to have assimilation across morpheme boundaries. Rules P3 and P4 therefore include an optional morpheme boundary before the non-vocalic segment which follows the nasal. Examples of assimilation across morpheme boundaries are:

Ex. 5

màŋ̀ tʃɛ̀ → [màǹ̪ tʃɛ̀]	chief, lit. town head
dúŋ̀ tùŋ̀ → [dúǹ̪ tùŋ̀]	thick darkness, lit. black darkness

PREDICTING CL, NL, NCL

The sequence structure rules that have been outlined so far disallow CL, NL, or NCL, although examples under Ex. 3 indicate that there are such clusters in Gã. What has been described as CL or NL has the underlying form $\begin{Bmatrix} C \\ N \end{Bmatrix} V_1\ L\ V_2$ where $V_1 = V_2$

In certain Gã words where a vowel precedes and follows a lateral, both vowels are maintained while in other words of identical structure, the vowel which precedes the lateral is optionally deleted. The tendency to delete the vowel is very strong and the frequency of deletion is very high in some instances while in other instances the vowel which precedes the lateral is never deleted. In pronouncing the following:

Ex. 6

[tátálé]	fried whipped plantain	[líl̩él̩]	tongue
[àwàlè]	owarri (game)	[sɔ̀lè]	to pray
[àwàlé]	spoon	[Àʃàlè]	a Gã name
[hèlà]	disease		

10 Forms like [dɔ́ŋ̀ŋ̀] 'never again' and [díŋ̀ŋ̀] 'very quiet' do occur. It can be argued that the second [ŋ] is really a separate morpheme which indicates 'intensity'.

a Gã would never leave out the vowel which precedes the lateral. Should this be done, the word loses its meaning. However, in words like:

Ex. 7

[túfèlé]	anus	[mèlé]	mushroom
[dzàrà]	market	[kpɛ̀ŋm̀kpɛ́lɛ̀]	rabbit
[kàlàŋ]	wolf		

the vowel which precedes the lateral may be optionally deleted without altering the meaning of the word. A Gã readily accepts a pronunciation with or without the vowel which precedes the lateral as in:

Ex. 8

[túf`lé]	anus	[m̀lé]	mushroom
[dz`rà]	market	[kpɛ̀ŋm̀kp'lɛ̀]	rabbit
[k`làŋ]	wolf		

Similarly in the following words:

Ex. 9

[àtʃw`lɛ́]	fist	[ŋm̀lɛ̀]	bell
[h'ré]	to save	[g'lí]	to become agitated

a Gã may pronounce the words with a vowel before the lateral thus:

Ex. 10

[àtʃwèlɛ́]	fist	[ŋmèlɛ̀]	bell
[héré]	to save	[gílí]	to become agitated

The forms under either Ex. 9 or 10 are perfectly acceptable to the Gã. There is a clear distinction between the examples under Ex. 6 on the one hand and those under Ex. 7, 8, 9, and 10 on the other hand. It would be observed that where a vowel deletion or insertion is possible (Ex. 7 through 10) the deleted or inserted vowel is the same as the vowel which follows the lateral. Furthermore, a lexical formative does not lose its semantic value where a vowel is either inserted or deleted before the lateral. On the other hand, where a vowel which precedes the lateral cannot be deleted, the lateral occurs between two different vowels. An optional phonological rule therefore operates to account for the surface structure occurrence of clusters involving the lateral. The vowel deletion rule is:

P5

$$= [\text{-voc}] \begin{bmatrix} \text{-cons} \\ \text{+voc} \\ \alpha F \\ \beta \text{Tone} \end{bmatrix} = \begin{bmatrix} \text{+voc} \\ \text{+cons} \end{bmatrix} \begin{bmatrix} \text{-cons} \\ \text{+voc} \\ \alpha F \\ \gamma \text{Tone} \end{bmatrix} = \Rightarrow \text{opt}$$

$$= [\text{-voc}] \quad \emptyset \quad = \begin{bmatrix} \text{+voc} \\ \text{+cons} \end{bmatrix} \begin{bmatrix} \text{-cons} \\ \text{+voc} \\ \alpha F \\ \gamma \text{Tone} \end{bmatrix}$$

In this rule [=] represents a syllable boundary. F stands for the other features of the vowel except tone. Notice that the two vowels under consideration do not have to bear identical tones. The deletion rule operates irrespective of tone. If the vowel deletion rule does not apply to words like [lálà] 'song', [lèlè] 'canoe', [lòlòí] 'lava', it is because the initial /l/ has the feature [+voc] while the rule requires an initial [–voc].

On the application of the optional vowel deletion rule, an obligatory tone shift rule assigns the tone of the deleted vowel to the preceding non-vocalic segment. The tone shift rule is:

P 6

$$[\text{–voc}] \longrightarrow [\beta\ \text{Tone}] \ / \ = [\_\_\_] = \begin{bmatrix} \text{+cons} \\ \text{+voc} \end{bmatrix} \quad \begin{bmatrix} \text{+voc} \\ \text{–cons} \end{bmatrix} \quad =$$

[β Tone] equals the value of the tone of the deleted vowel. Generally in Gã, consonants and glides do not carry tone, but when an optional vowel deletion occurs, a non-vocalic element carries tone as the above rule states.

It is phonetically more plausible to write a rule which would shift the tone to the lateral. If this view is followed, it would be because a sonorant is far more likely to carry tone than a non-sonorant. Two reasons make me reject this view as unrealistic. The first reason is that a native Gã articulates a CL cluster with the tone on the C and not on the L. This is done irrespective of whether the C is voiced. The second reason is related to the structure of the Gã syllable. Tone is a feature of the whole syllable though it is generally marked on the vowel where applicable. In a structure $CV_1\ CV_2$, V_1 goes with the preceding C and not with the following one. Since the tone has to stay within the syllable, if the tone has to be shifted, it is shifted on to the consonant with which it constitutes the syllable.

P 5 and 6 are conjunctively ordered in respect to each other but both rules are ordered after the rules which assign homorganicity to the nasal consonant in a cluster. Hence forms like m̀lé, ŋm̀lɛ̀, and ŋ́là are accounted for by the fact that since the homorganic rules apply first, at the time the rules apply, the forms are mèlé, ŋmèlɛ̀ and ŋálà. Later the vowel deletion rule applies, and the homorganic rules no longer re-apply.

A further support for the claim that a cluster involving a lateral is a surface cluster, is seen in the plural formation of independent nominals which contain such clusters. If we examine the following examples:

Ex. 11

Singular (surface)	*Gloss*	*Base*	*Plural* (surface)
[kpɛ̃ŋm̀kp′lɛ̃]	rabbit	[kpɛ̃ŋm̀kpɛ́lɛ̃]	[kpɛ̃ŋm̀kpɛ́dzi]
[f′lɔ́]	hole	[fɔ́lɔ́]	[fɔ́dzi]
[sáḿf`lɛ̀]	window	[sáḿfɛ̀lɛ̀]	[sáḿfɛ̀dzì]
[f′là]	sore	[fálà]	[fádzi]

we shall notice the presence of a vowel before the dzi. If we assume that the plural form is derived from the singular surface form, we have to write a rule to insert that vowel. On the other hand, if we assume that the plural form is derived from the base form then we do not have to account for the vowel before the dzi, because it is part of the structure. This is the correct assumption.

In this paper, I have shown that a re-examination of the consonant 'phonemes' of Gã indicates that the labialized consonants are all predictable. Furthermore, I have also shown that the only cluster which has a valid status initially and medially in the morpheme structure rules of Gã is NC.