

The Tonal Phonology and Phonetics of the Future Negative in Lokaa*

Alexander Iwara
University of Ibadan and Rutgers University

Akinbiyi Akinlabi
Rutgers University

Hubert Truckenbrodt
University of Tübingen

0. Introduction

In this paper, we describe some interactions between morphology and the tonal phonology and phonetics in Lokaa [lòkǎ:]. We are particularly interested in the Future Negative, which exhibits leftward spreading of a suffixal L tone. In the verb stem, this spreading process leads to a replacement of the tones of the stem. We argue with phonetic data that the spreading process goes past the stem to the prefixal domain, where it links to the prefix phonologically.

The paper is structured to build up step by step to the Future Negative. After some general background, underlying tones on verbs are discussed, followed by the introduction of negation and of Future tense, before we reach the phonology of the Future Negative. Finally, we present the phonetic data that provides evidence for the phonological link of the spreading L to the prefixal domain.

1. Some background on tones in Lokaa

Lokaa, a language of about half a million speakers in southeastern Nigeria, is a member of the upper-cross branch of the Benue-Congo language family (Faraclas 1988). Some of its immediate neighbors are Legbo, Kohumono, Agoi and Mbembe. Earlier studies on aspects of its grammar include Winston (1962), Bendor-Samuel (1971), Berry (1974), Runsewe (1980, 1982), Iwara (1982, 1983, 1985, 1990, 1991, 1993, 1994, 1995, 1996). The description presented here follows closely those presented in the various publications of the first author.

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Like many of the Benue-Congo languages, Lokaa operates basically a two-tone system of (H)igh and (L)ow level tones, as illustrated in the following nominal minimal pairs (transcription is phonemic throughout, unless otherwise indicated):

- (1)
- | | | | | |
|----|------|-------------|------|--------------|
| a. | ètí | ‘stick’ | ètì | ‘road’ |
| b. | ètó | ‘house’ | ètò | ‘hyena’ |
| c. | kébó | ‘impotence’ | kèbò | ‘squirrel’ |
| d. | èkóó | ‘advice’ | ékòò | ‘friendship’ |

Both of these tones may occur on short or long vowels (which are here transcribed as double vowels), as the examples in (1) illustrate. Contour tones (LH, HL), on the other hand, may occur on long vowels. These contour tones do not constitute tonal phonemes (Iwara 1982:55-60), but combinations of phonemic L and H tones.

- (2)
- | | | |
|----|-------|----------|
| a. | lètàá | ‘hernia’ |
| b. | lètáà | ‘stone’ |
| c. | kpàál | ‘gather’ |

2. Underlying tones on verbs

The verbal system shows a simple underlying contrast between stems with H and stems with L tone. Disyllabic H-stems occur with H on both syllables, while disyllabic L-stems occur with a LH tonal pattern in the infinitive and imperative.

- (3)
- | | <i>H-stems</i> | | <i>L-stems</i> |
|------------|----------------|--------------------|-----------------|
| Imperative | yómó | ‘measure’ | yòmó ‘lie down’ |
| and | | | |
| Infinitive | tó (lòbó) | ‘cry (crying)’ | làú ‘rub off’ |
| | máná (bòó) | ‘hold (something)’ | bàná ‘place’ |

More generally, while disyllabic nouns may carry L tone throughout as in the first three examples in (1), verbs cannot have all-L surface realizations.

We analyze the final H in the L-tone class in (3) as a tone that is inserted so as to meet a demand on the presence of at least one H tone in verbs (4a). Its insertion on the right, rather than on the left, may be seen to allow left-alignment of the verbal stem with the tone of the verb, represented as in (4b):

(4) a. Verbs have at least one H tone in isolation.

b.	b a n a	→	b a n a
	L		L H

The requirement that verbs have at least one H can also be seen with monosyllabic stems. These may be monomoraic (short), as in (5a), in which case they are always H. They may also be bimoraic (long), in which case they can be all-H (from /H/), as in (b), or LH (from /L/), as in (c). The latter two cases are comparable to the bisyllabic forms. The absence of monomoraic L-stems supports the contention that there is a ban on verbs with L tone only at work.

(5) a. <i>monomoraic</i>	b. <i>bimoraic /H/</i>	c. <i>bimoraic /L/</i>
tá ‘shoot’	táá ‘investigate’	tàá ‘win’
dó ‘clean up’	dóó ‘to be satisfied/full’	dòó ‘throw away’
wú ‘pin’	wúú ‘[river] be swollen’	wùú ‘steal’

The understanding of the final H of LH verbs along the lines of (4) receives further support when we add one level of complexity. The Aorist is marked with the agreement prefix [á-], ‘you’ in (6). As shown in (7a), the addition of this prefix to a H-stem leads to an all-H verb form, as expected. Of interest here is the addition of [á-] to L-stems as in (7b). The prefixal [á-] here surfaces as H, which motivates the assignment of

an underlying H tone to this prefix in our analysis. Interestingly, the final H tone that was seen on the unprefixated L-stems in (3) and (5c) is not realized in (7b).

(6) Subject-agreement 'you': [á-]

(7) *Aorist*

a. *H-stem*

b. *L-stem*

á-tóó 'you cried' á-yòòyì 'you wove' cf.: yòó (bòóŋ) 'weave'

á-mán 'you held' á-bàn 'you placed' cf.: bàná 'place'

á-táá 'you shot' á-tàà 'you won' cf.: tàá 'win'

á-dóí 'you were full' á-dòòyì 'you threw away' cf.: dòó 'throw away'

Here the demand on H tones in verbs (4a) is satisfied by the prefixal [á-], so there is no need for the insertion of a final H. This lends support to the understanding of the final H in (3) as a default, as in (4).

(It can be seen in these forms that the segmental make-up in the Aorist may vary. Iwara (1982:180ff) distinguishes thirteen morphological subclasses in this connection. Crucial for the purpose at hand is that choice of subclass does not change the tonal behavior in the relevant respects.)

3. Negation on verbs

We analyze the contribution of negation to a verb as a L-toned mora with no segmental content, which acts as a prefix.¹ As the comparison between the L-stems (7b) and (9b) shows, negation in the Aorist adds length to the agreement prefix, and adds an initial L tone.² In the H-stems in (9a), the addition of negation further turns the H of the agreement prefix (compare (7a)) to L. We analyze this as spreading of L and delinking

¹ See Akinlabi (1996) for affixational treatment of sub-segmental features.

² Where the non-negated form has an initial syllable onset, the L-toned mora seems to be added in position following that onset, rather than in absolute leftmost position. Thus one finds [yó-wúú], 'we pinned' negated as [yò-ò-wúú] 'we didn't pin', and [yó-wùù], 'we stole' negated as [yò-ó-wùù] 'we didn't steal'. These forms can be derived in parallel to the ones in (9), if the L-tone mora is added in position following the initial onset.

It is reasonable to assume that the addition of this suffixal L applies vacuously in the L-stems in (12b).³

(11) Future: [nè-]... -L Order of morphemes: FUT-AGR-VERB-FUT

(12) *Future*

a. H-stems

nè-á-fúkà

[nà-à-fúkà] 'you will gather'

nè á-yómè

[nà à-yómè] 'you will measure'

b. L-stems

nè-á-fùkè

[nà-áfùkè] 'you will count'

nè á-yòmè

[nà á-yòmè] 'you will sleep'

(13) *Aorist*

a. H-stems

á-fúká 'you gathered'

á-yómé 'you measured'

b. L-stems

á-fùkè 'you counted'

á-yòmè 'you slept'

Note that in the H-stems in (12a), the clitic [nè-] triggers the spreading process in (10), turning the underlying H of the agreement prefix to L.

5. Future negative

Consider then the negative form of the future. Here the positive future clitic [nè-] does not occur. Instead, the L suffix of the future (see (11)) spreads leftward, replacing the tones of the verb stem. This is shown in (14), in comparison with the Aorist Negative. The transcriptions here include a superscript question mark following the H tone of the agreement prefix. This reflects the intuitive sense that there is something different about the tone on this person prefix, an issue to which we return in the next section.

³ The underlying vowel of [nè-] is motivated by the rendition of this prefix in slow, very deliberate speech.

(14) *Future Negative*

NEG-2P-STEM-[FUT,L]

Aorist Negative

NEG-2P-STEM

a. H-stems

à-á[?]-yòòmè 'you won't measure' à-à-yóómó 'you didn't measure'

à-á[?]-yònṅè 'you won't repair' à-à-yóṅṅó 'you didn't repair'

b. L-stems

à-á[?]-kèbì 'you won't spoil' à-á-kèbì 'you didn't spoil'

à-á[?]-fùkè 'you won't count' à-á-fùkè 'you didn't count'

Notice that with the H-stems in (14a), leftward spreading of the L future suffix turns the stem's H tones to L. This process appears to bleed the application of (10) in the Future Negative, as the prefix (whatever as yet undiscussed other tonal properties it has) is still tonally rising, and thus marked with an initial sequence of L and H in our analysis: The initial L here does not spread and delink the following H on the prefix, as it would, had (10) applied.

For the L-stems in (14b), the effect of leftward spreading of the future L suffix is vacuous as far as the tones on the stem are concerned. However, there is intuitively a similar change in the prefixal tone as in the H-stems, which is likewise indicated by a superscript question mark.

The phonetic effect on the prefix of the Future Negative was noted in Iwara (1982:57f). The minimal contrast to the Aorist Negative, where this effect does not occur, is also pointed out there. In the following section, we contribute to clarifying the nature of this phonetic effect.

6. Phonetic details of the Future Negative

We conducted a small experimental study on the tonal effect of the Future Negative on the prefix, indicated by the question mark in (14). We first recorded and

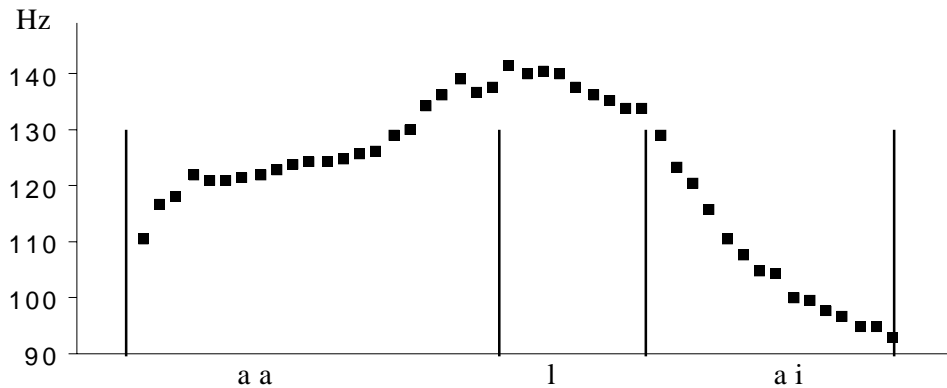
measured a number of Lokaa words and sentences with various tonal configurations, to get an initial sense of the phonetic realization of tones in Lokaa. We then recorded the Future Negative and Aorist Negative forms in (14), with the additional L-stem forms shown in (15). This addition was of interest because the Future Negative and the Aorist Negative in the L-stems are identical except for the tonal effect of the future on the prefix, the issue of interest here. We wanted to have enough tokens to do simple statistical calculations on differences we hoped to find in the measurements.

(15)	<i>Future Negative</i>		<i>Aorist Negative</i>
	NEG-2P-STEM-[FUT,L]		NEG-2P-STEM
	<i>L-stems</i>		
	à-á [?] -dìbè	'you won't catch'	à-á-dìbè 'you didn't catch'
	à-á [?] -nònà	'you won't cook'	à-á-nòn 'you didn't cook'
	à-á [?] -yòmè	'you won't lie down'	à-á-yòm 'you didn't lie down'
	à-á [?] -làù	'you won't rub off'	à-á-làì 'you didn't rub off'
	à-á [?] -yèèl	'you won't read'	à-á-yèlì 'you didn't read'
	à-á [?] -mè	'you won't swallow'	à-á-mèè 'you didn't swallow'

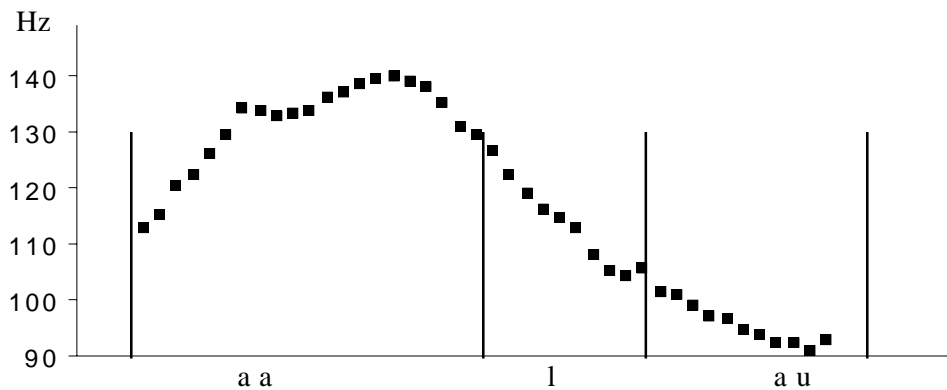
The tokens were written on index cards, randomized before each recording, and recorded three times by the first author, a native speaker of Lokaa. The recordings were made on a tape-recorder, and later analyzed using ESPS/waves+.

We found a clear difference in the L-tone stems between the Future Negative and the Aorist Negative forms in (14). The difference is illustrated by the pitch-tracks in (16) and (17). As can be seen, the difference lies in the timing of the **peak** in the prefix. In the Aorist Negative in (16), the peak occurs around the end of the prefixal sequence [aa]. In the Future Negative, on the other hand, the peak occurs noticeably earlier.

(16) Aorist Negative: [à-á-làì] 'you didn't rub off'



(17) Future Negative: [à-á²-làù] 'you won't rub off'

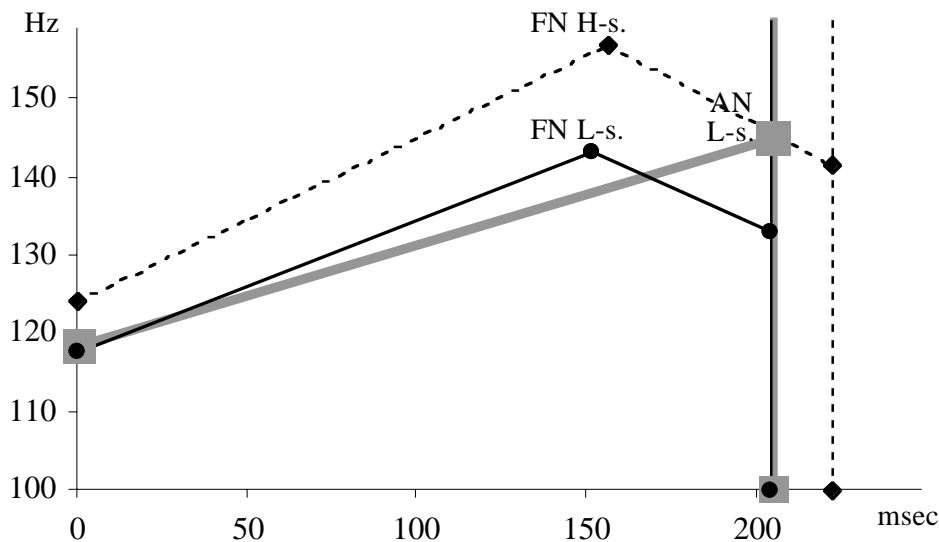


A more detailed analysis shows that this difference is consistent across tokens. The analysis included segment-by-segment labeling with the use of spectrograms, measurements of the temporal position of the H peak in the prefix, relative to the length of the prefixal [aa] and the length of the following consonant, as well as f0 measurements for the initial low point, the following peak on the prefix, and further points.

The plot in (18) shows that the difference observed in (16) and (17) is representative. (A third case, the Future Negative of the H-stems is also included, and will be compared with the other cases shortly). The vertical lines on the right show the length of the prefixal [aa-]. This is on average the same for the L-stems in the Aorist Negative (AN L-s.) and the Future Negative (FN L-s.): 205 msec in both cases. The

rising lines connect the average values of the initial L tones and the H peak of the entire forms, plotted at the averaged times at which they occur. The H peaks of the Aorist Negative are on average exactly at the end of the prefixal [aa-] (at 205 msec). The H peaks of the Future Negative are on average at the same f0 height (145 Hz and 143 Hz). However, they occur considerably earlier, at about three quarters of the length of the prefixal [aa-] (151 msec). A t-test that compares the temporal distances of the H peaks from the right edge of the prefixal [aa-] shows that this difference in temporal distance is statistically highly significant (paired-sample, two-tail, df=23, t=8.6, t-crit=1.7, p<0.001)

(18)



As mentioned, the Future Negative of the H-stems (see (14a)) are also plotted in (18). For reasons that are not clear, the prefixal [aa-] is a bit longer, and the f0-values of the initial rise are higher for these H-stems.⁴ Importantly, however, the timing of the H peaks is comparable across the two Future Negative cases, with the peak occurring around three quarters into the prefixal [aa-] in both cases (156 msec out of 222 msec in the case of the H-stems).

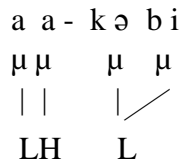
⁴ We cannot tell from our data whether these differences are significant. Recall that there are only a few tokens of these H-stems in our recordings (two stimuli, read three times). Larger numbers were obtained only for the L-stems, where both Future Negative and Aorist negative are represented by eight stimuli, read three times each.

To give a sense of the way the future negative shows a fall after the prefix-internal peak, average values of measurements taken at the end of the prefix are likewise included in the plot.

In sum, the Future Negative shows a significantly earlier H peak on the prefixal [aa-] than does the Aorist Negative.

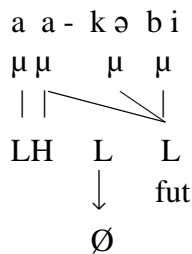
We interpret this difference as showing that the leftward spreading of the suffixal L in the Future Negative does not stop in the stem, but extends leftward to the prefix, as shown in (20). The example in (19) shows the Aorist Negative for comparison.

(19) *Aorist Negative, L-stems*



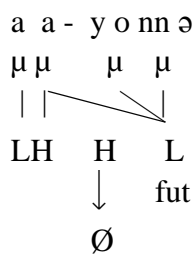
(20) a. *Future Negative*

L-stems



b. *Future Negative*

H-stems



This leads to a coherent picture of the timing of the peaks as follows: In the Aorist Negative in (19), H is timed to the end of the mora it is associated with. This is plausibly seen as a timing default. The additional association of the future L tone to the same mora in (20) can then plausibly be seen as the cause of leftward temporal displacement of this H peak.

Further interesting questions are why the L-tone suffix spreads leftward in the future negative at all, and why it spreads as far as the prefix, overriding an otherwise observable default of the language to not have more than one tone on each mora. This

seems to us unusual, in that spreading is normally phonologically triggered, rather than by the morphology. We suspect that this phenomenon is linked to the nature of the future marker as a circumfix, and that in some fashion the leftward spreading of the suffixal L relates to the absence of the prefix [nê-] in the negative form of the future. However, we leave this question for future work here.

7. Conclusion

We have argued that the future negative in Lokaa involves spreading of a L-tone suffix, part of a circumfix in the non-negated future, leftward across the stem, where it replaces the underlying tone of the stem. We have further shown phonetic evidence that the L suffix spreads past the stem to the prefix, where it leads to phonetic leftward displacement of the prefixal tones.

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