

## IMPLEMENTING A FLOATING TONE

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## ABSTRACT

This paper discusses the phonetic implementation of the floating Low tone in Yorùbá. It provides phonetic evidence that the floating L tone has the same effect as the lexical L and LH contour tones. It also shows that a LH (rising contour) tone differs from a L tone in resisting H tone spread from a preceding syllable.

## 1. INTRODUCTION

This paper examines the phonetic realization of both the lexical and floating Low (L) tones in Yorùbá. Yorùbá is a tone language with three tones, H(igh), M(id) and L. Two Tone Spread rules apply in Yorùbá, H tones spread to the following L tone syllable, H-Spread and L tones spread on to the following H tone syllable, L-Spread[1, 2]. A floating L tone is created in the phonology by the process of vowel deletion at V + V juncture. This L tone is either relinked or it remains floating [1, 2, 3]. The following examples illustrate the process. All the examples are verb + noun combinations except (1a), which is a noun + noun sequence: (H ('), M (unmarked) and L (').

- 1a.  $\text{omó } \dot{\text{o}}\text{kan} \rightarrow \text{omó}'\text{kan}$   
child one "one child"
- b.  $\text{gbé } \dot{\text{o}}\text{bẹ} \rightarrow \text{gbó}'\text{bẹ}$  "carry knife"
- c.  $\text{gbé } \dot{\text{o}}\text{dẹ} \rightarrow \text{gbó}'\text{dẹ}$  "carry hunter"
- d.  $\text{gbé } \dot{\text{á}}\text{dá} \rightarrow \text{gbá}'\text{dá}$  "carry machete"

The tonal output is the same regardless of the deleted vowel [1, 2]. In examples (1a) and (b), the L tone remains floating before a M tone after vowel deletion. This creates a "downstepped" or "lowered" M tone, represented as  $\dot{\text{L}}$  before the syllable [3], [4], [5]. But the L tone links to a following H tone as illustrated in (1d). Ward [4] claims that if a H tone follows the lowered M tone, it is in turn pulled down compared to an earlier H tone in the sentence, that is, the downstep effect of the L tone on the M tone persists throughout the rest of the utterance. Similarly, Bamgbose [5] characterizes the

floating tone as the "assimilated L tone" whose effect is to lower the fundamental frequency (f0) values of the following tones.

The experiment discussed below examines:

- the effects of the floating L tone on M tone, that is, to see the difference(s) in the realization of the M tone and the  $\dot{\text{M}}$ ;
- the realization of the rising tone (LH) in the same context as M and  $\dot{\text{M}}$  tones;
- the effects of the floating L, the rising tone, LH and the lexical L on preceding and following tones;
- the realization of a sequence of M $\dot{\text{M}}$  M tones, that is to see if the lowering of M tone persists to the next syllable (and beyond).

## 2. EXPERIMENT

The sentences below were recorded by four native speakers of Yorùbá as part of a larger study reported in Laniran [3]. Two factors were systematically varied in these sentences: the target tones (T) which are underlined, and the following tones (F). In each set of sentences, the following tone is H in (a), M in (b) and L in (c). The target tone is M in Set I,  $\dot{\text{M}}$  in Set II, LH in Set III. In Sets IV and V the target tones are (T<sub>1</sub>=M and L, and T<sub>2</sub>= $\dot{\text{M}}$  and M respectively.

## Set I

- a. Mo gbóḁḁ lálẹ́  
'I carried the hunter at night'
- b. Mo gbóḁḁ lọ sílẹ́  
'I carried the hunter home'
- c. Mo gbóḁḁ bò lálẹ́  
'I carried the hunter back at night'

## Set II

- a. Mo gbóḁḁ lálẹ́  
'I carried the knife at night'
- b. Mo gbóḁḁ lọ sílẹ́  
'I carried the knife home'
- c. Mo gbóḁḁ bò lálẹ́  
'I carried the knife back at night'

## Set III

- a. Mo gbáḁḁ lálẹ́  
'I carried machete at night'
- b. Mo gbáḁḁ lọ sílẹ́  
'I carried machete home'
- c. Mo gbáḁḁ bò lálẹ́  
'I carried machete back at night'

## Set IV

- a. Mo gbóḁḁ  $\dot{\text{m}}$ i lálẹ́  
'I carried my child at night'
- b. Mo gbóḁḁ  $\dot{\text{m}}$ i lọ sílẹ́  
'I carried my child home'
- c. Mo gbóḁḁ  $\dot{\text{m}}$ i bò lálẹ́  
'I brought back my child at night'

## Set V

- a. Mo gbáḁḁ lálẹ́  
'I got land at night'
- b. Mo gbáḁḁ lọ sílẹ́  
'I got land and took it home'
- c. Mo gbáḁḁ bò lálẹ́  
'I got land back at night'

## 3. RESULTS

An average of 6-8 tokens of each sentence was analyzed each for all subjects but only three are discussed here. See Laniran [3] for a discussion of the other speaker, whose result is similar. The sentences were digitized at 10KHz using the Waves+ software by Entropics. On the graphs following, the f0 values in each syllable is represented by two measurement points (see [3] for a detailed discussion on methodology).

In Figure 1 (page 4), an overlay of the f0 contour for Sets I-III sentences where the target tones are M,  $\dot{\text{M}}$  and LH are shown. The legend for all the graphs is shown at the beginning. SB data was recorded last. To make all the sentences be of the same length the parenthesized segments were excluded from his data set.

The consistent difference in the f0 tracks for two of the three speakers reported here is that the H tone preceding the  $\dot{\text{M}}$  tone is realized higher at points a and b than those preceding the M tone (filled symbols dashed lines). For SB, the results are in the same direction but there is not a significant difference in the f0 values. Also for SB and YL, the f0 value for the  $\dot{\text{M}}$  is slightly lower than that of the M tone.

In Figure 2 (page 4), the f0 values for only the Set III sentences are presented. For BJ the rising tone (LH) is realized with a slightly rising f0 contour when the following tones are M and L. But in Figures 2b and 2c, the f0 contour in the LH syllable is falling (SB, YL). In Figure 2 graphs, the f0 contour at the beginning of the following L tone syllable is realized with a high f0 value, an f0

value higher than that in the corresponding H tone syllable.

In Figures 3 and 4 (page 4), the f0 contour for the sentences in Sets IV and V are presented. In Figure 3, the f0 contours from the second M tone syllable to the end of the  $\dot{\text{M}}$  tone in the fourth syllable are falling. The f0 values of the M tone syllable following the  $\dot{\text{M}}$  tone are about the same. Figure 4 shows the sentences in Set V. The f0 values in the M tone syllable following the L tone are higher. In addition, the L tone syllable has a falling slope. An examination of Figures 3 and 4 show that both the L tone and the  $\dot{\text{M}}$  tone have falling f0 contours. The distinction, as shown by an overlay of both figures for SB, is that the L tone has f0 values lower than that of the  $\dot{\text{M}}$  and M tone, Figure 5.

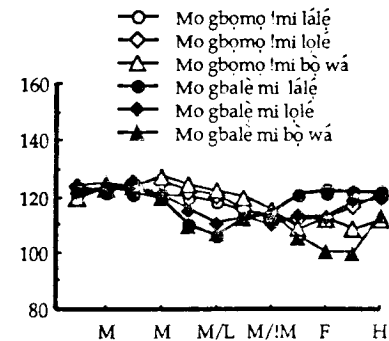


Figure 5: F0 Contour Comparing Target L, M and  $\dot{\text{M}}$  tones (SB)

## 4. DISCUSSION

The floating L tones survives from the phonology and is phonetically interpreted (rather than deleted) as shown in Figures 1a and 1c. Its main effect seems to be to raise the f0 value of the preceding H tone. The implication of this result is that a major cue to a  $\dot{\text{M}}$  tone seems to be the greater distance between a H tone and a following  $\dot{\text{M}}$  tone than that between a H and a following M tone for some speakers. SB's data is interesting in this regard since it is not clear from Figure 1b exactly what cues his listeners that the target syllable has a M as opposed to a  $\dot{\text{M}}$  tone.

If you recall, it was stated earlier that Ward [4] asserted that M and H tones occurring after a lowered M tone are realized lower than any preceding M and H tones in the utterance. This is the case as demonstrated in Figures 1 and 2, where the H tones occurring after the lowered M are not as high as the preceding H tone.

The f0 patterns for the rising tone (LH) were not all as expected in Figure 3. First, the application of the Tone Spread rule between the H and the following LH contour tone was suspended for all subjects, that is, no spreading takes place. For all subjects, point c on the graphs in Figure 2 shows no spreading effect of the preceding H tone. The expected pattern should have the f0 target for the H tone on the following L tone syllable as illustrated below for SB. Figure 6 shows an overlay of the Set IIIa sentence and a similar sentence where *gbáda* has been replaced with *gbòbè* (The sentences were recorded with those in Sets I-V.)

The H-spread rule is prevented from applying as shown by the difference in f0 values at point c in Figure 6, when the following tone is a contour tone (LH) as opposed to a single L tone (empty circles) which has a high f0 value. This is probably due to the fact that only two f0 targets are allowed in each syllable in Yorùbá. Since, the following syllable has two targets already, L and H, the Tone Spread rule does not apply.

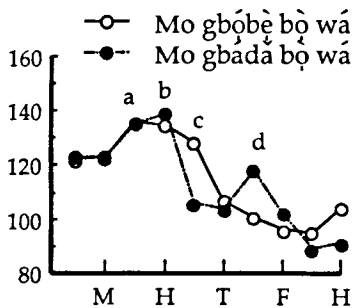


Figure 6: F0 Contour Comparing Target L and LH Tones (SB)

Point d in Figure 6 provides evidence that for the application of the H-Spread rule from the preceding LH contour tone to the following L tone. The f0 value at point d is higher when the preceding tone is LH as opposed to L supporting the hypothesis above that H-spread was blocked by a following contour tone.

5. CONCLUSION

The data presented in this paper has shown that there is no downstepped M tone in Yorùbá. Rather, the floating L tone preceding a M tone raises the f0 value of a preceding H tone for most speakers. The M tone preceded by the floating L tone itself does not consistently have an f0 value lower than that of other M tones in other environments. Therefore, the term "downstepped M tone" or "lowered M tone" is a misnomer.

It was also demonstrated that a LH (rising contour) tone differs from a L tone in resisting H tone spreading from a preceding syllable. The phonetic effect of the L tone, the floating L and the LH contour is the same on a preceding H tone. The F0 value in the H tone syllable is raised compared to when the following is non-L. The main difference seems to be that the H-Spread rule is prevented from applying to the LH syllable.

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