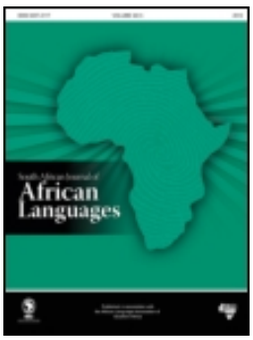

South African Journal of African Languages

ISSN: 0257-2117 (Print) 2305-1159 (Online) Journal homepage: http://www.tandfonline.com/loi/rjal20

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To cite this article: Alice Mwihaki (2004) A Case for the Phonetic Feature [Tongue], South African Journal of African Languages, 24:1, 13-19

To link to this article: http://dx.doi.org/10.1080/02572117.2004.10587222

A Case for the Phonetic Feature [Tongue]

Alice Mwihaki
Department of Kiswahili and African Languages, Kenyatta University,
P.O. Box 43844, Nairobi, Kenya
Email: *amwihaki2003@yahoo.com*

Based on the autosegmental principles of phonemic licensing, this article argues a case for the phonetic feature [tongue] to function as a cover label for all true consonants that are articulated with a tongue stricture. The case evolves from a qualitative analysis of two strategies of the adaptation of Gîkûyû loanwords from English: vocalic epenthesis and velar softening.

Vocalic epenthesis is an assimilation strategy which focuses on the front high vowel, /i/. This vowel is regularly inserted in the environment of the true [+con.–voc.] consonants, which are also articulated with a tongue stricture. Unlike the back vowels /u/ and /o/ which regularly occur in the environments of labials and the liquid respectively, the constraint of /i/ epenthesis is not generalizable by any set of recognized phonetic features.

Velar softening concerns a foregrounding of Dahl's Law of Dissimilation in the Gîkûyû phonological structure. This strategy defines the suppletion of the back voiceless plosive, /k/, to the homorganic voiced fricative, /ɣ/, in the environment of the voiceless obstruents of the tongue stricture. Once again, it seems impossible to capture a definitive constraint of the suppletion process by reference to the current set of phonetic features.

Overview

This article argues a case for the recognition of the phonetic feature [tongue]. The feature [tongue] is conceptualized in terms of the perceived upward elevation of the body of the tongue as a whole. This elevation is concomitant with both the primary and the secondary articulation of true consonants, [+con.-voc.], that require a tongue stricture. This case is, however, postulated without direct validation from experimental phonetics.

Experimental evidence is assumed unnecessary on the basis of existing knowledge. It is already accepted knowledge that sections of the body of the tongue are co-articulators with corresponding organs of the roof of the mouth. This action involves a general raising of the body of the tongue, since the latter generally acts as the movable articulator. It also indicates a relatively high elevation of the tongue position, due to the fact that the articulation of true consonants involves a close constriction of the air stream mechanism.

In arguing a case for the phonetic feature [tongue], this article revisits the debate on the Chomsky-Halle distinctive feature system (see Schane, 1973; Hyman, 1975; Ladefoged, 1982; Padgett, 1995). This system initially came up with four primary placement features for consonants, namely: [anterior], [coronal], [high] and [back].These features serve as cover labels for various classes of consonants:

[anterior] → labial, dental and alveolar;
[coronal] → dental and palatal;
[high] → palatal and velar;
[back] → velar and uvular.

The labial class stands out from the other classes of consonants, since their articulation does not involve a tongue stricture. Significantly, subsequent revisions of the distinctive feature system eventually came up with the additional placement features of [labial] and [glottal]. The physical scale of the feature [labial] corresponds to the perceived degree of approximation to the centers of the lips and that of the feature [glottal] to the rate of upward movement of the glottis, during phonation (see Hyman, 1975).

The logic behind the phonetic features [labial] and [glottal] can be taken to indicate an omission, in the sense that there lacks a correlating placement feature for the other classes of consonants. Correlation would be conceptualized in terms of the existence of a shared articulator, such as the tongue. The property [tongue] may not be a placement

feature in the strict sense of this term but it would appropriately function as a cover label for all the true consonants of the tongue stricture: notably the dental, alveolar, palatal and velar obstruents, as well as the nasals.

The significance of the tongue stricture for phonological operations was initially inferred from Hyman (1975), in connection with consonant-vowel associations of Maxakali and Burmese. Hyman cites certain epenthetic processes that seem to provide evidence for the shared properties of consonants and vowels. These properties specifically relate to tongue height assimilation, an indication of tongue position agreement among certain classes of consonants and vowels. Similar findings are presented in Mwihaki (1998, 2001).

Mwihaki (1998, 2001) infers a case for the phonetic feature [tongue] from a qualitative analysis of the phonological strategies involved in the adaptation of loanwords from English into Gĩkũyũ [ɣekojo]. Phonological adaptation refers to systematic change in sound structure, governed by specific grammatical constraints of the recipient language (see Anttila, 1972; Bynon, 1977; Hock, 1986). Three major strategies of phonological change are identified: sound substitution, sound insertion and syllable deletion. These strategies correlate with three basic aspects of loanword phonology: phonemic, phonotactic and prosodic.

The strategies employed in the adaptation of loanwords can be considered a response to specific principles that govern permissible structures as well as the optimal forms of the recipient language. Some strategies may reveal hitherto unknown constraints, which call for the revision of existing tenets and descriptive apparatus. Gĩkũyũ loanword phonology manifests situations which require a phonetic feature for the tongue stricture consonants. Logically and also economically, the postulated feature is simply labeled [tongue]. This feature can capture significant phonemic relationships, which are otherwise impossible to account for in an explicit or convincing manner.

The interpretation of phonemic relations in particular and phonological connections in general, would of necessity anchor in the concomitant inventory of phonemes. Gĩkũyũ phonology is constrained by an inventory of twenty-five phonemes: seven vowels and eighteen consonants. The following illustrative charts can be considered representative of Gĩkũyũ phonemic constraints. Both charts are adapted from Mwihaki (1998).

Table 1: Vowel Chart

Tongue Height	Tongue Placement		
	front	central	back
high	i		u
mid-high	e		o
mid-low	ɛ		ɔ
low		a	

Table 2: Consonant Chart

Manner of Articulation		Place of Articulation					
		labial	dental	alveolar	palatal	velar	glottal
obstruent	plosive			t		k	
	fricative	ɸ	θ		š	ɣ	h
	prenasal	mb		nd	ɲǰ	ŋg	
sonorant	nasal	m		n	ɲ	ŋ	
	liquid			r			
	glide				j	w	

Whereby: ɲǰ = ndʒ; š = ʃ

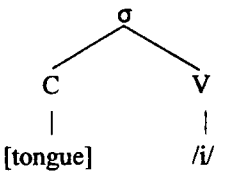
Besides these phonemic constraints, Gĩkũyũ phonology functions on an obligatory open syllable system. Except the word-initial V forms, the Gĩkũyũ syllable unit is predictably a CV structure. In this structure, C and V function as syllable onset and syllable rhyme, respectively. This seemingly simple syllable structure, however, motivates a wide range of phonotactic processes. The phonotactics of Gĩkũyũ is, therefore, a rich area of study.

The notion of phonotactics is conceptualized in relation to a principle of Autosegmental Phonology, which views

phonotactic structure as a system of phonemic licensing at the levels of the syllable and the word (see Katamba, 1989; Durand, 1990; Goldsmith, 1990; Carr, 1993). Consistently, Gîkûyû loanword phonology employs two phonemic licensers: the syllable for tautosyllabic and the word for heterosyllabic association.

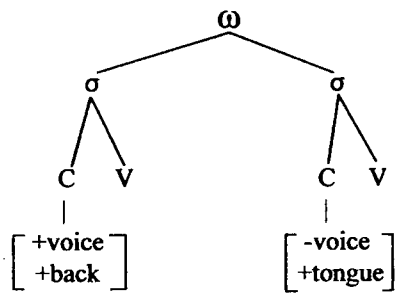
An instance of tautosyllabic phonemic licensing is exemplified in the constraint involved in the epenthesis of the front high vowel, /i/, (cf. **Vowel Epenthesis**). Assuming that the general constraint of the consonants co-occurring in the same syllable (σ) of a word is the tongue stricture, [+tongue], the following representation can be considered valid:

Figure 1: Tautosyllabic vowel licensing



Alongside the open syllable system, Gîkûyû phonology is constrained by Dahl's Law of Dissimilation. This law is foregrounded as the heterosyllabic suppletion of the voiceless velar plosive, /k/, to the voiced homorganic counterpart, /ɣ/, in the environment of a voiceless consonant of the tongue stricture (cf. **Velar Softening**). Notably, consonantal dissimilation takes place irrespective of the properties of co-occurring vowels. Assuming the property [tongue] to be operational, consonantal relations can be generalized at word (ω) level:

Figure 2: Heterosyllabic vowel suppletion



Despite the multi-linear conception of phonotactic structure, the illustrative data adopts a linear representation. This treatment need not be seen as a contradiction in terms, given the fact that the view of phonotactics stressed here is anchored in phonemic relations. A linear representation of the specific processes and general rules can be credited with the transparency of phonemic relationships. Significant relationships are associated with the two strategies of phonemic licensing cited above: vowel epenthesis and velar softening.

Vowel Epenthesis

A systematic comparison of the Gîkûyû and the English sound systems reveals that these phonologies function on distinct syllable structure conditions (SSC). Except for the rare word-initial context, the Gîkûyû word-forms comprise the obligatory concatenations of consonant-vowel (CV) units. In contrast, the syllable structure of English allows up to a cluster of three consonants (see Roach, 1983).

In view of the Gîkûyû SSC, the English consonant clusters co-occur with empty, (ø) vowel positions (see Goldsmith, 1990; Mwihaki, 1998). The empty vowel positions would hence need to be filled in order to preserve the preferred syllable structure. Ultimately, each consonantal unit is linked to a unitary vowel to derive CV . . . word-forms. Consider the skeletal derivations of CVC > CVCV, CCV > CVCV and CVCC > CVCVCV, which correspond to [pɪn] > [mbini], [drɔ:] > [ndirɔ:] and [vest] > [vɛst], respectively.

Owing to the distinct SSC, therefore, vowel epenthesis is clearly a pervasive strategy of the phonological adaptation of Gîkûyû loanwords from English. Three epenthetic vowels are regularly used in different tautosyllabic derivations: /i/, /u/, /o/. The back vowels, /u/ and /o/, are inserted in the environment of labials and the liquid, respectively. Consider:

(1) ø > u

soup [su:p] > thubu [θuɸu]
form [fɔ:m] > bomu [ɸɔmu]
plot [plɒt] > mburoti [mburɔti]

(2) ø > o

file [faɪl] > bairū [ɸairo]
mile [maɪl] > mairū [mairo]
bill [bɪl] > mbiirū [mbi:ro]

The operations illustrated above indicate the existence of a degree of phonetic affinity between the vowel /u/ and the labial consonants on the one hand, as well as the vowel /o/ and the liquid articulation, on the other. Such an affinity presupposes a general phonetic harmony between certain vowels and given classes of consonants (see Mwihaki, 2001).

Given this correlation, it is possible that the high, front vowel, /i/, has some affinity with the relatively high consonants in terms of tongue height approximation. The vowel, /i/, is regularly inserted adjacent to the consonants /θ/, /t/, /nd/, /n/, /š/, /ɲǰ/, k/, /ɣ/, /ŋg/ and /ŋ/, as illustrated in (3) to (12). Assuming that the phonotactic processes are simultaneous with phonemic adaptation, it is helpful to focus on the derived rather than the underlying consonant in order to discern the constraint of this operation.

(3) ø > i / θ -

stage [steɪǰ] > thitînji [θiteɲǰi]
desk [desk] > ndethiki [ndɛθiki]
tennis [tenɪs] > tenethi [tɛnɛθi]

(4) ø > i / t -

shirt [šɜ:t] > shati [šati]
note [nəʊt] > noti [nɔti]
suit [su:t] > thuuti [θu:ti]

(5) ø > i / nd -

card [kɑ:d] > kandi [kandi]
cent [sent] > thendi [θɛndi]
bond [bɒnd] > bûndi [ɸondi]

(6) ø > i / n -

chain [čeɪn] > ceni [šɛni]
pin [pɪn] > mbini [mbini]
line [laɪn] > raini [raini]

(7) ø > i / š -

brush [brʌš] > buraci [ɸuraši]
dance [dæns] > ndaci [ndaši]
torch [tɔ:č] > toci [tɔši]

(8) ø > i / ɲǰ -

inch [ɪnč] > inji [iɲǰi]
page [peɪǰ] > bînji [beɲǰi]
lunch [lʌnč] > ranji [raɲǰi]

(9) ø > i / k -

cheque [ček] > ceki [šɛki]
break [breɪk] > mburîki [mbureki]
clinic [klɪnɪk] > kiriniki [kiriniki]

(10) ø > i / ɣ -

degree [dɪgri:] > ndigirii [ndiɣiri:]
taxi [tæksi] > tegithi [tɛɣiθi]
inspector [ɪnspektə] > thibegita [θiɸɛɣita]

(11) ø > i / ŋg -

bank [bæŋk] > bengi [ɸeŋgi]
glass [glɑ:s] > ngirathi [ŋgiraθi]
grade [greɪd] > ngirîndi [ŋgirendi]

(12) ø > i / ŋ -

king [kɪŋ] > king'i [kiŋi] (as in drafts)
ring [rɪŋ] > ring'i [riŋi] (as in boxing)
wing [wɪŋ] > wing'i [wiŋi] (as in a building)

A salient observation of this operation concerns the fact that different categories of consonants are involved in the epenthesis of the high, front vowel, /i/, illustrated above. These consonants incorporate plosives, affricates, fricatives and nasals. Such a range of sounds implies that the features [sonorant], [continuant], [delayed release] and [voice], are operant in one way or another. Hence these features cannot capture a generalization.

Besides manner of articulation, there is variation in view of consonantal placement. The consonants involved include dentals, alveolars, palatals and velars. The broad range of inclusion could be re-interpreted to mean that the entire primary placement features, namely [anterior], [coronal], [high] and [back], are operant. The general constraint of this strategy, therefore, cannot be defined by means of the primary placement features.

One observation can, however, be made of the relevant consonants: they are true [-vocalic] consonants of the tongue stricture (see Schane, Hyman, Ladefoged, ibid.). It is plausible that the constraint regulating the epenthesis of the high vowel /i/ derives from the correlatively high position of the body of the tongue involved in the articulation of the affected consonants.

The recognition of the phonetic feature [tongue] would enable us to formulate a general feature rule for /i/ epenthesis. Rule formulation tentatively invokes the placement feature [coronal] for vowel specification, owing to the phonetic affinity of /i/ and the palatal approximant /j/ indicated in vowel gliding. Notably, coronal sounds are articulated with the blade of the tongue above its neutral position. Hence, the feature [coronal] will provide a precise means of distinguishing /i/ from the back or the front counterpart.

(13) ø > V / C –

[+ coronal] [+ tongue, - vocalic]

The formulation of this rule has hesitated to use the feature [front] in the specification of the vowel /i/. Citation of this feature would cloud motivation, in view of the presence of some back consonants in the same operation. The features [high], [close] or [diffuse], are also avoided since they would include the back vowel /u/. It is therefore unlikely that any of these features can define the general constraint of /i/ epenthesis. The rule formulated in (13) excludes all labials, glottals, approximants, and vowels except /i/.

An opinion has been expressed that /i/ is probably a default vowel for Gîkûyû loanword adaptation. This argument would be invalid for two reasons: the epenthetic processes also involve the back vowels mentioned above (cf. (1) and (2)), and, /i/ can only be seen to be prevalent relative to the prevalence of tongue stricture consonants. All the seven vowels of Gĩkũyũ function in a heterosyllabic strategy describable as vocalic spreading: consider the derivative [setlə] > [θɛtɛra] or [dʌzn] > [ndaθani] (also see Mwihaki, 1998).

The epenthesis of /i/ can be considered an instance of consonant-vowel (CV) harmony, an affinity correlative with the agreement assumed of the epenthetic /u/ and /o/, illustrated above. Since a Gîkûyû (CV) structure represents a unitary syllable, the operant harmony can be re-interpreted as an instance of tongue height agreement. Validity for the feature [tongue] is further indicated in a dissimilation strategy that involves velar softening.

Velar Softening

Velar Softening describes the suppletion of the voiceless plosive, /k/, to the homorganic voiced fricative, /ɣ/. The fricative is derived where the plosive precedes a dental, an alveolar, a palatal or a velar voiceless consonant, in the succeeding syllable. This process is re-interpreted to mean that a Gîkûyû phonological principle de-associates the plosive

/k/ from either the obstruent /θ/, /t/, /š/ or /k/, in the following syllable. The whole de-association strategy involves the actualization of Dahl's Law of Dissimilation (cf. **Overview**).

Dahl's Law of Dissimilation describes a general principle that governs specific voicing de-association in certain cases of Bantu phonology (see Kenstowicz and Kisseberth, 1977). This law is productive in the Gîkûyû phonological structure (see Mbugua, 1990; Mwihaki, 1998). As a productive synchronic rule, Dahl's Law of Dissimilation functions as a constraint of the phonological adaptation of loanwords as illustrated below:

(14) k > γ / - $θ

socks [sɒks]	>	thogithi [θɔγiθi]
course [kɔ:s]	>	gothi [γɔ:θi]
taxi [tæksi]	>	tegithi [tɛγiθi]

(15) k > γ / - $t

carton [kɑ:tn]	>	gotoni [γɔtɔni]
packet [pækɪt]	>	mbagiti [mbaγiti]
ticket [tɪkɪt]	>	tigiti [tiγiti]

(16) k > γ / - $ š

agriculture [ægrɪkʌlčə]	>	ngirigaca [ŋgiriγaša]
lecture [lekšə]	>	regeca [rɛ γɛša]
scotch [skɒč]	>	thigoci [θi γɔši]

(17) k > γ / - $ k

khaki [kɑ:ki]	>	gaaki [γa:ki]
cake [keɪk]	>	geki [γɛki]
cocoa [kəʊkəʊ]	>	goko [γɔkɔ]

A salient observation of this operation concerns the correlation of the constraint of velar softening with that of /i/ epenthesis. The relevant sounds are dental, alveolar, palatal and velar consonants, incorporating the primary placement features of [anterior], [coronal], [high] and [back]. A phonological rule invoking these features would be meaningless, as it would involve opposing values of any of the phonetic properties.

Besides belonging to three primary placements of articulation, the consonants involved incorporate plosives and fricatives. This would then mean that the potentially relevant features of [continuant] or [delayed release], would not be definitive of the constraint. Significantly, both values of [continuant] are operant while [delayed release] is irrelevant for fricatives. The elimination of these properties leaves us with the feature [voice].

The feature [voice], however, operates exclusive of the labials and the glottal, all of which are articulated without a tongue stricture. This observation can be re-interpreted to mean that the presence of a tongue stricture is an essential condition of velar softening in the Gîkûyû phonological structure. In other words, it is difficult to determine a general constraint of velar softening for Gîkûyû without reference to the tongue stricture.

Reference to the tongue stricture would be tantamount to the recognition of a phonetic feature [tongue]. This recognition allows phonological descriptions to capture the salient properties of velar softening, for Gîkûyû, in a general rule. Rule formulation also needs the feature [back], on account of the input and the output to the process.

(18) C → C / - $ C

$$\begin{bmatrix}\text{-voice}\\ \text{+back}\end{bmatrix} \qquad [\text{+ voice}] \qquad \begin{bmatrix}\text{- voice}\\ \text{+tongue}\end{bmatrix}$$

Usually, the equivalent of (18) is represented as a phonemic rule. The problem with the phonemic rule lies in the obscurity of the conditions or the principle behind the procedure as a phonological entity. In the formulation of (18), both the motivation and the constraint of the rule are transparent: dissimilation in terms of the voice value, where the phonetic property of tongue height or its equivalent is essential. This condition cooperates with its correlate for /i/ epenthesis, in the validation for the phonetic feature [tongue].

Summary and conclusion

This article has argued a case for the recognition of the phonetic feature [tongue], with reference to two strategies of the adaptation of Gĩkûyû loanwords. These strategies indicate salient properties of tautosyllabic assimilation and heterosyllabic dissimilation, in relation to vowel epenthesis and velar softening, respectively. Their representation aims to satisfy the general structure dependency criterion for phonological operations.

Vowel epenthesis is a response to the need for the preservation of the preferred Gĩkûyû syllable structure, occasioned by the English consonant clusters. A pervasive strategy for breaking consonant clusters involves the epenthesis of unitary vowels that derives CV... sequences, in which case the choice of the epenthetic vowel is constrained by specific consonantal properties. The case in point is the epenthesis of the high, front vowel, /i/, which regularly occurs in the environment of true consonants of the tongue stricture.

Velar softening is an actualization of Dahl's Law of Dissimilation that regularly occurs in the Gĩkûyû phonological structure. This law is manifest as the suppletion of the voiceless velar plosive to the homorganic voiced fricative in the environment of tongue stricture voiceless consonants. Immediately notable is the relevance of the feature [voice]. The feature [voice] alone is however unable to account for the application of tongue stricture consonants, to the exclusion of the labials and the glottal.

Conclusively, a limitation in the existing apparatus for phonological description is indicated. The existing system of distinctive features does not seem to have a logical set of features for capturing significant generalizations relating to vowel epenthesis and velar softening. However, since all the operant consonants involve a tongue stricture, it is possible that the adoption of the phonetic feature [tongue] would capture significant structural generalizations. This assumption is concomitant with the conviction that use of the feature [tongue] would enrich specific aspects of descriptive phonology through the enhanced concreteness and economy of rule formulation.

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