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CONSONANT MUTATION IN NZEMA

I. K. CHINEBUAH

One of the most important phonological features of Nzema is the phenomenon of consonant mutation. It is exhibited to a high degree of frequency and consistency by, and for that reason this statement of consonant mutation will be restricted to, the following four forms:

(a) Plural (Pl.) forms (e.g. the k/h alternation in kila/æhila 'mouse' or the h/g alternation in ɛhanĩ/ŋganĩ 'trap').

(b) Verbal noun (Vn.) forms[1] (e.g. the f/v alternation in fʊʔ 'climb'/ɛvʊlɛʔ 'climbing').

(c) Reduplicated (R) forms of verbs (e.g. the t/d alternation in tuʔ/tudu 'dig, uproot' or tĩʔ/tĩndĩ 'pinch').

(d) Tense forms (e.g. the d/l alternation in daʔ 'sleep'/mɔ̃la 'I have slept' or the d/n alternation in daʔ 'sleep'/mã:nna 'I did not sleep'). In the case of the tense forms, exemplication will be drawn from the Present (Pr.), Past (Pt.), Perfect (Per.), Future (Fut.) I and Future II tense Affirmative (A) or Negative (N) forms.

Consonant mutation is not exclusive, however, to the above constructions; some three relationship terms exhibit consonant mutation when they enter into a genitival construction with a preceding pronominal possessive prefix.

(1) sìlɛ́ 'father'/mɪ̀zì 'my father'—exemplifying s/z alternation.

(2) nɪ̀ɬɪ́ 'mother'/ɔ̀ɬɪ̀ 'his or her mother'—exemplifying n/ɬ alternation.

(3) kʊ̀ɬɪ́ 'husband'/jèhʊ̀ 'our husband'—exemplifying k/h alternation.

In Nzema, consonant mutation affects stem-initial consonants and is therefore restricted to a particular place in the structure of a stem. This is illustrated by the following examples of singular/plural nouns:

(4) abusua/æbu$\underline{s}$ũã 'clan' VCV$\underline{C}$ṼṼ: mbusua/mmũ$\underline{s}$ũã 'clans' NCṼ$\underline{C}$ṼṼ.

(5) sua/$\underline{s}$ua 'house' $\underline{C}$VV: azua/æ$\underline{z}$ua 'houses' V$\underline{C}$VV.

In Example (4) the stem-initial C element realized phonetically as the stop b in the singular form mutates as the nasal m in the plural form, but the medial C element (underlined) realized as the voiceless fricative s does not mutate. In Example (5), however-the stem-initial C element (underlined) whose phonetic realization is s in the singular form enters into mutation as the voiced fricative z in the plural form.

In morphological constructions, consonant mutation is a junctural phenomenon occurring at a morpheme boundary. The junction in the case of (a) a plural form is plural prefix (either a vowel or a homorganic nasal)+nominal stem; in the case of (b) a verbal noun the junction is vowel prefix+verb stem; in the case of (c) the reduplicated form of a verb the junction is the countersegment[2] (ending in a vowel or a homorganic nasal)+verb stem; and in the case of (d) a tense form the junction is either pronominal prefix (which may consist entirely of a vowel or end in a vowel which may either be reduced in duration and is represented by ə or not pronounced in normal speech)+verb stem, or tense prefix (ending in a vowel or homorganic nasal)+verb stem.

[1] Other kinds of nominalizations derived from verbs which also involve consonant mutation of the initial consonant of the underlying verb stem are not considered here, although the descriptive statement presented here would apply.

[2] I owe the term 'countersegment' to Dr Florence Dolphyne. See her article 'A phonological analysis of Twi vowels', THE JOURNAL OF WEST AFRICAN LANGUAGES, IV, 1 (1967).

In addition, consonant mutation may be said to be phonologically conditioned; that is, it takes place under the phonological influence of (1) a preceding vowel element symbolized as V (e.g. the k/h alternation in kila/æhila 'mouse' under the phonological influence of the plural formative vowel prefix æ or the t/d alternation in the reduplicated form of the verb tia/tiedia 'walk' under the phonological influence of the preceding final vowel e of the counter-segment); and (2) under the phonological influence of a homorganic nasal consonant element symbolized as N (e.g. the k/g alternation in kila/ŋgila 'mouse' under the phonological influence of the plural formative nasal prefix ŋ or the t/d alternation in the reduplicated form of the verb tī/tīndī 'scratch, pinch' under the phonological influence of the final nasal consonant n of the countersegment). It is to be noted that the noun word kila/kila 'mouse' has two possible plural forms, ahila or ŋgila; the k/h alternation in kila/æhila results from the phonological influence of the V element, whereas the k/g alternation in kila/ŋgila results from the phonological influence of the N element. Such singular nouns with two plural forms in free variation constitute a closed set of nouns whose stem-initial consonants are restricted to k, kw, b, d, cw. In each case, mutation of the stem-initial consonant takes place in one plural form under the influence of the plural formative V element and in the alternative plural form under the influence of the plural formative N element, which is in free variation with the V element, as set out below.

	Stem-initial C	Singular form	Plural forms: Under V influence	Plural forms: Under N influence
(1)	k:	kila/kila 'mouse'	k/h: æhila	k/g: ŋgila
(2)	kw:	koasea/kwasia 'fool'	kw/ʍ: aʍasia	kw/gw: ŋgwasia
(3)	b:	boka/buka ' 'hill'	b/w: awuka	b/m: mmuka
(4)	d:	duku/dukũ 'headkerchief'	d/l: ælukũ	d/n: nnũkũ
(5)	cw:	twea/cwia 'dog'	cw/ɥ: aɥia	cw/ʝw: ɲʝwia

Of the consonants which enter into mutation only the bilabial stop b has three possible mutated forms: w, ɣ, and m; the first two alternations b/w and b/ɣ occur under the influence of V element as in buka/awuka 'hill' and belẽmgbũɬĩ/æɣelẽmgbũɬĩ 'chief' respectively; and the third alternation b/m occurs under the influence of N element as in baka/mmãka 'tree'.

Four consonants, comprising the two stops k, d and the two affricates c, cw, have two mutated forms each, one occurring under V influence and the other under N influence, as illustrated in the following singular/plural forms:

		Alternation under:		
(1)	k/h	V influence	kɪlɛʔ/ahɪlɛʔ	'blow'
	k/g	N influence	kækula/ŋgækula	'child'
(2)	d/l	V influence	dũmã/ælũmã	'name'
	d/n	N influence	dukũ/nnũkũ	'headkerchief'
(3)	c/ʃ	V influence	cɛlɛ/aʃɛlɛ	'hat'
	c/ʝ	N influence	ɛcɛlɛʔ/ɲʝɛlɛʔ	'a kind of bird'
(4)	cw/ɥ	V element	cwia/aɥia	'dog'
	cw/ʝw	N element	cwia/ɲʝwia	'dog'

All other consonants, namely t, kw, kp, f, s, ʃ, ɣ, h, n, l, have one mutated form each. Of the set, the n/ɬ and kw/ʍ alternations take place only under V̶ influence; the kp/gb, ʃ/ʒ, l/n, ɣ/m and h/g alternations take place only under N influence; and the t/d, f/v, s/z alternations occur under either V̶ or N influence.

The regular cases of consonant mutations may be summarized as in Table 1.

Table 1

	Grade 1 (stem-initial C)	Grade 2 (mutated C under N influence)	Grade 3 (mutated C under V̶ influence)	
1	b	m	ɣ	Rule I
2	d	n	l	Rule I
3	n	(n)	ɬ	Rule I
4	k	g	h	Rule II
5	kw	gw	ʍ	Rule II
6	c	ʄ	ʃ	Rule II
7	cw	ʄw	ɥ[3]	Rule II
8	t	d	d	Rule III
9	f	v	v	Rule III
10	s	z	z	Rule III
11	kp	gb		Rule III

And in order to handle the regular cases of consonant mutation summarized above three general rules are stated:

I. Labial or Apical C → (i) continuant under V̶ influence,
(ii) nasal under N influence.
That is, b, m, d, n → (i) *β, *β̃, l, ɬ under V̶ influence,
(ii) m, m, n, n under N influence.
But resultant labial under V̶ influence (i.e. *β, *β̃)
→ (i) dorsal non-lateral if oral,
(ii) non-continuant if nasal.
That is (i) *β → ɣ.
(ii) *β̃ → m.

II. Voiceless dorsal non-labial C → continuant C under V̶ influence.

III. Any stop or non-dorsal continuant C → voiced C under V̶ or N influence.

As regards the remaining cases of consonant mutations, the h/g alternation may be regarded as a special case of the more regular k → g → h alternation (no. 4 of Table 1); the l/n alternation of the d → n → l alternation (no. 2 of Table 1); and the ɣ/m alternation of the b → m → ɣ alternation (no. 1 of Table 1).

It is not, however, all stem-initial consonants that exhibit mutation at the relevant place in the structure of a morphological construction; for example, stem-initial consonant tp in the verb tpĩã 'push' does not enter into mutation in the reduplicated form tpietpĩã. And even stem-initial consonants which exhibit mutation in some constructions may not exhibit mutation in similar or other constructions. For example, the stem-initial C element s in the verb suʔ 'measure' enters into mutation in the reduplicated form suzu, but not in

[3] ɥ represents the voiceless labio-palatal semi-vowel.

the perfect negative tense form mɔ̃tesulı 'I have not measured'. The same stem-initial C element s in the verb siʔ 'build' does not undergo mutation in the reduplicated form sisi nor in the perfect negative tense form mɔ̃tesilı 'I have not built'. But even for these immutable cases it would seem analytically profitable to posit entry into zero-mutation.

To handle the various types of consonant mutation, therefore, I propose, firstly, to set up a five-term junction consonant mutation system as Z, P, H, B and R. Secondly, since a mutated consonant is the alternant of a stem-initial consonant, I set up a two-term stem-initial C system, symbolized as K or G, K being realized as a voiceless stem-initial consonant and G as a voiced stem-initial consonant. Thirdly, I propose to deal with phonological features involving different places of consonant articulation by means of a three-term prosodic system, symbolized by the capital letter superscripts: L (Labiality), A (Apicality) and D (Dorsality). The phonological feature of labiality includes, as phonetic exponents, different kinds of lip articulations: bilabial consonant articulations which may be stop or nasal consonants, and labio-dental fricative consonants.

Under the phonological feature of apicality are subsumed, as phonetic exponents, tip or tip and blade and blade consonant articulations which may be stop, fricative or lateral consonants.

Finally, the phonological feature of dorsality is realized phonetically as consonant articulations with contact or narrowing involving the body (i.e. front, centre or back) of the tongue and may include stop, fricative, nasal and semi-vowels. In the phonological formulae, the prosodic feature of L, A or D characterizes simultaneously Z, P, H, B or R, terms in the consonant mutation system, and K or G, terms in the stem-initial consonant system. There are cases, however, where the prosodic features L, A and D occur in combination; for example, the prosodic pair LA is expounded by the labio-velar implosive stops kp, gb. In nasal complexes the prosodic feature L, A or D or a pair of them applies to the complex as a whole, since in pronunciation the nasal and the following consonant are homorganic.

Table 2 sets out the five-term mutation system, indicating, for each alternation, the determinant phonological influence, Ɐ or N, and the grammatical distribution. In respect of the reduplication of verbs, there is an indication in parentheses of the phonological structure of the verb (CV, CVV, CVCV) which exhibits the particular mutation.

Table 2. Consonant mutation system

Stem-initial C	Ɐ influence	Grammatical distribution	N influence	Grammatical distribution
		Consonant mutation system: term 1, Z-mutation		
t	d	Pl, Vn, R (CV, CVV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	d	Pl, R (CṼ), Pr. N, Pt. A (1st sing.), N; Fut. I, N
k	—	—	g	Pl, Pr. N, Pt. A (1st sing.), N; Fut. I, N

Table 2 (*cont.*)

Stem-initial C	V̄ influence	Grammatical distribution	N influence	Grammatical distribution
ko/kw	—	—	go/gw	Pl, Pr. N, Pt. A (1st sing.), N; Fut. I, N
kp	—	—	gb	Pl, R (CṼ)
f	v	Pl, Vn, R (CVV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	v	R (CṼ), Pr. N, Pt. A (1st sing.), N; Fut. I, N
a	z	Pl, Vn, R (CV, CVV, CVCV), Pt. A (2nd–3rd sing, 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	z	R (CṼ), Pr. N, Pt. A (1st sing.), N; Fut. I, N
ky/c	—	—	gy/ɟ	Pr. N, Pt. A (1st sing.) N; Fut. I, N
tw/cw	—	—	dw/ɟw	Pl, Pr. N, Pt. A (1st sing.), N; Fut. I, N
hy/ʃ	—	—	gy/ɟ	Pl.
		Special case		
h	—	—	g	Pl.
		Consonant mutation system: term 2, P-mutation		
t	t	R (CV, CVCV), Pr. A, Per. N	—	—
k	k	R (CV), Pr. A, Per. N	—	—
kp	kp	Vn, R, Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	kp	Pr. N, Pt. A (1st sing.), N; Fut. I, N
tp	tp	Pl, Vn, R, Pr. A, Pt. A (2nd–3rd sing, 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	tp	Pr. N, Pt. A (1st sing.), N; Fut. I, N
f	f	R (CV, CVCV), Pr. A, Per. N	—	—
s	s	R (CV, CVV), Pr. A, Per. N	—	—

Table 2 (*cont.*)

Stem-initial C	Ɏ influence	Grammatical distribution	N influence	Grammatical distribution
c	c	R (CV), Pr. A, Per. N	—	—
cw	cw	Pr. N, Per. N	—	—
		Consonant mutation system: term 3: H-mutation		
k	h	Pl, Vn, R (CV, CVV, CVCV), Pt. A (2nd–3rd sing, 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	—	—
ko/kw	ho/M	Pl, Vn, Pt. A (2nd–3rd sing. 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	—	—
c	ʃ	Pl, Vn, R (CV, CVV, CVCV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	—	—
tw/cw	hw/ɥ	Pl, Vn, R (CV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	—	—
		Consonant mutation system: term 4, B-mutation		
b	—	—	m	Pl. Pr. N, Pt. A (1st sing.), N; Fut. I, N
b	ɣ	Pl., Pt. A (2nd–3rd sing., 1st 3rd pl.), Per. A; Fut. I, A; Fut. II, A, N—(bɛla 'come' only)	—	—
b	w	Pl.	—	—
d	l	Pl, Vn, R (CVV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	n	Pl, Pr. N, Pt. A (1st sing.), N; Fut. I, N

Table 2 (*cont.*)

Stem-initial C	∀ influence	Grammatical distribution	N influence	Grammatical distribution
n	nl/ɬ	Vn, R (CVV), Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A; Fut. I, A; Fut. II, A, N	—	—
		Special cases		
l	—	—	n	Pl.
ɣ	—	—	m	Pl.
		Consonant mutation system: term 5, R-mutation		
b	b	Vn, R (CV, CVV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	—	—
d	d	R (CV, CVCV), Pr. A, Per. N	d	Pl.
g or gu/gw	g or gw	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	g or gw	Pr. N, Pt. A (1st sing.), N; Fut. I, N
m	m	Vn, R (CV, CVV, CVV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	m	Pr. N, Pt. A (1st sing.), N; Fut. I, N
n	n	R (CV, CVCV), Pr. A, Per. N	n	Pr. N, Pt. A (1st sing.), N; Fut. I, N
ny/ɲ or nw/ɲw	ɲ or ɲw	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	ɲ or ɲw	Pr. N, Pt. A (1st sing.), N.; Fut. I, N
nr/ŋ or nw/ŋw	ŋ or ŋw	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	ŋ or ŋw	Pr. N, Pt. A (1st sing.), N; Fut. I, N

Table 2 (*cont.*)

Stem-initial C	Ɏ influence	Grammatical distribution	N influence	Grammatical distribution
ɟ	ɟ	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	ɟ	Pr. N, Pt. A (1st sing.), N; Fut. I, N
ɣ	ɣ	Vn, R (CVCV) Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	ɣ	Pr. N, Pt. A (1st sing.), N, Fut. I, N
w	w	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N, Fut. I, A; Fut. II, A, N	w	Pr. N, Pt. A (1st sing.), N; Fut. I, N
y/j	j	Vn, R (CV, CVCV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	j	Pr. N, Pt. A (1st sing.), N; Fut. I, N
ɥ	ɥ	Vn, R (CV), Pr. A, Pt. A (2nd–3rd sing., 1st–3rd pl.), Per. A, N; Fut. I, A; Fut. II, A, N	ɥ	Pr. N, Pt. A (1st sing.), N; Fut. I, N

In what follows a detailed description of each term of the mutation system is presented. In the structural formulae, lE is the suffix of a verbal noun and is realized phonetically as le or lɛ according to the vowel harmony; lI is the past tense affirmative or perfect tense negative suffix and is realized phonetically as lɪ; Ɏ is the influential (final) vowel element of the pronominal prefix, tense prefix or the countersegment; N is the influential nasal consonant prefix of plural nouns or the influential final nasal consonant element of tense prefix or the countersegment. Other component parts of the pronominal prefix or tense will retain in the structural formulae their phonetic representation.

TERM I: Z-MUTATION. GENERALIZED FORMULA: KV-/-(Ɐ/N)ZV-

EXAMPLES

(1) t/d						
(a)	tʊba	'bottle'	^{A}KVCV:	adʊba	'bottles'	Ɐ^{A}ZVCV
	tabʊa	'board'	^{A}KVCVV:	ndabʊa	'boards'	^{A}NZVCVV
(b)	tĩʔ	'pinch'	^{A}KṼ:	edĩleʔ	'pinching'	Ɐ^{A}ZṼlE
(c)	tuʔ	'dig'	^{A}KV:	tudu	'dig'	^{A}KɆ^{A}ZV
	tĩʔ	'pinch'	^{A}KṼ:	tĩndĩ	'pinch'	^{A}KṼN^{A}ZṼ
	tia	'walk'	^{A}KVV:	tiedia	'walk'	^{A}KVɆ^{A}ZVV
(d)	tia	'walk'	^{A}KVV:	mãŋẽdia	'I shall not walk'	mãŋṼ^{A}ZVV
(2) k/g						
(a)	kila	'mouse'	^{D}KVCV:	ŋgila	'mice'	^{D}NZVCV
	akɔlɛ	'fowl'	V^{D}KVCV:	ŋgɔkɔlɛ	'fowls'	^{D}NZV^{D}KVCV
(d)	kɔʔ	'go'	^{D}KV:	mã:ŋgɔ	'I did not go'	mã:^{D}NZV
(3) kw/gw						
(a)	kwasıa	'a fool'	^{D}KVCVV:	ŋgwasıa	'fools'	^{D}NZVCVV
(d)	kwæti	'slip'	^{D}KVCV:	mãŋgwætilı	'I slipped'	mã^{D}NZVCVlI
(4) kp/gb						
(a)	kpɔba	'gold nugget'	^{LD}KVCV:	mgbɔba	'gold nuggets'	^{LD}NZVCV
	ɛkpa	'bed'	^{LD}VKV:	mgba	'beds'	^{LD}NZV
(c)	kpũʔ	'smoke'	^{LD}KṼ:	kpũmgbũ	'fumigate'	KṼN^{LD}ZṼ
(5) f/v						
(a)	fũɬĩ	'corpse'	^{L}KṼCṼ:	ævũɬĩ	'corpses'	Ɐ^{L}ZṼCṼ
(b)	fʊʔ	'climb'	^{L}KV:	ɛvʊlɛʔ	'climbing'	Ɐ^{L}ZVlE
(c)	fũʔ	'dig'	^{L}KṼ:	fũmvũ	'dig'	^{L}KṼ^{L}NZṼ
	fıa	'hide'	^{L}KVV:	fıɛvıa	'hide'	^{L}KVɆ^{L}ZVV
(d)	fıa	—	—	m(ə̃)ba:vıa	'I shall hide'	mə̃bɆ:^{L}ZVV
(6) s/z						
(a)	sua	'house'	^{A}KVV:	æzua	'houses'	Ɐ^{A}ZVV
(b)	suʔ	'measure'	^{A}KV:	ezuleʔ	'measuring'	Ɐ^{A}ZVlE
(c)	suʔ	—	—	suzu	'measure'	^{A}KɆ^{A}ZV
	sʊ̃ʔ	'weed'	^{A}KV:	sũnzʊ̃	'weed'	^{A}KṼNZṼ
	sie	'keep'	^{A}KVV:	siezie	'keep'	^{A}KVɆ^{A}ZVV
	sılı	'laugh'	^{A}KVCV:	sılızılı	'laugh'	^{A}KVCɆ^{A}ZVCV
(d)	sılı	—	—	mə̃zılı	'I have laughed'	mṼ^{A}ZVlI
(7) c/ɟ						
(a)	eci:	'small'	V^{D}KVV:	ɲɟici	'small'	^{D}NZV^{D}KV
(d)	cıʔ	'catch'	^{D}KV:	mã:ɲɟıʔ	'I did not catch'	mã:^{D}NZV
(8) cw/ɟw						
(a)	cwıa	'dog'	^{D}KVV:	ɲɟwıa	'dogs'	^{D}NZVV
(d)	cwĩʔ	'pull'	^{D}KṼ:	mã:ɲɟwĩ	'I did not pull'	mã:^{D}NZṼ
(9) ʃ/ɟ						
(a)	eʃɛlɛʔ	'a kind of bird'	V^{D}KVCV:	ɲɟɛlɛʔ	'birds'	^{D}NZVCV
			Special case			
(10) h/g						
(a)	ɛhan(ĩ)	'trap'	V^{D}KVC(Ṽ):	ŋgan(ĩ)	'traps'	^{D}NZVC(Ṽ)

The above examples are cases of Z-mutation, and the K/Z alternation expounds a type of consonant mutation in which the mutated consonant Z has the same place and manner of articulation as the stem-initial consonant K and voicelessness as a feature of the stem-initial consonant is related to voicing as a feature of the mutated consonant. In the special case (no. 10), however, the members of the h/g alternation have the same place of articulation but the manner of articulation is different.

The phonetic exponents of K/Z alternation are the mutation pairs: t/d, k/g, kw/gw, kp/gb, f/v, s/z, c/ɟ, cw/ɟw, ʃ/ɟ, h/g.

In respect of place of articulation the mutation pair f/v expounds labiality; t/d and s/z expound apicality; k/g, kw/gw, c/ɟ, cw/ɟw, ʃ/ɟ and h/g expound dorsality; and the mutation pair kp/gb expounds both labiality and dorsality. In the case of the h/g alternation, the members share the common feature of dorsality but are opposed as voiceless fricative to voiced stop.

It is to be noted that the mutation pairs ʃ/ɟ and h/g are restricted to pluralization; the mutation pair kp/gb is restricted to pluralization and reduplication of CṼ verbs only; and the mutation pairs k/g, c/ɟ, and cw/ɟw, all occurring under N influence, are restricted to pluralization and tense forms. The other mutation pairs of the set, namely t/d, f/v and s/z, are unrestricted to any particular forms.

TERM 2: P-MUTATION. GENERALIZED FORMULA: KV–/–(Ɐ/N)PV–

EXAMPLES

(1)	t/t					
(c)	tɪʔ	'tear'	^{A}KV:	tɪtɪ	'tear'	^{A}KƐ^{A}PV
	tia	'tread on'	^{A}KVV:	tietia	'tread on'	^{A}KVƐ^{A}PVV
	toli	'comb'	^{A}KVCV:	tolitoli	'comb'	^{A}KVCƐ^{A}PVCV
(d)	toli	—	—	mətoli	'I have combed'	mṼ^{A}PVCV
(2)	k/k					
(c)	kaʔ	'bite'	^{D}KV:	kɪka	'bite'	^{D}KƐ^{D}PV
(d)	kaʔ	—	—	məka	'I bite'	mṼ^{D}PV
	kaʔ	—	—	mətɛkali	'I have not bitten'	mətƐ^{D}PVII
(3)	kp/kp					
(b)	kpʊʔ	'wash'	^{LD}KV:	ɛkpʊlɛʔ	'washing'	Ɐ^{LD}PVIE
(c)	kpaʔ	'shave'	^{LD}KV:	kpʊkpa	'shave'	^{LD}KƐ^{LD}PV
	kpũã	'sweep'	^{LD}KṼṼ:	kpʊɔkpũã	'sweep'	^{LD}KVƐ^{LD}PṼṼ
	kpɔlɔ	'go bad'	^{LD}KVCV:	kpɔlɔkpɔlɔ	'go bad'	^{LD}KVCƐ^{LD}PVCV
(d)	kpɔlɔ	—	—	jəkpɔlɔ	'it has gone bad'	jƐ^{LD}PVCV
(4)	tp/tp					
(a)	tpɪmã	'grass cutter'	^{LA}KVCṼ:	atpɪmã	'grass cutters'	Ɐ^{LA}PVCṼ
(b)	tpɪʔ	'struggle'	^{LA}KV:	ɛtpɪlɛʔ	'struggling'	Ɐ^{LA}PVIE
(c)	tpĩʔ	'drip'	^{LA}KṼ:	tpĩtpĩ	'drip, drizzle'	^{LA}KṼ^{LA}PṼ
	tpĩã	'push'	^{LA}KṼṼ:	tpietpĩã	'push'	^{LA}KVƐ^{LA}PṼṼ
(d)	tpĩã	—	—	mətpĩã	'I have pushed'	mṼ^{LA}PṼṼ

(5)	f/f					
(c)	fiʔ	'vomit'	^{L}KV:	fifi	'vomit'	^{L}K$\bar{V}^{L}$PV
	fiti	'make a hole'	^{L}KVCV:	fiti-fiti	'make a hole'	^{L}KVC$\bar{V}^{L}$PVCV
(d)	fiti	—	—	m(ə̃)fiti	'I have made a hole'	m($\tilde{\bar{V}}$)^{L}PVCV
	fiti	—	—	mẽ:mfiti	'I did not make a hole'	mẽ:^{L}NPVCV
(6)	s/s					
(c)	siʔ	'build'	^{A}KV:	sisi	'build'	^{A}K$\bar{V}^{A}$PV
	sũã	'tear'	^{A}K$\tilde{V}\tilde{V}$:	suosũã	'tear'	^{A}KV$\bar{V}^{A}$P$\tilde{V}\tilde{V}$
(d)	sũã	—	—	mə̃sũã	'I have torn'	m$\tilde{\bar{V}}^{A}$P$\tilde{V}\tilde{V}$
	sũã	—	—	mẽ:nsũã	'I did not tear'	mẽ:^{A}NP$\tilde{V}\tilde{V}$
(7)	c/c					
(c)	cɪʔ	'bind'	^{D}KV:	cɪcɪ	'bind'	^{D}K$\bar{V}^{D}$PV
(d)	cɪʔ	—	—	mə̃tɛcɪlɪ	'I have not bound'	mə̃t$\bar{V}^{D}$PVlI
(8)	cw/cw					
(d)	cwīʔ	'pull'	^{D}K$\tilde{V}$:	mə̃tɛcwīlī	'I have not pulled'	mə̃t$\bar{V}^{D}$P$\tilde{V}$lĨ

The above examples are cases of P-mutation and exhibit zero-mutation; that is, K corresponds or is equivalent to P. In phonetic terms, the stem-initial consonant K has the same place and manner of articulation as the immutable juncture consonant P and voicelessness as a feature of K is related to voicelessness as a feature of P.

The phonetic exponents of the K/P correspondence are the voiceless stops t, k, kp, tp, the voiceless fricatives f and s and the voiceless affricates c and cw. The prosodic features of L, A and D are dispersed among the members of the set. Of the set, f expounds the prosodic feature of labiality; t, s expound apicality; c, cw, k are exponents of dorsality; tp expounds both labiality and apicality; and kp expounds both labiality and dorsality.

As regards grammatical distribution, the zero-mutation pairs t/t, k/k, f/f, s/s, c/c are restricted to reduplication and certain tense forms. The zero-mutation pair cw/cw is restricted only to certain tense forms. The zero-mutation pair kp/kp is exhibited by verbal noun, reduplicated and tense forms. The zero-mutation tp/tp has a wider distribution, which includes plural, verbal noun, reduplicated and tense forms.

TERM 3: H-MUTATION. GENERALIZED FORMULA: KV-/-$\bar{V}$HV-

EXAMPLES

(1)	k/k					
(a)	kila	'mouse'	^{D}KVCV:	æhila	'mice'	$\bar{V}^{D}$HVCV
(b)	kaʔ	'bite'	^{D}KV:	ɛhalɛʔ	'biting'	$\bar{V}^{D}$HVlE
(c)	kãʔ	'say'	^{D}K$\tilde{V}$:	kĩhã	'say'	^{D}K$\tilde{\bar{V}}^{D}$H$\tilde{V}$
	kũã	'gather'	^{D}K$\tilde{V}\tilde{V}$:	kuohũã	'gather'	^{D}KV$\bar{V}^{D}$H$\tilde{V}\tilde{V}$
	kũndo	'roll'	^{D}K$\tilde{V}$CCV:	kũndohũndo	'roll'	^{D}K$\tilde{V}$CC$\bar{V}^{D}$H$\tilde{V}$CCV
(d)	kãʔ	'say'	^{D}K$\tilde{V}$:	m(ə̃)ba:hã	'I shall say'	m(ə̃)b$\bar{V}$:^{D}H$\tilde{V}$

(2) kw/ʍ:						
(a)	kwasɪa	'a fool'	^{D}KVCVV:	aʍasɪa	'fools'	$\forall^{D}$HVCVV
(3) c/ʃ						
(a)	cɛlɛ	'hat'	^{D}KVCV:	aʃɛlɛ	'hats'	$\forall^{D}$HVCV
(b)	cɛʔ	'share'	^{D}KV:	ɛʃɛlɛʔ	'sharing'	$\forall^{D}$HVlE
(c)	cɛʔ	—	—	cɪʃɛ	'share'	^{D}K$\forall^{D}$HV
	cɪa	'bend'	^{D}KVV:	cɪɛʃɪa	'bend'	^{D}KV$\forall^{D}$HVV
	ciba	'twist'	^{D}KVCV:	cibeʃiba	'twist'	^{D}KVC$\forall^{D}$HVCV
(d)	ciba	—	—	m(ə̃)be:ʃiba	'I shall twist'	m(ə̃)b$\forall$:^{D}HVCV
(4) cw/ɥ						
(a)	cwɪa	'dog'	^{D}KVV:	aɥɪa	'dogs'	$\forall^{D}$HVV
(b)	cwĩʔ	'pull'	^{D}KṼ:	ɛɥĩlɛʔ	'pulling'	$\forall^{D}$HṼlE
	cwĩʔ	—	—	cwĩɥĩ	'pull'	^{D}KṼ^{D}HṼ
(d)	cwĩʔ	—	—	mə̃ɥĩ	'I have pulled'	m$\tilde{\forall}^{D}$HṼ

In the above examples of H-mutation, the K/H alternation expounds a third type of consonant mutation, in which voicelessness as a feature of the stem-initial consonant K is related to voicelessness as a feature of the mutated consonant H and, although the manner of the voiceless articulations is different, the place of articulation is the same.

The K/H alternation is realized phonetically as k/h, kw/ʍ, c/ʃ and cw/ɥ. In each case, the alternation takes place under the phonological influence of $\forall$ element. The four mutation pairs expound the common prosodic feature of dorsality. In respect of manner of articulation, the members of the mutation pair k/h are opposed as plosive to fricative; in the mutation pair kw/ʍ the members are opposed as plosive to semi-vowel; in the pair c/ʃ, affricate articulation is opposed to fricativity; and in the pair cw/ɥ, affricate articulation is opposed to semi-vowel articulation.

As regards grammatical distribution, all the alternations of the set, k/h, kw/ʍ, c/ʃ and cw/ɥ, are unrestricted and are exemplified by plural, reduplicated, verbal noun and tense forms.

TERM 4: B-MUTATION. GENERALIZED FORMULA: GV-/-(∀/N)BV-

EXAMPLES

(1) b/m						
(a)	baka	'tree'	^{L}GVCV:	mmãka	'trees'	^{L}NBṼCV
	æbusũã	'clan'	V^{L}GVCṼṼ:	mmũsũã	'clans'	^{L}NBṼCṼṼ
(d)	bɛla	'come'	^{L}GVCV:	m(ə̃)mmãlɪ	'I came'	m(Ṽ)^{L}NBṼlI
(2) b/ɣ						
(a)	belẽmgbũɬĩ	'chief'	^{L}GVCṼCCṼCṼ:	æɣelẽmgbũɬĩ	'chiefs'	$\forall^{D}$BVCṼCCṼCṼ
(d)	bɛla	'come'	^{L}GVCV:	mə̃ɣa	'I have come'	m$\tilde{\forall}^{D}$BV
(3) b/w (or b/m)						
(a)	bʊka	'hill'	^{L}GVCV:	awʊka or mmʊ̃ka	'hills' 'hills'	$\forall^{D}$BVCV ^{L}NBṼCV
	bʊlɛ	'stone'	^{L}GVCV:	awʊlɛ	'stones'	$\forall^{D}$BVCV

	bʊzʊ̃ɬĩʔ	'idol'	^{L}GVCṼCṼ:	awʊzʊ̃ɬĩʔ	'idols'	V^{D}BVCṼCṼ
	bʊlɔfʊlɛʔ	'European'	^{L}GVCVCVCV:	awʊlɔfʊlɛʔ	'Europeans'	V^{D}BVCVCVCV
	bʊlʊkʊʔ	'book'	^{L}GVCVCV:	awʊkʊlʊʔ or mmʊlʊkʊʔ	'books' 'books'	V^{D}BVCVCV ^{L}NBVCVCV
(4)	d/l					
(a)	dʊ̃mã	'name'	^{A}GVCV:	ælʊ̃mã	'names'	V^{A}BṼCṼ
(b)	diʔ	'eat'	^{A}GV:	elileʔ	'eating'	V^{A}BVlE
(c)	die	'receive'	^{A}GVV:	dielie	'receive'	^{A}GVV^{A}BVV
(d)	die	—	—	m(ə̃)be:lie	'I shall receive'	m(ə̃)bV:^{A}BVV
(5)	d/n (or d/l)					
(a)	dɪhɪlɛʔ	'royal person'	^{A}GVCVCV:	nnɪhɪlɛʔ or alɪhɪlɛʔ	'royal persons' 'royal persons'	^{A}NBVCVCV V^{A}BVCVCV
(d)	daʔ	'sleep'	^{A}GV:	mənnãlɪ	'I slept'	mə̃^{A}NBṼlI
	daʔ	—	—	mã:nnã	'I did not sleep'	mã:^{A}NBṼ
(6)	n/ɬ					
(b)	nʊ̃ʔ	'drink'	^{A}GṼ:	ɛ̃ɬʊ̃lɛʔ	'drinking'	Ṽ^{A}BṼlE
(c)	nĩã	'look'	^{A}GṼṼ:	nĩɛ̃ɬĩã	'look for'	^{A}GṼṼ^{A}BṼṼ
(d)	nĩã	—	—	məɬĩã	'I have looked'	mṼ^{A}BṼṼ
			Special cases			
(7)	l/n					
(a)	ɛlɛka	'box'	V^{A}GVCV:	nnɛ̃ka	'boxes'	^{A}NBṼCV
(8)	ɣ/m					
(a)	ɣalɛ	'child'	^{D}GVCV:	mmãlɛ	'children'	^{L}NBṼCV
	ɛɣɛlɛʔ	'proverb'	V^{D}GVCV:	mmɛ̃lɛ̃ʔ	'proverbs'	^{L}NBṼCV

In the above examples (nos. 1–6) of B-mutation, the G/B alternation expounds a fourth type of consonant mutation, in which voicing as a feature of the stem-initial consonant G is related to voicing as a feature of the mutated consonant B and, although the place of the voiced consonants is, generally speaking, the same, the manner of articulation is different. It is to be noted that in the case of the b/ɣ and ɣ/m alternations, both the place and manner of articulation are different.

The G/B alternation is realized phonetically as b/m, b/w, d/l, d/n, l/n, n/ɬ, b/ɣ and ɣ/m.

The b/m alternation (occurring under N influence) has the common features of labiality and voice, but the alternants are opposed as plosive to nasal consonant articulation. In respect of grammatical distribution, the b/m alternation is restricted to plural forms and certain tense (i.e. present negative, past affirmative 1st person singular, past negative and future I negative) forms.

The members of the mutation pair l/n (occurring under N influence) share the common features of apicality and voice but are opposed as lateral to nasal consonant articulation. As regards its grammatical distribution, the l/n alternation is restricted to plural forms of singular nouns in which the stem-initial consonant l is preceded by a vowel prefix.

The members of the mutation pair ɣ/m (occurring under N influence) have voicing as the only common feature and are opposed as oral, dorsal and fricative consonant articulation to labial and nasal consonant articulation.

The alternants of the mutation pair b/w (occurring under Ⱶ influence) share the common features of labiality and voice, although the alternant w has also the feature of dorsality; the alternants are, however, opposed as plosive to semi-vowel. In terms of distribution, the b/w alternation is restricted to the plural forms of a closed set of singular noun forms (e.g. bʊka/awʊka and the loan word bʊlʊkuʔ/awʊlʊkuʔ) which are characterized by the common phonological feature of the presence of the back rounded vowel ʊ or u in the first syllable of the singular form.

The common features characterizing the members of the mutation pair d/l (occurring under Ⱶ influence) are apicality, voice and orality, but the members are opposed as plosive to lateral. The d/l alternation is not restricted in its grammatical distribution but is dispersed among plural, verbal noun, reduplicated and tense forms.

The n/ɬ opposition (occurring under Ⱶ influence) has the common features of apicality, nasality and voice, but differ as nasal to lateral consonant articulation. The n/ɬ alternation is exhibited by verbal noun, reduplicated and tense forms. It is to be noted that within the reduplication of verbs both the d/l and n/ɬ alternations are restricted to verbs of CVV structure only and thereby serve to distinguish such verbs from those of CV and CVCV structure.

The members of the mutation pair b/ɣ (occurring under Ⱶ influence) are related in terms of voice only but are opposed as labial plosive to dorsal fricative. In terms of distribution the b/ɣ alternation is restricted to the plural form of the noun word belɛ̃mgbʊ̃ɬĩ/æɣelɛ̃mgbʊ̃ɬĩ 'chief' and the tense (i.e. past affirmative 2nd and 3rd person singular and 1st–3rd person plural, perfect affirmative, future I affirmative and future II affirmative and negative) forms of the verb bɛla 'come' only.

Finally, the d/n alternation (under N influence) has the common features of apicality and voice but the alternants are opposed as oral plosive to nasal consonant articulation. In terms of distribution, the d/n opposition is excluded from verbal noun and reduplicated verbal forms but exhibited by plural and tense forms.

TERM 5: R-MUTATION. GENERALIZED FORMULA: GV-/-(Ⱶ/N)RV-

EXAMPLES

(1) b/b						
(b) buʔ	'break'	ᴸGV:		ebuleʔ	'breaking'	ⱵᴸRVlE
(c) buʔ	—	—		bubu	'break'	ᴸGⱵᴸRV
bia	'wash'	ᴸGVV:		biebie	'wash'	ᴸGVⱵᴸRVV
(d) bɪlɪ	'bend'	ᴸGVCV:		bɪlɪbɪlɪ	'bend'	ᴸGVCⱵᴸRVCV
(d) bɪlɪ	—	—		m(ɜ̃)bɪlɪlɪ	'I have bent'	m(Ⱶ̃)ᴸRVCVlI

The above examples (restricted for convenience to b- initial stems) expound R-mutation, which, like P-mutation, is zero-mutation. Initial G therefore corresponds or is equivalent to R. The phonetic exponents of the G/R correspondence, like those of the K/P correspondence, have the same place and manner of articulation, but differ from the exponents of K/P which are voiceless in that they are characterized by voicing.

The exponents of the G/R correspondence are the voiced plosives b, d, g, gw, the

nasals m, n, ɲ, ɲw, ŋ, ŋw, the voiced affricates ɟ, ɟw, the voiced fricative ɣ and the voiced semi-vowels w, j, ɥ. All the exponents, except the b/b correspondence which occurs only under V influence, may occur under either V or N influence. Of the set of exponents, the voiced plosives, g, gw, the nasals m, ɲ, ɲw, ŋ, ŋw, the voiced affricates ɟ, ɟw and the voiced semi-vowels w, j, ɥ consistently exhibit zero-mutation in all morphological constructions, although there are restrictions on the distribution of each initial consonant in verbs of different phonological structure. Of the remaining exponents, the b/b correspondence (occurring under V influence) and the ɣ/ɣ correspondence (occurring under V or N influence) are exhibited by verbal noun, reduplicated and tense forms. The d/d and n/n correspondence (under V influence) are exhibited by the reduplicated forms of verbs of CV and CVCV structures and certain tense (i.e. present affirmative and perfect negative) forms. The d/d correspondence (under N influence) is restricted to plural forms of singular nouns with a vowel prefix (e.g. ɛdãlɛʔ/ndãlɛʔ 'cloth'). The n/n correspondence (under N influence) is restricted to certain tense (i.e. present negative, past affirmative 1st person singular and past negative, and future I negative) forms.

THE GRAMMATICAL AND LEXICAL FUNCTIONS OF MUTATION

One important grammatical function of consonant mutation is that it serves to distinguish present tense affirmative forms from perfect tense affirmative (1st person singular and 1st–3rd person plural) forms—e.g. mekɔ/mə̀kɔ̀ 'I go' and mehɔ/mə̀hɔ̀ 'I have gone'. This distinction is restricted to certain exponents of Z-mutation (i.e. t/d, f/v, s/z), H-mutation (i.e. k/h, kw/ʍ, c/ʃ, cw/ɥ and B-mutation (i.e. d/l, n/ɬ and b/ɣ in the case of bɛla 'come' only).

Another grammatical function of mutation is that it serves in part to distinguish reduplicated from simple (non-reduplicated) verbal forms in respect of (a) their verbal noun forms and (b) certain tense (i.e. present negative, past affirmative and negative, perfect affirmative, future I and II affirmative and negative) forms. This phonological distinction lies in the fact that the non-reduplicated verbal forms exhibit Z-mutation, whereas the reduplicated verbal forms exhibit P-mutation. In the case of the verbal noun forms the distinction is restricted to verb stems of CV and CVCV structure in which the stem-initial C element is realized as the voiceless consonants t k, f, s, c and the voiced consonants d, n, but in the case of the tense forms the distinction only applies to the voiceless consonants t, k, f, s, c.

EXAMPLES

Mutation	Verb		Verbal noun form	
(1) t/d	(a) te/tɪʔ	'pluck'	ɛdelɛ/ɛdɪlɛʔ	'plucking'
t/t	(b) tete/tɪtɪ	'pluck'	ɛtetelɛ/ɛtɪtɪlɛʔ	'plucking'
(2) d/l	(a) dɔ/dɔʔ	'weed'	ɛlɔlɛ/ɛlɔlɛʔ	'weeding'
d/d	(b) dodɔ/dʊdɔ	'weed'	ɛdodɔlɛ/ɛdʊdɔlɛʔ	'weeding'
			Tense Forms	
(3) t/d	(a) tɪʔ	'pluck'	mende/mə̃ndɪ	'I do not pluck'
t/t	(b) tɪtɪ	'pluck'	mentete/mə̃ntɪtɪ	'I do not pluck'
(4) d/n	(a) dɔʔ	'weed'	mendɔ/mə̃nnɔ	'I do not weed'
d/d	(b) dʊdɔ	'weed'	mendodɔ/mə̃ndʊdɔ	'I do not weed'

Consonant mutation may serve to distinguish the different senses of a lexical item. For example, the verb tia/tia has at least two senses: (1) 'walk or toddle' and (2) 'tread on or kick'. In its first sense, it has the verbal noun form edialɛʔ the reduplicated form tiedia and the perfect tense affirmative jədia 'he has walked', all three forms exhibiting the t/d alternation of Z-mutation. In its second sense, it has the corresponding verbal noun form etialɛʔ, the reduplicated form tietia and the perfect tense affirmative form jətia 'he has trod on or kicked', all three forms exhibiting the t/t correspondence of P-mutation, which is a case of zero-mutation.

Consonant mutation may also serve, among other descriptive means, to distinguish two homonymous items. The verb words 1. sua/sùà 'tear' and 2. sua/sùà 'prop against' are homonyms. The first verb has the verbal noun form esũãlɛʔ, the reduplicated form suosũã and the perfect tense affirmative form mɔ̃sũã 'I have torn', all three forms exhibiting the s/s correspondence of P-mutation. On the other hand, the second verb has the corresponding forms ezũãlɛʔ, suozũã and mɔ̃zũã 'I have propped something against', the three forms exhibiting the s/z alternation of Z-mutation.

Such lexical distinction by means of consonant mutation is restricted to the verbal noun, reduplicated and certain tense (i.e. present negative, past affirmative and negative, perfect affirmative, Future I and II affirmative and negative) forms of a small number of verbs of CVV structure.

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