

Consonant-tone interaction in Siswati

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Bradshaw, Mary M. 2003. Consonant-tone interaction in Siswati. *Studies in Phonetics, Phonology and Morphology*. 9.2. 277–294. This paper argues that Siswati is a three tone language, although it has traditionally been analyzed as a two tone language. Despite three audibly different tone levels, the presence of a L tone has been previously denied phonological status because it occurs primarily after depressor consonants. However, the existence of L tone lexically and grammatically as well as its actual behavior in consonant-tone interaction justify its phonological status, as argued here. In addition, Siswati provides an interesting example of the phenomenon of consonant-tone interaction. Depressor consonants in Siswati trigger a number of phonological effects involving tone spreading, tone shifting and the blocking of tone shift. **(Kyungpook National University)**

Keywords: consonant-tone interaction, tone, depressor, tone feature

1. Introduction¹

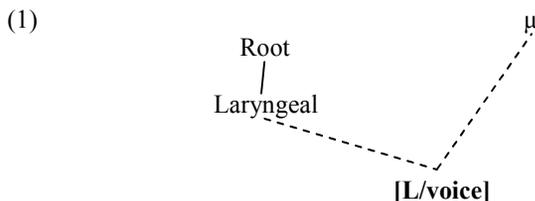
Siswati is a Bantu language of southern Africa from among the Nguni group. The Nguni languages are well known for their consonant-tone (CT) interaction, also referred to as depressor effects. Depressor effects most generally entail the positioning of L tones on vowels following voiced obstruents, but they also include blocking effects on H tones after voiced obstruents. Although traditionally the Nguni languages are analyzed as having only two underlying tones (like most Bantu languages) with a third surface tone due to the lowering of the nonhigh tone by depressor consonants, there is evidence that the correct analysis of the Siswati tone system is one in which there are three underlying tones: H, M and L². Rycroft (1980) proposes a ‘suprasegmental prosodic feature’ called ‘depression’ which interacts with the tone system (consisting of 2 level tones and a falling tone) but is separate from it, perhaps to be thought of as a feature of register. In this paper, I will provide evidence for a simpler analysis which posits three level tones (which can combine to form contour tones) and I will illustrate this three-tone analysis by describing the extensive consonant-tone interaction found in Siswati.

¹ The data in this paper comes from the author’s field notes. Thanks go to the language consultant, Ruth Dlamini as well as to David Odden and 2 anonymous reviewers for useful comments.

² According to Rycroft (1980), Lanham’s unpublished dissertation (1960) mentions a ‘mid toneme’ for Siswati, but apparently this notion did not gain widespread acceptance.

1.1 The framework

The preferred representation of CT interaction is with the use of a feature [L/voice], which is more fully justified in Bradshaw (1999). This feature, denoting both voicing in consonants and L tone on moras, captures the relationship between voiced consonants and tone. It is a monovalent multiplanar feature which can link to either the mora or the laryngeal node of the consonant or both.



Consonants with this feature in a language with CT interaction can be referred to as depressor consonants, because they typically lower the tone of the following vowel. In Siswati, if the following vowel bears a H tone, the resulting tone is rising (LH); while if the following vowel bears a nonhigh tone, the resulting tone is low (L). Note that this effect can be seen as the spreading of a L tone from the consonant to the following vowel. In this model, what is spreading is the [L/voice] feature. Consonants which are phonetically voiced but not contrastively voiced usually (but not always) lack this phonological feature; as do voiceless consonants. In Siswati, only the voiced obstruents among the consonants are specified as [L/voice]³. However, L/voice also exists independent of the consonants as a L tone.

1.2 Depressor consonants and tone

The three tones of Siswati are notated here with an acute accent for H [á], a grave accent for L [à] and no accent for the mid tone [a] which is posited to be phonologically toneless. It is also possible to get a rising tone on a single mora [ǎ]. Long vowels are found in the penultimate syllable as a result of stress and these can have a level H tone pattern [áá], a level L [àà], a level M [aa], a falling pattern when a H tone is followed by a toneless mora [áa], and a rising pattern [ǎá]. Occasionally, we also find a rising-falling tone [ǎa] or even a falling-rising tone caused by the presence of a downstep within the syllable [á'á]. All of these tones are audibly distinguishable. The L and the initial portion of the rising tone can be realized with breathy voicing. This breathy voicing may be regarded as part of the strategy for articulating the low pitch of the tone (see Traill

³ The bilabial implosive is not specified as [L/voice] because it is not contrastively voiced in Siswati.

1990 for further discussion).

The depressor consonants in Siswati are *b*, *d*, *g*, *gc* (=voiced dental click), *v*, *z*, *fi*, *dz*, *ɓ* (=voiced lateral fricative), *dʒ*, and *ɣ*. These include the entire set of voiced obstruents, excluding the sole implosive, *ɓ*, which is also the only (phonetically-) voiced obstruent which is not contrastively voiced. The inclusion of *ɣ* in this set is no doubt surprising at first glance in light of the failure of other sonorants to trigger depressor effects. However, there is evidence that *ɣ* is a reduced form of *ɣg* and therefore it follows naturally that it should, as all other nasal plus voiced obstruent sequences, behave as a depressor. Evidence for this analysis of *ɣ* comes from distributional data, especially the fact that the cluster *ɣg* only occurs as the first root consonant, but a thorough exposition of this evidence is beyond the scope of this paper.

After the depressor consonants, vowels are realized with a L or rising tone. The effects triggered by the depressor consonants include a lowering of pitch on the following vowel, a process of Depressor Induced H Tone Shift (DIHTS) and the blocking of DIHTS. At the word and phrase level, the depression resulting from these consonants will block a process of H Spread.

A L is realized on a syllable after a depressor consonant either as a level L or in combination with a H tone as a rising tone. In the following examples, the prefixes designate the noun class of the noun, which has no relevance to the present discussion of tone. Likewise, the verbal prefixes mark the infinitive form (which can be seen as a kind of noun class in Bantu languages).

(2) [b]	lú-bààmbò	‘rib’	sí-bààmu	‘gun’
[d]	lí-dààdà	‘duck’		
[g]	kú-gèèca	‘to cut with ax’	sí-gòòdzǐ	‘region’
[gc]	kú-biigcà	‘to mix’	ín-gcùùbu	‘carrion’
[v]	kú-vààla	‘to close’	ín-ɓòòvò	‘elephant’
[z]	kú-gèèzà	‘to bathe’		
[fi]	kú-fiàfiàata	‘to sprinkle’		
[ɓ]	kúú-ɓǎ	‘to eat’		
[dz]	kú-giìdzà	‘to dance’	lí-dvùùba	‘zebra’
[dʒ]	si-bándʒààna	‘small handle’	lúú-dʒù	‘honey’

The L tones in these tone patterns can be accounted for as the spread of [L/voice] from the depressor consonant to the following mora, as depicted in the previous section.

2. Evidence for a third tone

When a depressor consonant is followed by a H tone in Siswati, a rising tone results, and when it is followed by a nonhigh tone, a L tone results. So

if we follow the traditional approach of Rycroft (1980, 1981), we will say there are two variants of the high tone (level high and rising) and two variants of the nonhigh tone (mid and low) and that the contextually constrained variant in each case (rising and low) occurs after a depressor consonant. Rycroft relies on the use of a subsegmental feature [depression] which occurs on vowels after a depressor consonant. However, it turns out that the tone variants that are expected to be contextually constrained occur outside of that context. In other words, these variants occur in contexts where there are no depressor consonants. Instead, there are lexical and grammatical L tones. Rycroft dealt with these phenomena by postulating lexically and grammatically specified [depression]. Since this ‘depression’ is realized as a L tone or rising tone, there is no convincing justification for the use of a specially constructed feature that is different from a L tone.

In addition, the behavior of the depressor consonants in blocking H tone processes can only be explained in a principled manner if there is a L tone present. That is, something is blocking a tone from its usual movement and whatever it is, it must be a phonological entity to block a phonological process. Moreover, in a theoretically constrained model of blocking effects, it must be a tone to block movement of a tone.

2.1 Lexical L tones

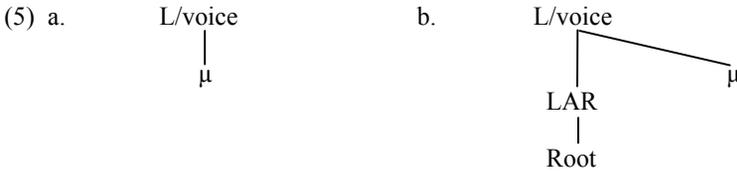
In some words, syllables which do not have depressor onsets are realized consistently with a tone pattern that is more generally associated with depressor consonants. These tone patterns, however, occur in the absence of depressor consonants and must be analyzed as underlyingly present. In the first set of examples, the tone pattern in question is the rising tone on the stressed penultimate syllable. This tone, usually associated with depressor consonants, follows a variety of consonants when it is lexical in nature, including voiceless obstruents (c^h , t , k^h , f) and sonorants (l , y).

- | | | |
|-----|-------------------------|-----------------|
| (3) | lic ^h ááwe | ‘warrior’ |
| | líláádì | ‘ladder’ |
| | liyèémbè | ‘shirt’ |
| | ínkányééti | ‘star, planet’ |
| | báfáána | ‘boys’ |
| | lík ^h átááne | ‘tick; sponger’ |

Underlying L tones are also found in bound morphemes. A subset of the Subject Prefixes (SP) have L tones that surface as rising tones in the remote past. In this tense, a H is assigned to the initial mora of the word which is realized as a rising tone on the 1S (first person singular), 2S (second person singular), 1P (first person plural) and 2P (second person plural) SPs. Other SPs, such as the 3S (third person singular) and 3P (third person plural) SPs and the class 7 SP have level H in this tense.

- | | | | | |
|-----|----------|---------------|----------|---------------------|
| (4) | wě-fiiká | ‘you arrived’ | wé-fiiká | ‘he arrived’ |
| | sě-fiiká | ‘we arrived’ | sé-fiiká | ‘it (cl.7) arrived’ |
| | sǎ-liimá | ‘we plowed’ | bá-liimá | ‘they plowed’ |

The existence of a third lexical tone level, as shown by the data in (3) and (4), convincingly demonstrates the existence of an underlying L tone. This tone can be represented as in (5a) where it differs from a surface L tone after a depressor consonant in (5b).



2.2 Grammatical L tone

In addition to the lexical L tone, there is a grammatical L tone that appears in several morphological contexts. Here again, we find what look like the effects of depressor consonants in the absence of depressor consonants. In these cases, a floating grammatical L tone acts as a morpheme and is blocked by the presence of either H or L tones. A floating grammatical L tone provides additional strong evidence for the existence of a third tone level in Siswati, as do the blocking effects of other tones.

2.2.1 Verbs in the imperative mode

The imperative mode is marked by a grammatical L tone, a grammatical H tone and the absence of prefixes. As we will see in the following data, verbal extensions such as the causative (-is) and the benefactive (-el) can be suffixed before the final vowel (-a). Tonally, verbs in Siswati can be divided into those with an underlying H tone (high verbs) and those without (nonhigh verbs). The grammatical L tone of the imperative is characteristic of nonhigh verbs but not high verbs and this blocking of grammatically imposed L in high verbs underlines the need for a tonal analysis of depressor effects in Siswati.

Nonhigh verbs in the imperative are characterized by a L tone on the penultimate syllable. Nonhigh bisyllabic verbs have a level L on the penult and a final H.

(6) fìká	from fika	arrive
p ^h èèká	from p ^h eeeka	cook
ḅààlá	from baala	count
bìicá	from biica	mix
vààlá	from vāala	close
bùùdzǎ	from bùùdzà	dream

Longer verbs have a rise on the penult. In contrast to the shorter verbs, both the grammatical tones (L and H) are realized on the penult.

(7) landzèéla	follow	
k ^h otsáama	bend down	
p ^h ap ^h áama	wake up	
c ^h ap ^h áata	mock	
p ^h ap ^h am-ééla	wake up for	(verb+benefactive)
p ^h ap ^h am-íisa	cause to wake up	(verb+causative)
gèz-íisa	cause to bathe	“
lim-íisa	cause to plow	“
lim-is-ééla	cause to plow for	(verb+caus.+benef.)

Verbs in the plural imperative end in [ni]. They behave like the long verbs in (7) with a rise on the penult.

(8) fikáá-ni	arrive
liláá-ni	grieve

The presence of the grammatical L on the penult is affected by tones elsewhere in the verb. When there is a depressor consonant on a nonpenultimate syllable, there is no grammatical L on the penult.

(9) bìcáá-ni	mix
vàláá-ni	close
ḅ-ísáá-ni	make eat

Similarly, in longer forms of the singular imperative with a nonpenultimate depressor consonant, the grammatical L does not surface on the penultimate.

(10) landzèl-ééla	follow for	landzèl-íisa	cause to follow
vàl-íisa	cause to close	vàl-ééla	close for
bìc-ééla	mix for	bìc-íisa	cause to mix
gèz-ìs-ééla	cause to bathe for		

Likewise, the grammatical L is not manifested in high verbs in the plural imperative. That is, high verbs are characterized by a level H on the penultimate syllable.

(11) ɬafunáá-ni	<i>from ɬáfuuna</i>	<i>chew</i>
sikáá-ni	<i>from síika</i>	<i>slice</i>
laɬáá-ni	<i>from lááɬa</i>	<i>discard</i>
bonáá-ni	<i>from bóóna</i>	<i>see</i>
bulaláá-ni	<i>from búláála</i>	<i>kill</i>
ɬukanisáá-ni	<i>from ɬúkaniisa</i>	<i>separate</i>
tfaláá-ni	<i>from tfáála</i>	<i>carry</i>

The careful reader will note that stem H's in high verbs are absent in the imperative. That is, the stem H evident on the initial syllable of the stem is no longer present in the imperative, but instead the grammatical H on the penult is evident. In this case (and others) the preceding H is deleted by Meeussen's rule which deletes the first of two adjacent H's in Siswati (and is typical of many Bantu languages).

How can we account for the patterning of the grammatical L in the imperative? As we have seen, the pattern involves a L tone on the penult in all verbs except those with lexical H tones or those with L tones accompanying depressor consonants elsewhere on the verb. The convergence of these two sets of verbs, both failing to surface with a grammatical L tone on the penult, points to the presence of a blocking process that affects both. The floating grammatical L morpheme is a prefix which targets the penult and it can be blocked from docking by an intervening tone, whether L or H.

2.2.2 Remote past negative

Grammatical L tones are also found in the remote past negative--a tense that is marked by a prefix *a-* and a suffix *-ay*. This tone pattern resembles that of the imperative in a number of ways. Like the grammatical L in imperatives, that in the remote past negative affects only nonhigh verbs. The L tone is, as in the imperative, realized on the penult as part of a rising tone.

In the following verbs, the SPs are H in tone, which has no effect on the grammatical tones. It turns out that only stem H's act to block the grammatical L.

(12) a-bá-p ^h ek-ááŋà	'They didn't cook.'
a-bá-lim-el-ááŋà	'They didn't plow for.'
a-bá-lim-el-an-ááŋà	'They didn't plow for each other.'
a-bá-p ^h ek-el-ááŋà	'They didn't cook for.'
a-bá-p ^h ek-el-an-ááŋà	'They didn't cook for each other.'
a-bá-w-ááŋà	'They didn't fall.'
a-bá-y-ááŋà	'They didn't go.'
a-b-ét-ááŋà	'They didn't come.'
a-b-ós-ááŋà	'They didn't roast.'

a-b-él-ááŋà	‘They didn’t winnow.’
a-bá-b-ááŋà	‘They didn’t divide.’

As in the imperative, the penult L tone does not surface when there is a depressor consonant and its associated L tone preceding the penult.

(13) a-sí-vàl-el-ááŋà	‘We didn’t close for.’
a-bá-vàl-el-an-ááŋà	‘They didn’t close for each other.’
a-b-óng-ìs-ááŋà	‘They didn’t cause to economize.’
a-bá-luŋ-ìs-ááŋà	‘They didn’t cause to be good.’
a-sí-mpoŋòlot-ááŋà	‘We didn’t cry loudly.’
a-sí-gèz-ìs-ááŋà	‘We didn’t cause to bathe.’
a-sí-landz-èl-is-ááŋà	‘We didn’t cause to follow.’

Again we see the pattern in which there is a grammatical L assigned to the penult which is blocked in verbs with stem H’s or L’s.

2.2.3 Copular nominals

A copular nominal is a noun that includes the added sense of a copular assertion (It is X). In Siswati, copular nominals are derived by a change in tone. More specifically, a grammatical L is inserted on the first syllable of the noun. The tone patterns that result from this L insertion differ according to whether the target noun has depressor consonants or lexical H tones or neither.

If the first TBU (tone bearing unit) is toneless, it becomes L in tone.

(14) <i>Noun</i>	<i>Copular</i>	<i>Gloss</i>
/sicátfuulo/	sìcátfuulo	‘It’s a shoe.’
/ubìila/	ŋùbìila	‘It’s maize.’
/ugáánú/	ŋùgáánú	‘It’s a Marula tree.’
/emáncóobo/	ŋèmáncóobo	‘It’s boiled dried corn.’

Note that when vowel-initial nouns such as *ugáánú* become copular nouns, a consonant onset surfaces. Before an [i], the onset is [y], while before any other vowel, the onset is [ŋ].

If the first TBU bears a H, the H is shifted onto the next syllable, which results in a falling tone pattern when the shift is to the long penult. There is no blocking effect as there was in the imperative or remote past negative because the TBU targeted is the mora of the first vowel. The L tone need not pass over any lexical tones to dock there. After docking the disfavored rising tone that is created is resolved by a shift of H to the next TBU.

(15) /síbaambò/	sìbáambò	‘It’s a handle.’
/línceéfa/	lǐncééfa	‘It’s a wound.’
/sícooco/	sǐcóoco	‘It’s a tree.’
/inyooni/	yǐnyóoni	‘It’s a bird.’
/imfene/	yǐmféene	‘It’s a baboon.’

The shifting of H seen above is blocked if the second syllable has a depressor consonant onset with the result that the first syllable surfaces with a rise.

(16) /síbáamu/	sǐbáamu	‘It’s a gun.’
/lúbáambò/	lǐbáambò	‘It’s a rib.’
/lídáádá/	lǐdáádá	‘It’s a duck.’
/ínǚòòvù/	yǐnǚòòvù	‘It’s an elephant.’
/ínǚgwèènya/	yǐnǚgwèènya	‘It’s a crocodile.’
/índvòòdzà/	yǐndvòòdzà	‘It’s a man.’
/índvùùku/	yǐndvùùku	‘It’s a stick.’
/libùbéesi/	libùbéesi	‘It’s a lion.’

For bisyllabic verbs with an initial fall followed by a final H, the grammatical L results in an initial rising-falling tone.

(17) /iindzǎ/	yǐindzǎ	‘It’s a dog.’
/tʃáani/	tʃǎani	‘It’s grass.’
/tʃwáalá/	tʃwǎalá	‘It’s beer.’

The OCP blocks the shift of H onto the penultimate mora immediately preceding a final H.

Several processes are seen in the copular nominals. In every case, there is insertion of grammatical L tone. This L tone triggers a shift of H away from the mora bearing the L tone. This shift is blocked if there is a depressor consonant intervening between the triggering mora and the target mora. This shift can also be blocked by the OCP when shifting would place one H immediately adjacent to another H.

The evidence from grammatical L tone morphemes in the imperative and remote past negative for verbs and in the copular nominative for nouns strongly demonstrates that L is not merely a derived tonal effect triggered by voiced obstruents. Rather it is an underlying tone level in contrast with M and H tones.

3. Consonant-tone interaction

As noted in section 1.2, L tones are found after depressor consonants due to the spread of L/voice from the consonant to the mora of the following vowel. The presence of this L tone leads to other depressor effects. These

depressor effects include a depressor-induced tone shift, the blocking of the depressor-induced tone shift, and blocking of H spread both word internally and phrasally. In an additional phrasal context, L tones are found after depressor consonants across word boundaries.

3.1 Depressor-induced H tone shift

Depressor-induced H tone shift (DIHTS), in which a H tone shifts one mora to the right, targets nonhigh verb and noun stems. In order to better understand DIHTS, it is first necessary to appreciate the attraction of a H tone to the antepenultimate syllable. Nonhigh nouns generally get a H from the noun class prefix. This is most evident in nouns that do not have a noun class prefix in the singular. When a plural prefix (in this case *bó-*) is added, the prefixal H is realized on the antepenultimate syllable.

- | | | | |
|------|---|---------------|--|
| (18) | bèd ₃ ààne | ‘black rhino’ | 60-bèd ₃ ààne |
| | dòkoteela | ‘doctor’ | 60-dòkóteela |
| | c ^h oc ^h ooc ^h o | ‘trachea’ | 60-c ^h oc ^h ooc ^h o |

Other nonhigh nouns with noun class prefixes in both singular and plural forms also surface with one H which is realized on the antepenultimate syllable, provided the noun is long enough to have one.

- | | | | | |
|------|-------------|-----------------|--------------------------|-------------------|
| (19) | sí-cooco | <i>frog</i> | sí-gcòòko | <i>hat</i> |
| | lí-saaka | <i>sack</i> | sí-6aambò | <i>handle</i> |
| | sí-bààmu | <i>gun</i> | í-nyooni | <i>bird</i> |
| | ín-tsaambò | <i>rope</i> | ín-1aanti | <i>fish</i> |
| | sí-1aalo | <i>chair</i> | sí-1aata | <i>tree</i> |
| | ín-1òòvù | <i>elephant</i> | lú-p ^h oondvò | <i>horn</i> |
| | ím-feene | <i>baboon</i> | lí-c ^h aagà | <i>container</i> |
| | si-cátfuulo | <i>shoe</i> | ímí-fuula | <i>rivers</i> |
| | ímí-leende | <i>legs</i> | ímí-paala | <i>lower legs</i> |
| | ímí-lòomò | <i>mouths</i> | umú-liilò | <i>fire</i> |
| | emá-fuutsa | <i>oil</i> | umú-ntfwaana | <i>child</i> |

Although the nouns in (19) have the H on the antepenult, with the exception of *si-cátfuulo*, the tone remains on the prefix from which it originated. However, these nouns can be made longer through the addition of the diminutive suffix *-an* (which combines with the final vowel to give *-ana*) or the locative suffix *-eni*. Note that the locative also requires a prefix *e-*. When the nouns are made longer, the H is still found on the antepenultimate syllable.

(20) Diminutive form of nouns

siłáł-aana	‘tree’	luswát-aana	‘stick’
lisák-aana	‘sack’	siłálw-aana	‘chair’
imfény-aana	‘baboon’	sicócw-aana	‘frog’
inłánt-aana	‘fish’	inyóny-aana	‘bird’
intsándz-ààna	‘rope’	siłándz-ààna	‘handle’
lic ^h ág-ààna	‘container’	sicatfúlw-aana	‘shoe’

(21) Locative form of nouns

e-sicócw-eeni	‘in the frog’	e-siłálw-eeni	‘in the chair’
e-siłándz-ìni	‘in the handle’	e-nyón-iini	‘in the bird’
e-lup ^h óndvw-èèni	‘on the horn’	e-nyám-eeni	‘in the meat’
e-c ^h ág-èèni	‘in the container’	e-ntsándz-èèni	‘on the rope’
e-siłáł-eeni	‘on the tree’	e-sák-eeni	‘in the sack’

Nouns can be made even longer by adding more than one suffix. A noun can have two diminutive suffixes, giving the meaning ‘tiny’, or it can have both a diminutive and a locative suffix. In these nouns too, the H remains on the antepenultimate syllable.

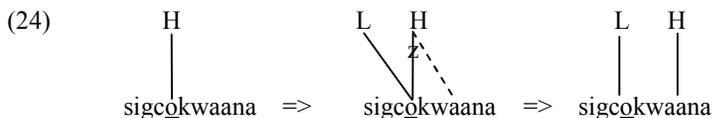
(22) sicutfulw-ány-aana	‘tiny shoe’
e-sicutfulw-any-án-eeni	‘on the tiny shoe’
e-siłáł-án-eeni	‘in the little tree’
e-sak-án-eeni	‘in the little sack’

We have seen from the data above that there is a process of tone shift whereby a H tone shifts rightwards to the antepenultimate syllable. However, when the antepenultimate syllable has a depressor consonant as the onset, the H tone shifts again from the antepenult to the penult resulting in a penultimate falling tone. This can be seen most clearly if we compare forms where an extension changes a penultimate depressor onset to antepenultimate position, as in (23).

(23) sígcòòko + ana	sigcòkwáana	‘hat’
íngwèènya + ana	íngwènyáana	‘crocodile’
íngcùùbu + ana	íngcùtjáana	‘carrion’
índvùùku + ana	índvùkwáana	‘walking stick’
sibààmu + ana	sibànyáana	‘gun’

This shifting of the H tone rightwards after depressor consonants in the antepenultimate syllable is referred to as DIHTS, a name taken from Cassimjee (1998). The observed fact that the H tone ends up on the penultimate syllable justifies an analysis in which antepenultimate H tone shift occurs (and is not blocked by the depressor consonant) and is followed by DIHTS. DIHTS causes the antepenultimate H to shift one

mora to the right after the L tone spreads from the depressor consonant onto the antepenultimate mora.



DIHTS operates whenever its conditions are met. (25) shows DIHTS in the case of locative nouns with antepenultimate depressor onsets.

- (25)
- | | |
|---|---------------------------|
| e-sib ^h am-iini | ‘in the gun’ |
| e-sigc ^h okw-éeni | ‘on the hat’ |
| e-sibandz- ^h an-éeni | ‘on the little handle’ |
| e-c ^h ag- ^h an-éeni | ‘in the little container’ |

Tone patterns in verbs very much like it patterns in nouns. Like nonhigh nouns, nonhigh verbs in the infinitive have a H which comes from the prefix and is realized on the antepenult.

- (26)
- | | | | |
|---------------------------|------------------|--|---------------------------|
| kú-liima | <i>plow</i> | kú-ciitsha | <i>throw out (liquid)</i> |
| kú-liila | <i>grieve</i> | kú-fiika | <i>arrive</i> |
| kú-p ^h eeeka | <i>cook</i> | kú- ^h baala | <i>count</i> |
| kú-bìigcà | <i>mix</i> | kú-vààla | <i>close</i> |
| kú-bùùdzà | <i>dream</i> | kú-gèèca | <i>cut with an ax</i> |
| kú-giìdzà | <i>dance</i> | kú-gèèzà | <i>bathe</i> |
| ku-k ^h òtsaama | <i>bend down</i> | ku-p ^h àp ^h aama | <i>wake up</i> |
| ku- ^h ákuula | <i>weed</i> | ku-c ^h àp ^h ata | <i>put someone down</i> |

When a suffixal extension is added to make the verb longer, the H is still realized on the antepenult.

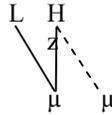
- (27)
- | | |
|---------------------------|-------------------------------------|
| ku-p ^h ék-iisa | <i>cause to cook</i> |
| ku-lil-iisa | <i>cause to grieve</i> |
| ku-lim-iisa | <i>cause to plow</i> |
| ku-lil-ís-aana | <i>cause each other to grieve</i> |
| ku-lim-ís-aana | <i>cause each other to plow</i> |
| ku-lim-él-aana | <i>plow for each other</i> |
| ku-lim-is-él-aana | <i>cause to plow for each other</i> |

When the antepenult has a depressor onset, the H shifts to the penult where it is realized as a falling tone, as seen previously in locative and diminutive nouns.

- | | |
|---------------------|------------------------------------|
| (28) ku-neŋ-ᵊs-éela | <i>to be a nuisance for</i> |
| ku-luŋ-ᵊs-éela | <i>to make good for</i> |
| ku-bòc-áana | <i>to smear each other</i> |
| ku-ceŋ-èl-áana | <i>to filter for each other</i> |
| ku-caḃuz-èl-áana | <i>to kiss each other for</i> |
| ku-boŋ-ᵊs-áana | <i>cause each other to thank</i> |
| ku-banz-ᵊs-áana | <i>cause each other to chop up</i> |
| ku-caḃuz-ᵊs-áana | <i>cause each other to kiss</i> |
| k-oŋgès-éela | <i>to cause to economize for</i> |

DIHTS can be expressed as a shifting of H rightwards from a mora which it shares with a L tone to a toneless mora. This is no different than the shifting of H tone after a grammatical L tone that we saw in copular nominals.

(29)



3.2 The blocking of DIHTS

There is a case in which the conditions for DIHTS are met and yet it fails to operate. This failure of DIHTS occurs when the penultimate syllable has a depressor onset. The H is in effect trapped between two depressor consonants, where it combines with the L tone resulting in a rising tone.

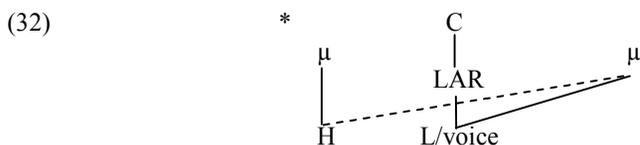
In the previous section, we saw that a nonhigh noun with a diminutive extension undergoes DIHTS when the antepenultimate syllable has a depressor onset. When both the antepenultimate syllable and the penultimate syllable have a depressor onset, as in (30), the H cannot shift and a rising tone is realized on the antepenult.

- | | |
|-----------------|-------------------------|
| (30) inḃǒv-ààna | <i>'small elephant'</i> |
| indvǒdʒ-ààna | <i>'little man'</i> |
| ingcǒdʒw-ààna | <i>'small brain'</i> |
| lidǎd-ààna | <i>'small duck'</i> |
| luḃǎndʒ-ààna | <i>'small rib'</i> |

Similarly, the locatives in the previous section undergo DIHTS, but those in (31), with a depressor consonant onset for the antepenult and the penult syllables, maintain the H tone on the antepenult. Again it is realized as a rising tone in combination with the depressor L tone.

- (31) e-ndv^ǔdz-èèni ‘in the man’
 e-nḥ^ǔv-ììni ‘on the elephant’
 e-tinb^ǔnd^ǔ-èèni ‘on the ribs’
 e-dǎd-èèni ‘on the duck’
 e-ḥǎḥ-èèni ‘in the cooking hut’
 e-siḥ^ǔḥ-èèni ‘on the traditional head ring’

The blocking of DIHTS is due to the general autosegmental constraint against line crossing. Because a L tone ([L/voice]) is multiply linked to the consonant and to the following mora, a H tone cannot shift over it, as shown in (32) where No Line Crossing is violated⁴.



Although some tone phenomena in Siswati, such as the assignment of the antepenultimate H, disregard depressor consonants, this can be accounted for by ordering such processes before the L tone spreads onto the mora. It is crucial to understanding CT interaction to make a distinction between processes that are tier sensitive and those which are plane sensitive. Processes which are plane sensitive will cause tone to be blocked by the L tone only if it is attached to a mora. Processes which are tier sensitive will be blocked by the L tone regardless of what it is linked to. In Siswati, once L has spread from the consonant to the mora, it is visible to either plane sensitive or tier sensitive processes, and it blocks other tones from moving across it

3.3 Blocking of H spread

There are two processes of H spread in Siswati, one at the word level and one at the phrase level. In both cases, H spreads from one H to another creating a ‘plateau’ effect, i.e. a string of vowels with H tone. This is a process which affects the class of high verbs, unlike the processes we’ve looked at previously. The word internal process can be seen below with high verbs in the infinitive. The stem H of these verbs is found on the antepenultimate syllable unless the verb stems have fewer than three syllables (excluding the final vowel). In shorter verbs, the stem H is found on the penult. After H spread has applied, the H’s extend from the prefixal H to the stem H in an unbroken string.

⁴ It should be noted here there is structure to the tones which has been simplified here. That is, there is a tone node to which the tone features are linked.

(32)	kú + ɬafúúna	→	kúɬáfúúna	‘chew’
	kú + lanyééla	→	kúlányééla	‘plant’
	kú + k ^h ulúúma	→	kúk ^h ulúúma	‘spoke’
	kú + ts ^h anyééla	→	kúts ^h anyééla	‘sweep’
	kú + βekéeteela	→	kúβékéeteela	‘be patient’
	kú + ɬukániisa	→	kúɬúkániisa	‘make separate’

When a depressor consonant intervenes between the infinitive prefix and the rightmost H, only the endmost H's surface. Word-internal H spread is completely blocked. H does not even spread as far as the depressor consonant. Thus, this is more than simply ‘no line crossing’.

(33)	kúvùúká	wake up	kúfìúúka	hook
	kúgáyíiṅà	dry roast	kúbàsóóbà	watch over
	kúbùṅùúka	wander	kúcindzētéela	oppress
	kúcandvùúla	hammer	kúcombēléela	guess
	kúdèléézà	queue up	kúfundziisa	teach
	kúβiṅèléela	greet	kúmponḡlóota	cry loudly
	kúɬaṅányéela	participate	kúk ^h antiṅsélana	dry roast

Phrasal H Spread is found when a verb is followed by an object noun. The H of the verb spreads as far as the first H of the noun. This spreading is blocked by an intervening depressor consonant. However, [ɲ] does not block this spreading. It appears that [ɲ] functions as a depressor word-internally, but not phrasally, although a full account of the behavior of [ɲ] is beyond the scope of the present paper. Nevertheless, this fact makes it clear that word internal and phrasal H spread are separate phenomena.

Phrasal H spread can be seen in the examples in (34) where the SP is 3S [ú-], which has an underlying H. These examples contrast with those in which the SP is 1S [ɲi-], which has no H tone and therefore cannot trigger phrasal H spread. When the SP is underlyingly H, a nonhigh verb gains a H which is realized stem-initially due to yet another tone process, i.e., a process of local shift which shifts a H rightwards one syllable.

(34)	ɲi-lima insiimu	‘I plow the field’	
	u-limá insiimu	‘he plows the field’	
	ɲi-ḡala ticátfuulo	‘I count shoes’	
	u-ḡalá ticátfuulo	‘he counts shoes’	
	ɲi-bōca ticátfuulo	‘I smear shoes’	
	u-bōcá ticátfuulo	‘he smears shoes’	
	u-vǎlá imínyaṅḡ	‘he closes the door’	[imínyaṅḡ]

Phrasal H Spread can also occur in infinitive NP's where H spreads over the final syllable of the infinitive when the following noun has a H.

- | | | | |
|------|--|--------------------------|--------------------------------------|
| (35) | kwáák ^h á éñṣ̀ìní | ‘to build a house’ | [kwáák ^h a] |
| | kúp ^h úma éñṣ̀ìní | ‘to go out from a house’ | [kúp ^h úuma] |
| | kúbéka éñṣ̀ìní | ‘to put in a house’ | [kúbééka] |
| | kúk ^h íp ^h á éñṣ̀ìní | ‘to take out of a house’ | [kúk ^h íp ^h a] |

Phrasal H spread is blocked by the presence of a depressor consonant that intervenes between the H of the verb and the H of the object.

- | | | | |
|------|--------------------|---------------------------|--|
| (36) | ñibambà tícátfuulo | ‘I hold shoes’ | |
| | uábambà tícátfuulo | ‘he holds shoes’ | |
| | uábánzà tícátfuulo | ‘he chops up shoes’ | |
| | ugězà bántvaana | ‘he bathes children’ | |
| | uñilisa bātáata | ‘he boils sweet potatoes’ | |

As mentioned at the beginning of this section, phrasal H spread is not blocked by the presence of an intervening [ɣ], even though the [ɣ] in these same words may act as a depressor at the word level.

- | | | | |
|------|-------------------------------------|--|---------------|
| (37) | u bóŋá tícátfuulo | ‘he praises the shoes’ | |
| | ucéŋá tṣwáalá | ‘he filters beer’ | |
| | asi bóŋáŋá tícátfulo | ‘we didn’t see shoes’ | [asi bóŋááŋá] |
| | a balets ^h áŋá tícátfulo | ‘they didn’t bring shoes’ | |
| | añi bóŋáŋá íñfóoko | ‘I didn’t see a head’ | |
| | a ba bóŋáŋá tígòlwáane | ‘they didn’t see stray dogs’ | |
| | a bóŋgìsáŋá báfáati | ‘they didn’t cause women to economize’ | |
| | kulúŋélá bántfaana | ‘to be good for children’ | [kulúŋèèla] |

As illustrated for the blocking of DIHTS, the blocking of H spread which is connected to the presence of depressor consonants indicates that the pitch lowering that occurs in that context is due to the presence of a L tone. In this case, the triggering environment, in which two H tones are adjacent on the tonal tier, is interrupted by the presence of an intervening L tone.

3.4 Phrasal L spread

Another phrasal process that is relevant to CT interaction involves L spread across word boundaries. When a verb with a depressor consonant onset on the final syllable is followed by an object with an initial vowel, the final vowel of the verb is deleted and the initial vowel of the object gets a L tone. For example, *ñi-bamba* ‘I am holding (short present tense) + *inkoomó* ‘cow’ undergoes deletion of the final *-a* of the verb and the initial tone of the object goes from H to LH (rising). Thus, the [L/voice] feature of the verb-final consonant spreads to the initial tone-bearing unit of the object.

(38)	ɲi-6amb' \checkmark inkoomó	<i>I'm holding a cow.</i>	[inkoomó]
	ɲi-6amb' \checkmark iintʃá	<i>I'm holding a dog.</i>	[iintʃá]
	ɲi-6amb' \checkmark inkúuk ^h u	<i>I'm holding a chicken.</i>	[inkúuk ^h u]
	ɲi-6amb' \checkmark indvòòdzà	<i>I'm holding a man.</i>	[indvòòdzà]
	ɲi-6amb' \checkmark inʎóóko	<i>I'm holding a head.</i>	[inʎóóko]
	ɲi-6amb' \checkmark ilíɲɲi	<i>I'm holding a circle.</i>	[ilíɲɲi]
	ɲi-6amb' \checkmark intsaambò	<i>I'm holding a rope.</i>	[intsambò]
	ɲi-ḥ' \checkmark inkoomó	<i>I'm eating a cow.</i>	
	ɲi-ḥ' \checkmark iintʃá	<i>I'm eating a dog.</i>	
	ɲi-ḥ' \checkmark inkúuk ^h u	<i>I'm eating a chicken.</i>	

As in the case of phrasal H spread, [ɲ] fails to act as a depressor for phrasal L spread. There is no L tone on the initial syllable of the object when [ɲ] is the final consonant of the verb.

(39)	ɲi-ts ^h éɲ' inkoomó	<i>I'm buying a cow.</i>
	ɲi-ts ^h éɲ' iintʃá	<i>I'm buying a dog.</i>
	ɲi-ts ^h éɲ' inkúuk ^h u	<i>I'm buying a chicken.</i>
	ɲi-ts ^h éɲ' indvòòdzà	<i>I'm buying a man.</i>
	ɲi-ts ^h éɲ' ilíɲɲi	<i>I'm buying a circle.</i>
	ɲi-ts ^h éɲ' intsaambò	<i>I'm buying a rope.</i>

If [ɲ] is analyzed as underlyingly [ɲg], the differing behavior of [ɲ] with respect to the depressor effect can be explained in terms of the ordering of the reduction, i.e., loss of [g]. This must happen after the word-level depressor effects, but before the phrase-level depressor effects.

4. Conclusion

In this paper, I have described the various processes in which consonants and tones interact in Siswati. Siswati is especially interesting because of the extensive nature of its CT interaction. Depressor consonants have a consistent lowering effect regardless of morphological category or context. In most languages, CT interaction is restricted in some way. For example, in Suma, a Niger-Congo language spoken in the Central African Republic, CT interaction is restricted to the insertion of L tone after voiced obstruents in verbs and adjectives when there is a grammatical H present. Perhaps because of the extensive nature of the depressor effects in Siswati, previous analyses have been led to posit a feature “depression” that is realized on any syllable with a depressor consonant onset, and/or one in which a L or rising tone is present. I have argued that it is more principled to postulate a third contrastive tone level, a L tone, and its connection to the depressor consonants comes from the existence of a feature [L/voice] which is part of the makeup of such consonants.

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