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Effects of Plural Suffixation on Tone Assignment in the Keiyo Language Spoken by the Keiyo Community in Kenya

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Abstract
This paper discusses the effects of the plural suffixes on the assignment of tone in Keiyo language. The aim of the study was to analyze the phonological and prosodic processes that Keiyo nouns (both definite and indefinite) undergo when inflected for number. Since the research was basically descriptive, a design that allowed for the careful description of the phonological characteristics was used. The research was carried out in Tambach Division of Keiyo District in Rift Valley Province. Four adult native speakers who have spent their entire lives in Tambach Division were selected as respondents as they had a rich inventory of the Keiyo nominal vocabulary. The author engaged them with a list of different kinds of generated nouns in their root forms, the singular forms and their corresponding plurals for them to confirm the researcher's version of the selection of suffixes. Data analysis was done in various stages. From the findings, Keiyo has about three (3) different underlying tones that include High (H), Low (L) and Mid (M). As such, tone is assigned on a noun depending on the meaning that is desired from the individual word. It was noted that plural suffixes in Keiyo are of two forms the indefinite default **/in/** and the definite default **/ik/** respectively. These two suffixes are however realized differently in different contexts because of constraining phonological factors. Noun roots in Keiyo in their standard forms predominantly carry mid-tone or occasionally a low tone. This feature is however exclusive to the first syllable of the noun roots. The rest of the syllables that follow will also be dictated by the harmony factor. Therefore, when the suffix applies, the initial mid-tone in the root word changes to a low (L) tone in the suffixed word and then to a high (H) tone on the suffix boundary which in most cases is the last syllable in the realized plural suffixed word. Upon suffixation therefore, the features found in the singular nouns and those brought in by the suffixes merge and create a new pattern of tone in the plural form.
Keywords: Effects, Plural Suffixation, Tone Assignment, Keiyo Language, Keiyo Community, Kenya

1. Introduction

The majority of Kalenjin languages suffix their nouns for pluralisation. This suffixation process creates a phonological re-arrangement in the root-word because of the new properties contained in the incoming suffix. One such re-arrangement is the repositioning of tone. This new pattern is occasioned by phonological factors that include assimilation, coalescence, voicing, length and the absence or presence of ATR feature. In many African languages, tone is crucial both at the semantic and grammatical levels. Divine (1994) points out that several of these languages have tonal systems in which the distributional freedom of the tone begins to show culminativity- the presence of one syllable in a word that functions as tonally prominent. This implies that in a word, one syllable is more prominent than the rest. This prominence, according to Devine (ibid.) comes about because the sounds of a language do not all have the same intensity even if the utterance is produced with stable energy input.

1.1 Morphemes and Tone Assignment

Pulleyblank (2008), among others, have argued that the theory of tone assignment is based on a conception of morphology claiming that the structure of the word is similar to that of an onion: it is made up of strata. Goldsmith (1990) describes the strata as the small compartments in which affixation processes and phonological rules can be packaged together.

This paper argues that the Keiyo noun stem is organised into two strata. The singular nominal form (i.e. the root + definite or indefinite singular suffix) is formed at stratum one whereas the nominal plural form (i.e. singular stem + plural definite or indefinite suffix) is derived at level two.

It is worth noting that tone assignment is done at the various strata of lexical phonology whereby each morpheme independently comes with its underlying tonal characteristics so that at each stage of suffixation there is a re-assignment of tone.

Moreover, tone is assigned differently on the root, definite singular stem, and the nominal plural form.

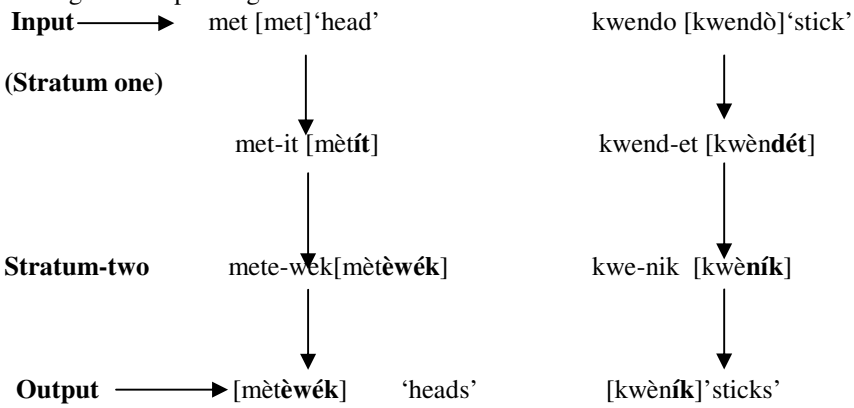
Examples:

Tone on roots	Tone on singular Noun	Tone on plural nouns	Gloss
[met]M	metit[mètít] LH	metewek[mètèwék]LLH	'head'
kwendo[kwendò]ML	kwendet[kwèndét]LH	kwenik[kwèník]LH	'stick'
sapta[saptà]ML	saptet[sàptét]LH	saptaik[sàptàík]LLH	'tin'
moi [moi]M	moita[mòítà]LHL	moek[mòék]'LH	'calf'

From the above, it is observed that the tonal statuses of the words in the three columns present a certain trend of tonal assignment. On the roots, there is a general mid tone on the first syllables and a low tone on the second syllable (if it is present). Upon suffixation (both singular and plural) the mid tone on the root word changes to a low tone.

If the root-word contains a second syllable with a low tone, by default this changes to a high tone or takes the plural suffix and again takes a high tone. Each suffix comes with its unique tonal characteristics quite different from those on the root or stem. When they (the root and suffix) merge, tonal patterns get reorganised. These different tones are picked at different levels because of the suffixes with different phonological features.

The following is a sample diagrammatic derivation of the above nouns:



From the two arguments on how the theory addresses the aspects of suffixation and tone assignment, the author investigated the effect of plural suffixation on tone assignment of the Keiyo language.

1.2 Tone

Devine (1994) argues that the sounds of a language do not all have the same intensity even if the utterance is produced with stable input energy and unchanging fundamental frequency. Loud speech vowels tend to be produced with much greater jaw openings. Devine (ibid.) implies that at least the different syllables in the word will have different intensities occasioned by several factors, one being the rule which states that vowel sounds have greater intrinsic intensity than consonants since the latter are produced with greater articulatory constriction. Therefore, the intensity differences on the vowel occasion the pitch differences.

Schulman (as cited in Laver, 1994) agrees with Devine and observes that syllables vary in the way their prominence is perceived. He says that in a chain of continuous articulation, the pronunciations of some syllables are made to stand out. The general assumption is that the more prominent a syllable is the greater the muscular effort that has been devoted by the speaker to the articulation of its constituent segments. Other things being equal, one syllable is more prominent than another is to the extent that its constituent segments display higher pitch, greater loudness, longer duration or greater articulatory excursion from the neutral disposition of the vocal tract.

The state in Keiyo is that in the singular, nouns have vowels that may be high or low. But when the plural suffixes are taken, the vowels in the suffix combine with those in the singular noun causing lengthening and high pitch. See the example below.

Singular nouns	Gloss
a) chorin/tʃòrín/	'thief'
b) werit /wèrít/	'son'

However, when they convert into their plural forms, the suffixes used to pluralize once affixed on the root noun, phonologically creates long vowels or diphthongs at the suffix position. The result is that the duration of articulation is prolonged at these lengthened vowels/ diphthongs and intensity rests in these positions. The duration of articulation and intensity heightens here attracting pitch and consequently tone from the initial position in the singular noun. See the two examples below.

Singular	Plural	Gloss
a) chorin [tʃòrín]	cho-riik[tʃòrí:k]	'thief'
b) werit [wèrít]	we-riik [wèrí:k]	'son'

Ohala (as cited in Laver, 1994) states that it has been noted for 50 years that other things being equal, the average pitch of vowels shows a systematic correlation with vowel height. That is the higher the vowel, the higher the pitch.

Lehiste and Peterson (1961) have been able to show from data measured in over 1,200 different syllables from a single adult male speaker of American English that the average pitches below were found.

Table 1: Intrinsic pitch on vocoids

Vocoid	***Average Hz***	Vocoid	Average Hz
[i]	183 Hz	[u]	182Hz
[I]	173Hz	[ʊ]	171Hz
[ɛ]	166z	[o]	170Hz
[ə]	164Hz	[ɔ]	160Hz
[æ]	162Hz		

Table showing the average Hz being higher on high vowels

Source: Laver, 2000, p. 455

Similar results, according to Lehiste and Peterson (ibid.) were found in Iteskiri a Nigerian language of West Africa. This implies that the two Keiyo plural suffixes – **/in/** and **/ik/** both carry the high vowel **/i/** and hence the reason for attracting high pitches and tones to them. This is the high vowel that joins with the vowel in the last syllable of the singular noun to realize either a diphthong or a long vowel. This is the most productive suffix variant but the other is **/-ek/,** and **/ok/** used with particular nouns. This feature makes the pluralized nouns pull the high tones towards these positions from the initial singular position.

This correlation of vocoid height and tone height, according to Devine, is physiologically based on the fact that when the tongue is raised for the production of a high vocoid it is hypothesized that the effect on the larynx is to pull it slightly upwards and thus raising the frequency of their vibration and hence pitches leading to higher tones.

1.3 Limitations of the Study

The research was faced with certain limitations including the fact that since little has been done in Keiyo language in general, it was difficult getting literature on the same. This caused the author to review literature in other languages with similar features under study. The same factor also meant that crucial information was to be based on the data. In addition, data for the study was largely generated by the researcher. However, for verification purposes selected respondents were used. This selection only concentrated on the Keiyo population living around Tambach region and used this to confirm the researcher's generated data. Tambach was chosen because of its proximity to the researcher. Again it was not possible to go round getting representative respondents across the District. Time was a limiting factor.

2. Materials and Methods

Since the research was basically descriptive, a design that allowed for the careful description of the phonological characteristics was used. Descriptive design and causal-comparative design thus were chosen for the study and explained below. The descriptive design was used not only for the description of the factual surface realisations but also the explanation of the underlying principles governing plural suffix selection. The causal-comparative design aimed at determining the phonological factors responsible for the plural suffix variant selection and the eventual tone assignment. The design became appropriate because it was necessary to have a comparison of the plural suffix variants selected by singular nouns and establishing the causes and factors responsible for the selection of each variant by the singular nouns. Secondly the design became appropriate since the tonal characteristics of the singular and the plural nouns needed to be compared in order to observe and describe the general shifts as a result of suffixation.

Although the researcher generated data, it warranted that certain parts of the data be subjected to selected respondents for verification. These respondents were selected from Tambach Division of Keiyo District in Rift Valley Province. The reason for choosing the site was because historically, at the time of dispersion, the Kenyan Kalenjin final point of separation took place at this point. Towett (1979) says that the Keiyo remained at Tambach as the Kipsigis and the Nandi moved to the south. This (former) remnant eventually multiplied to form the larger Keiyo community. For a concrete and more reliable lot of respondents this region was found more appropriate. Four adult native speakers who have spent their entire lives in Tambach Division were selected for this task. These were those deemed to have a rich inventory of the Keiyo nominal vocabulary.

The researcher interviewed four selected respondents for verification. The researcher engaged them with a list that contained already generated nouns in their root forms, the singular forms and their corresponding plurals for them to confirm the researcher's version of the selection of suffixes. A list of different kinds of nouns ranging from foods, plants, animals, people, heavenly bodies, body parts, farm implements, technological instruments among others was subjected to them. The above nouns were clustered into three: the standard forms, the deverbalised and the borrowed nouns and each of these categories had the root, the singular and the corresponding plural forms.

Apart from the list of nouns, the author also used a tape-recording machine. This was important because it helped to capture the prosodic changes. As they pronounced the nouns in their roots, singular forms and then in their plural forms, tape-recording was done and it was easy to later analyse the assignment of tone.

Once the required data had been collected, analysis was done along three stages. First, the nouns were sorted out into their various categories-the standard, the deverbalised and the borrowed, the de-adjectivalised and the compounded nouns. Once this was done, a table was made for each category. Each of the tables had five columns – A, B, C, D, and E. Column A contained the root of the noun, B the singular form in the indefinite, C the indefinite plural form, D the definite singular form and E the definite plural form. Once this was done, all the nouns both in the singular and plural forms as well were transcribed phonetically and at this point not only the researcher's intuition was important but also the respondents' input.

Transcription was then an important stage in revealing the resultant phonological features of the nouns as they change from singular to plural. These include the types of vowels found in the roots of nouns and the general Keiyo language phonotactics. The author then studied all these nouns to observe whether or not in the plural noun forms there was a general rule that attached specific plural suffix variants to specific syllables that end the singular nouns. At this point phonological factors responsible for this were described.

The author also, through careful transcriptions, observed the general patterns between the singular forms and the plural forms to see if there is a general rule of tone placement when the different plural variants are used. It was also important to consider the three tables to observe whether certain nouns are prone to a particular plural suffix. Out of this, the observed pattern was then used to categorise the nouns.

3. Results and Discussion

3.1 Tone Assignment

3.1.1 Tone System in Keiyo

Generally, Keiyo has about three (3) different underlying tones that include the following:

- High (H)
- Low (L)
- Mid (M)

These three different tones have possible options of combination that include L+H (LH) and H+L (HL). These tones and the combinations are exemplified below.

High (H) Tone

The study did not come across any noun roots monosyllabic, disyllabic or polysyllabic whose initial syllable is of H tone. However, the following words are some examples with H tones on post initial syllables of some noun roots:

koi[koí] (MH) 'this house'
mui[muí] (MH) 'this skin'

Low (L) Tone

pey[peì] (L) 'water'
kong'[kòŋ] (L) eye'
ter [tèr] 'pot' (L)

Rising Tone

maiyo[màíjo](LHM) 'liquor'
kaine[kàíne](LHM) 'what happened?'
ee[eé] (MH) 'yes'
moet[mòét] (LH) 'wound'

Falling Tone

tiany[tiàɲ] (HL) animal'
ilat[ílàt] (HL) 'thunder'

Level/Mid Tone

kenen[kenen](MM) 'name'
roop[ro:p](MM) 'rain'

3.1.2 Tone on Noun Roots

The above examples depict that tone is distinctive in Keiyo as the cases below indicate

moet[mòét] (LH) 'wound'
moet[móét] (HH) 'Don't deny'
maiyo[màíjo] (LHM) 'liquor'
maiyo[máíjo] (HHM) 'didn't cook'

This shows that tone is assigned in a noun depending on the meaning that is desired from the individual word. This fact is seen to manifest itself, especially in monosyllabic and disyllabic words like the examples given above.

This also exemplifies that it is the tone system adapted in the noun root that determines the kind of suffix it eventually takes. This is because altering the nouns already observed, or several different noun forms for example in:

moet[mòét] (LH) 'wound'
moet[mòèt] (LL) 'stomach '
moet[móèt] (HL) 'name of person'

This fact also greatly determines the kind of plural suffix that agree with particular noun forms, e.g.

Singular definite	**Plural definite**	**Gloss**
moet[mòèt] (LL)	mootinwek[mó:tinwék]	'Stomach'
moet[mo´e´t] (HH)	mook[mó:k]	'wound'

As individual entities (without plural suffixes), Keiyo singular noun forms have their independent tones, depending on the meaning attached to them. These singular noun forms could also be monosyllabic as in *[ko]* 'house' or disyllabic as in *[moet]* 'wound' or even polysyllabic as in *[makatarwa]* 'cactus'

3.1.3 Tone on the Plural Suffix

It was observed that plural suffixes in Keiyo are of two forms the indefinite default /in/ and the definite default /ik/. These two suffixes are however realised differently in different contexts because of constraining phonological factors. In general, Keiyo has the following suffixes:

Table 2: Keiyo Suffixes

Number	**Indefinite**	**Definite**
Singular	-t	-it
	-in	-et
	Ø	Ø
Plural	-in	-ik
	-en	-ek
	-on	-ok
	-oi	-ok/ ik

From this table, it follows that most of these suffixes begin with vowels. Some take the high [i], others the back and low [o], and some take the mid, front [e]. Each of these vowels has its unique properties and these properties determine the tonal states of the suffixes.

So that at their independent states they carry the following tones:

/ík/ (H) / ín/ (H)
/ek/ (M) /òn/ (L)
/òk/ (L) /òí / (LH)

However (as is discussed in subsequent sections), the suffixes that are seen to carry mid (M) or low (L) tones combine with other final vowels of the roots making them heavy and hence high. This indirectly implies that ideally, a big number of these suffixes are of high (H) tones and associate themselves with the final syllables of the singular nouns making these high in tone. It is these underlying tones that are eventually linked to those in the root words by certain rules of conformity (Bodda, 2008, p. 117).

3.1.4 Suffixation and Tone

Having looked at the Keiyo tone systems and the independent noun and suffix tone specification, it is then important to analyze the processes that take place when the suffixes attach to the roots.

To do this, the tables provided under the standard, deverbal and borrowed nouns below was used.

Standard Nouns

i) Indefinite Plurals

Table 3: Indefinite Plural Suffixation

Root	Suffix	Realization	gloss
ket[ket]M	-in	ket-in[kètín]LH	Tree
ma[ma]M	-in	mat-in[mà̱tín]LH	Fire
it[it]M	-in	it-in[ì̱tín]LH	Ear
morna[mornà]ML	-in	mor-in[mòrín]nLH	Finger
mbar[mbar]M	-en	mbar-en[mbàrén]LH	Land
supa[supà]ML	-en	sup-en[sùpén]LH	Log
angurwa[aŋurwà]MML	-on	angur-oon[àŋùrwá]LLH	A plant
tarakwa[tarakwà]MML	-on	tarak-oon[tàrakwá]LH	Cedar
kata[kata]MM	-oi	kat-oi[kàtoí]LH	Thorn

It is seen that the noun roots in Keiyo in their standard forms have the mid-tone or occasionally a low tone. This feature is exclusive to the first syllable of the noun roots. The other syllables that follow will also be dictated by the harmony factor. Therefore, when the suffix applies I realize that the initial mid-tone in the root word changes to a low (L) tone in the suffixed word and then to a high (H) tone on the suffix boundary which in most cases is the last syllable in the realized plural suffixed word.

There seems to be a rule that changes a mid-tone into a Low tone in a plural suffixed noun in the following way:

Mid tone → Low tone /-Plural suffix

From this, it seems that Keiyo operates on a mid-tone in most of its singular noun roots. This arrangement however is distorted by plural suffixing. Note also that, the vowels in the singular roots are ideally –ATRT. However, when they take the plural suffixes, these same vowels change to +ATR

This is true because the combination of [o+i], [e+n], [i+n] and [o+n] in the suffixes create a series layer of double voice suggesting that the larynx vibrates more than expected. In an abstractive competition between [–ATR] and [+ATR], we realize that the later wins as it gets closer to a free of strain production of the [+voice + voice] cluster. Probably this is eventually spread regressively and harmonically to the rest of the vowels in the word.

As such a mid tone in initial [–ATR] vowel in the singular root, reduces further to a low tone when takes the [+ATR] feature

[-ATR] ⟶ [+ATR] / Plural –

ii) Definite Plural

Table 4: Definite Plural Suffixation

Root	Suffix	Realization	Gloss
ket[ket]	-ik	ket-iik[kètí:k]	Tree
ma[ma]	-ik	mot-iik[mo̱tí:k]	Fire
ko[ko]	-ik	kor-iik[kòrí:k]	House
morna[mornà]	-ik	mor-iik[mòrí:k]	Finger
sapta[sapta]	-ik	sapt-aik[sàptaík]	Tin
moi[moi]	-ek	mo-ek[mòék]	Calf
karwa[karwa]	-ok	karon-ook[kàronó:k]	Fence

Apart from the roots like *karwa[karwa]*MM which eventually takes a [n] epenthetic in the plural form, the rest in the data display a different feature unlike in the indefinite case. The inclusion of the epenthetic [n] does not change the vowels in the suffixed word. But the other suffixes [ik] and [ek] do change the states of the vowels in the word. This is because, the [k] in the suffix is –voice. This factor makes it attract a [+front+high] variant of [i]. The mid tones in the initial syllables of the roots are retained in the plural form. But the heavy syllable in the suffix is quite high and this effect forces the syllable preceding it to adapt the H tone feature.

In the long run where the word is Polysyllabic the first syllable is mid tone and the last two are H, H, i.e.

1st syllable	Penultimate syllable	last syllable
M	H	H

Deverbalised Nouns

Indefinite Plurals

Table 5: Indefinite Plural Suffixation

Root	Suffix	Realization	Gloss
chor[tʃor] M	Non-seqmental	choor[tʃó:r] H	Thieves
sus[sus] M		suus[sú:s] H	Biters
kol[kol] M		kool[kó:l] H	Planters
pan[pan] M		paan[pá:n] H	Witches
mor[mor] M		moor[mó:r] H	Insultors

Like it was the case with the standard Keiyo noun, the deverbal roots also have low tones in their initial syllable. However, to pluralise them, there is the use of a covert suffix that is non-segmental. This suffix is realised at two levels:

a) At the level of length. The initial vowel in the singular lengthens in the plural form

b) At the level of tone - Once this vowel lengthens, a high tone is attached to it.

There's therefore, a movement from a mid tone in the singular to a High tone in the plural through a rule

Mid tone ⟶ High tone /First syllable

Secondly, the quality of the vowel also transforms from a [–ATR] to [+AT], in the plural form. And this could be attributed to the absence of the plural segment.

Hence the rule applicable is that a –ATR vowel becomes a +ATR if it comes in the first syllable of a plural indefinite noun.

[-ATR] ⟶ [+ATR] / Plural

Definite Plural

Table 6: Definite Plural Suffixation

Root	Suffix	Realization	Gloss
chor[tʃor]M		chor-iik[tʃorí:k]MH	Thieves
sus[sus]M		sus-iik[susí:k]MH	Bitters
kol[sol]M		kol-iik[kolí:k]MH	Planters
pan[san]M		pan-iik[paní:k]MH	Witchdoctors
mor[mor]M		mor-iik[morí:k]MH	Insultors

It is observed that the vowel quality in the singular root is not affected in the plural. This is voiceless because of the phoneme /k/ in the plural suffix. Being a voiceless consonant, it combines with [i] and eventually produced as front.

As such it doesn't change the vowels to [+ ATR]. This feature also makes the mid tones in the singular form unaffected. If the word is however Polysyllabic, like

tangurur [taŋgùrúr] (MLH) 'snore'

The effect is that the vowels in the last syllable of the word (which is of a low tone), associates with that syllable in the neighbouring vowel (suffix) which has a high tone and makes the former syllable also attain a high tone. Thus

tangururik [taŋgùrúrík] (MLHH) 'snorers'

Borrowed Nouns

Indefinite Plurals

Table 7: Indefinite Plural Suffixation

Root	Suffix	Realization	Gloss
panga[páŋgà]	-ai	panga-i[pàŋgaí]	Matchet
ndege[ndégè]	-ai	ndeg-ai[ndègaí]	Plane
skuli[skúlì]	-in	sukul-in[sùkulín]	School
mkate[mkátè]	-in	makat-in[màkatín]	Bread

These borrowed words come with their unique features like stress and tone from the loaning language. When they are taken by Keiyo part of their nativization is to adapt them into the phonotactics of the language. Secondly they are fitted into the tone system. From the data we realize that *'panga' 'ndege'* and' *mkate'* are borrowed from Swahili and this language insists on high tones falling on the first syllabus of nouns. When used in Keiyo this pattern is changed so that they take mid tone acceptable in Keiyo. Hence:

H tone ⟶ **M** tone / first syllables

This means that a high tone changes to a mid tone on the first syllables of the noun roots.

It is also evident that in Swahili the last syllables are normally L. When used in Keiyo this changes to the new language's systems where the use of [ai] makes them adapt H tones. Again this is captured as follows:

L H / ⟶ # ⟶

This means that a low tone on the last syllable in Swahili changes into high tones when used on the same syllable in the same position in Keiyo.

Definite Plurals

Table 8: Definite Plural Suffixation

Root	Suffix	Realization	gloss
panga[páŋgà]HL	-ik	pange-shek[pàŋgeʃék]LMH	Matchet
ndege[ndégè]HL	-shek	ndege-shek[ndègeʃék]LMH	Plane
skuli[skúlì]HL	-shek	sukuli-shek[sùkulíʃék]LMHH	School
mkate[mkátè]HL	-nik	makatin-ik[màkatíník]LMHH	Bread

Different from the analysis earlier made, this category presents a radical shift, with the definite suffix /ʃek/. While we expected this suffix to take High tones like the other suffixes, it doesn't do so. Instead it takes the low tones. This could be attributed to the fact that this plural suffix has two voiceless consonantal phonemes, /ʃ/ and /k/**.** In between these two is the mid vowel /e/.

Therefore, this combination of a mid vowel, and two voiceless consonants would find it hard to retain an H tone especially if there is an adjacent syllable having vowels with high properties, or voiced consonants.

Thus in cases like the ones below

/-lishek/

/-jikeshek/

The environments that have both high vowels and voiced consonantal phonemes take the High tone. This suggests that in Keiyo, tone not only relies on predictability where we can easily state that M tones are found in initial syllables of singular root words, but also culminativity where H tones easily culminate on environments with high vowels and voiced consonantal phonemes.

4. Conclusion and Recommendations

The study has established that the selection of the different plural variants has a direct effect on the tonal shape of the eventual plural forms. The nouns in their singular forms contain phonological shapes exclusive to them before suffixation. The suffixes on the other hand also have certain (mostly high) phonological features due to the intrinsically high vowels they contain. Upon suffixation, therefore, the features found in the singular nouns and those brought in by the suffixes merge and create a new pattern of tone in the plural form.

The author emphasized on the noun in the study. A critical study of the verb formation through suffixation is thus necessary. This would help determine whether or not tone alignment behaves in the same way with verb suffixation as it does with nouns. This may allow for generalizations on tonal behaviours on the two Keiyo content words (nouns and verbs).

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