

FLOATING TONES IN Gǎ*

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This paper provides robust empirical evidence for floating tones in Gǎ, a Kwa language of Ghana. As will be shown, floating tones are crucial to an analysis of verbal tense/aspect/mood distinctions. I begin by describing two tonal processes, the HL rule and Plateauing. While these are regular processes of the language, both are blocked in the perfective. I show that the blockage is the result of a floating low tone that marks the perfective, and that the floating tone marker explains other anomalous tonal effects in the perfective. I then give an analysis of floating tone prefixes that mark certain tenses/aspects/moods by associating to the subject prefix, thus overwriting the lexical tone of the subject prefix. Finally, I give examples of suffixed floating tones that mark tense/aspect/mood by associating to verb stems, causing the underlying stem tones to delink. In these tenses/aspects/moods, we find evidence for an underlying L vs. toneless contrast, constituting another phenomenon where, as with floating tones, there is a mismatch between the number of tones and tone-bearing units. Thus, a major prediction of Autosegmental Phonology (Goldsmith 1976, Clements and Ford 1979) is borne out in Gǎ.

1. Introduction

1.1 Downstep and floating tones. One of the ways that a floating tone can be manifested in Gǎ is as a downstep between successive high tones. Clark (1993)

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has proposed that downstep is simply the manifestation of the boundary between two adjacent identical tones. This proposal fails in Gã because, as will be shown, the assumption that a floating low tone results in a downstep between two high tones is crucial to an analysis of the verbal system. The perfective aspect (section 3), for example, is indicated through downstep, blocking of the HL rule (section 2), or blocking of the Plateauing rule (section 2). While the abstractness of floating tones may be troubling to some, the fact remains that all of these effects receive a unified analysis only if we assume that the perfective is marked by a floating low tone, which is responsible for the otherwise anomalous tonal effects in the perfective. The present analysis therefore supports Clements and Ford's (1979) claim that downstep is conditioned by floating low tones.

1.2 Previous studies. The earliest work on Gã was carried out by Zimmerman (1858), who did not include any analysis of the tone system. Okunor (1969) provides the first in-depth discussion of tone, even recognizing downstepped high tones, though at that time no theoretical model existed to represent them. Wentum (1997) gives a useful analysis of lexical tone, but does not analyze grammatical tone. Dakubu (1986) and Trutenau (1972) propose some tone rules and make use of floating tones. The present study provides the first unified account of the effects of floating tones throughout the verbal system.

2. Tonal processes

There are two major tone rules in Gã, which operate in a wide variety of constructions. One of these rules, the HL rule, changes a final low (L) to downstepped high (¹H) after a penultimate high (H). When the HL sequence is not prepausal, no change occurs in underlyingly HL verbs, as shown in (1a). When the same verbs occur prepausally with no object (1b), the HL rule applies, and the stems surface with H¹H tone (tones are marked as follows: H tone = ¹, downstepped H tone = ¹̣, L tone not marked; tildes in these and subsequent examples indicate nasalization, which is irrelevant here).

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|-----|----|----------------|-------------------------|
| (1) | a. | e-káne gbɛmẽĩ | ‘he counted people’ |
| | | e-chála mǎmạ̌ĩ | ‘he mended clothing’ |
| | | e-pĩĩ shɔ | ‘he suffered Wednesday’ |
| | | e-bóte-ɔ | ‘he enters (habitual)’ |

b. e-ká ¹ né	‘he counted’
e-chá ¹ lá	‘he mended’
e-pí ¹ í	‘he suffered’
e-bó ¹ té	‘he entered’

The HL rule also applies when the HL sequence is the result of a H prefix followed by L stem, as shown in (2). The simple past forms (2a) show the underlying L tone of the stems. In the subordinate (2b), the combination of the H-toned prefix with the L stem tone before a pause triggers the HL rule, and the stems surface with downstepped H tone. In (2c), the stems remain L toned after a H-toned prefix when followed by objects, because the L of the stem is not prepausal and therefore does not trigger the HL rule. A comparison of (2a) with (1b) shows that the penultimate H is the trigger of the HL rule, since a final L is not raised when preceded by L.

(2) a. e-nā	‘he saw’	b. é- ¹ nā	‘that he see’
e-kɔ	‘he bit’	é- ¹ kɔ	‘that he bite’
e-jo	‘he dug’	é- ¹ jó	‘that he dance’
e-fũ	‘he buried’	é- ¹ fũ	‘that he bury’
c. é-nā wɔ	‘that he see us’		
é-kɔ wɔ	‘that he bite us’		
é-jo adoá	‘that he dance the Adoa’		
é-fũ ako	‘that he bury Ako’		

Two-syllable stems that have L tone in the simple past (3a) do not undergo the HL rule even when preceded by a H-toned prefix, as in the subordinate and future (3b). This is further evidence for the claim, supported by the data in (2c) above, that in order for the HL rule to be triggered, the H tone must be penultimate.¹

¹ If disyllabic L-toned stems have only a single L tone linked to both stem syllables, as I assume, then technically the H tone of the stems in (3b) is the penultimate tone. However, the application of the HL rule to these stems is ruled out by the structural description of the rule (6), which requires the target to be a L tone belonging to a single syllable preceded by H tone and followed immediately by a phrase boundary.

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|-----|----|--------|-----------------|----|------------|--------------------|
| (3) | a. | e-sɔle | ‘he prayed’ | b. | é-sɔle | ‘that he pray’ |
| | | e-bɔle | ‘he surrounded’ | | é-bɔle | ‘that he surround’ |
| | | e-hala | ‘he chose’ | | e-baá-hala | ‘he will choose’ |
| | | e-kata | ‘he lifted’ | | e-baá-kata | ‘he will lift’ |

In addition to the restrictions described above, the HL rule does not apply to verbal suffixes or noun roots.² Following a stem with final H tone, neither the L-toned habitual suffix (4a) nor the L-toned negative perfective suffix (4b) undergo the rule.

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|-----|----|----------|---------------------|----|-----------|---------------------|
| (4) | a. | e-fó-ɔ | ‘he weeps (hab.)’ | b. | e-fó-kɔ | ‘he hasn’t wept’ |
| | | e-télé-ɔ | ‘he carries (hab.)’ | | e-télé-kɔ | ‘he hasn’t carried’ |
| | | e-kpé-ɔ | ‘he chews (hab.)’ | | e-kpé-kɔ | ‘he hasn’t chewed’ |
| | | e-chú-ɔ | ‘he sends (hab.)’ | | e-chú-kɔ | ‘he hasn’t sent’ |

There is a robust surface contrast between HL (5a) and H¹H (5b) in nouns. This indicates that the HL rule does not apply to noun roots, whose application would neutralize the two types to H¹H.

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|-----|----|--------|-----------|----|--------|----------|
| (5) | a. | mɔ́bɔ̃ | ‘pity’ | b. | shí'tó | ‘pepper’ |
| | | fɔ́te | ‘termite’ | | yí'chú | ‘head’ |
| | | kpúlu | ‘cup’ | | gbé'ké | ‘child’ |
| | | zéŋgle | ‘roof’ | | gó'wá | ‘guava’ |

The HL rule, as shown in (6), states that H tone is inserted and links to a L-toned syllable when preceded by a H tone and followed by pause (#). The L tone delinks from the vowel and is manifested as a downstep before the final H tone, so that the underlying tone sequence HL surfaces as H¹H.

- (6) HL rule
- | | | |
|---|-----|-------|
| V | V | |
| | ┬ | |
| H | L # | H ← ∅ |
- (does not apply to verbal suffixes or noun stems)

² It is not the case that the target L must be a stem tone. L-toned noun suffixes do undergo the rule. For example, in phrase-final position, the L-toned plural suffix /-i/ surfaces with L following L-final roots, as in [nãne-i] ‘legs’, but with downstepped H following H-final roots (due to the HL rule), as in [chwá'i] ‘hearts’.

A second rule, Plateauing, raises a L tone between two H tones. The simple past forms (7a) show the underlying LH pattern of these stems. In (7b), the H-toned subject prefix of the subordinate in combination with the LH of the stems gives HLH. This sequence triggers Plateauing, which causes underlying HLH to surface as H'HH.

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|-----|----|--------|--------------|----|----------------------|-----------------|
| (7) | a. | e-hulú | 'he jumped' | b. | é- ^h húlú | 'that he jump' |
| | | e-kojó | 'he judged' | | é- ^h kójó | 'that he judge' |
| | | e-májá | 'he sent' | | é- ^h májá | 'that he send' |
| | | e-basá | 'he grabbed' | | é- ^h básá | 'that he grab' |

Plateauing also applies to monosyllabic L-toned stems. When underlyingly L-toned stems in the progressive are followed by a L-toned object, no tone change occurs because neither Plateauing nor the HL rule described earlier are triggered (8a). In (8b), the combination of the H-toned progressive prefix -^hN-, L-toned verb stem, and H-toned object provides the HLH sequence that triggers Plateauing, so that the underlyingly L-toned stems surface with downstepped H tone.

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|-----|----|--|-----------------------|
| (8) | a. | mí- ^h ŋ-gbe ako | 'I am killing Ako' |
| | | mí- ^h m'-fo ako | 'I am cutting Ako' |
| | | mí- ^h ŋ-fĩ ako | 'I am scratching Ako' |
| | | mí- ^h ŋ-kõ ako | 'I am biting Ako' |
| | b. | mí- ^h ŋ- ^h gbé ákú | 'I am killing Aku' |
| | | mí- ^h m'- ^h fó ákú | 'I am cutting Aku' |
| | | mí- ^h ŋ- ^h fĩ ákú | 'I am scratching Aku' |
| | | mí- ^h ŋ- ^h kõ ákú | 'I am biting Aku' |

Plateauing applies to underlyingly HL stems when followed by a H-toned object. When a L-initial object or adverb appears after the verb, no change is triggered (9a). When the HL verb stem is followed by a H-initial object, Plateauing applies to this HLH sequence, so that the underlyingly L syllable of the stem surfaces as ^hH (9b).

- (9) a. e-káne ako 'he counted Ako'
 e-kóta cho 'he folded a tree'
 e-bóte shɔ 'he entered Wednesday'
 e-pĩi shɔ 'he suffered Wednesday'
- b. e-ká'né ákú 'he counted Aku'
 e-kó'tá tú 'he folded a gun'
 e-bó'té jú 'he entered Monday'
 e-pĩ'í jú 'he suffered Monday'

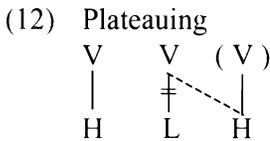
The Plateauing rule does not apply where multiple L-toned syllables intervene between the H tones. In (10a), the H-toned prefix of the progressive, followed by a L-toned verb stem, which is followed by objects with the tone patterns LH or LLH, produces the sequences HLLH and HLLLH, respectively, and no tone change occurs. In (10b), a HL stem followed by a LH or LLH object also yields sequences of multiple L-toned syllables between H's, and there is no change in the surface form.

- (10) a. mĩ-ń-gbe kwakwí 'I am killing a mouse'
 mĩ-m-fo lemá 'I am cutting an axe'
 mí-ń-kɔ̃ ataadé 'I am biting a dress'
 mí-ń-cha kaklá 'I am digging a knife'
- b. e-káne kwakwí 'he counted a mouse'
 e-kóta ataadé 'he folded a dress'
 e-chála ataadé 'he mended a dress'
 e-chála lemá 'he mended an axe'

Unlike the HL rule, Plateauing does apply to suffixes. The imperative and habitual suffixes (/a/ and /ɔ/, respectively), have underlying L tone (11a). Adding an object whose initial syllable has H tone yields the sequence HLH, to which the Plateauing rule applies, changing the underlyingly L suffix tones to downstepped H (11b).

- (11) a. nyĕ́-wó-a ‘lift (pl.)!’
 nyĕ́-hé-a ‘buy (pl.)!’
 e-kpé-ɔ ‘he chews (hab.)’
 e-lá-a ‘he sings (hab.)’
- b. nyĕ́-wó-¹á ákú ‘lift (pl.) Aku!’
 nyĕ́-hé-¹á tú ‘buy (pl.) a gun!’
 e-kpé-¹ɔ wó ‘he chews (hab.) a bone’
 e-lá-¹á lálá ‘he sings (hab.) a song’

The Plateauing rule (12) applies to HLH as follows: the second H tone spreads to the L-toned syllable, and the L tone delinks, remaining as a downstep. Thus, underlying HLH surfaces as H¹HH.³



Assuming, with Clark (1993), that downstep is the automatic result of adjacent identical tones, one might be tempted to reinterpret Plateauing as follows: the second H spreads to the L-toned syllable, delinking the L, which is then deleted via Stray Erasure and thus is not phonetically manifested. The downstep that I have attributed to a floating L tone might then actually be the phonologically predictable result of two adjacent H tones. This type of reanalysis fails because, as shown below, sequences of adjacent H tones in Gã do not result in downstep.

³ A reviewer has suggested that the Plateauing rule could be seen as two separate rules, one spreading H, and another delinking L when preceded by H and linked to the same tone-bearing unit (TBU) as a following H. The ostensible advantage of this approach would be that the second of these rules could also generate the delinking of L in cases I have described as undergoing the HL rule. This would require a separate rule to replace the first part of the HL rule, where a H is inserted after HL and spreads to the L-bearing TBU when immediately preceding a pause; this effect cannot be attributed to a general H ‘boundary tone’ at the end of every phrase, since as shown in (4) and (5), the HL rule does not apply to verb suffixes or to noun stems. My objection to this reanalysis is that there is no independent evidence for either of the two new rules that would serve as the ‘first steps’ of Plateauing and the HL rule. That is, both of these rules would invariably feed the delinking rule, since there is no environment where the first rule would apply without the second. This being the case, the reanalysis seems unmotivated.

Some H-toned roots are shown in (13a) in the simple past, where subject prefixes surface with L tone. When the subject prefix takes on the H tone of the subordinate (13b), no tone sandhi occurs between the H of the prefix and the H of the stem.

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|------|----|--------|-----------------|----|--------|---------------------|
| (13) | a. | e-lá | ‘he sang’ | b. | é-lá | ‘that he sing’ |
| | | e-dú | ‘he cultivated’ | | é-dú | ‘that he cultivate’ |
| | | e-yóó | ‘he recognized’ | | é-yóó | ‘that he recognize’ |
| | | e-fóté | ‘he poured’ | | é-fóté | ‘that he pour’ |

In addition, no downstep occurs between the final H of a stem and the initial H of a following object. Nouns with underlying H tone (14a) do not have their H tone downstepped when preceded by H-final roots (14b).

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|------|----|-----|--------------------|----|-------------|---------------------|
| (14) | a. | ákú | ‘Aku (man’s name)’ | b. | e-yóó ákú | ‘he recognized Aku’ |
| | | tú | ‘gun’ | | e-chósé ákú | ‘he trained Aku’ |
| | | | | | e-kpé tú | ‘he chewed a gun’ |
| | | | | | e-wó tú | ‘he lifted a gun’ |

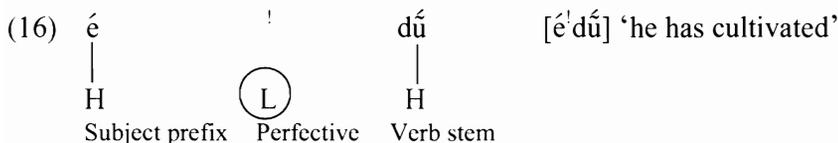
3. A floating tone in the perfective

The two processes described in section 2, the HL rule and Plateauing, apply regularly throughout the language. They apply to both nominal constructions (to noun suffixes, though not to roots) and verbal constructions. In the perfective tense, however, these rules do not apply. In this section, I show that a downstep that appears in the perfective between H-toned prefixes and H-toned roots is the result of a floating L tone prefix that marks the perfective. As I show, the presence of this floating L tone also explains the blockage of the HL rule and Plateauing in the perfective.

The perfective introduces a downstep before H-initial stems. In (15a), H-toned stems do not change tone when preceded by a H-toned subject in the subordinate, since no tone change is triggered by the tone sequence HH (as was demonstrated in section 2). In the perfective (15b), a downstep appears between the H-toned prefix and H-toned stems.

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|---------|------|---------------------|----|--------------------|---------------------|
| (15) a. | é-lá | ‘that he sing’ | b. | é- ¹ lá | ‘he has sung’ |
| | é-dú | ‘that he cultivate’ | | é- ¹ dú | ‘he has cultivated’ |
| | é-wó | ‘that he lift’ | | é- ¹ wó | ‘he has lifted’ |
| | é-fó | ‘that he weep’ | | é- ¹ fó | ‘he has wept’ |

The diagram in (16) schematizes how the downstep results from a floating L that marks the perfective. This accounts for why the downstep appears in the perfective (15b), but not in the subordinate (15a), since the floating tone is specific to the perfective. The circled tone indicates that the tone is unassociated.



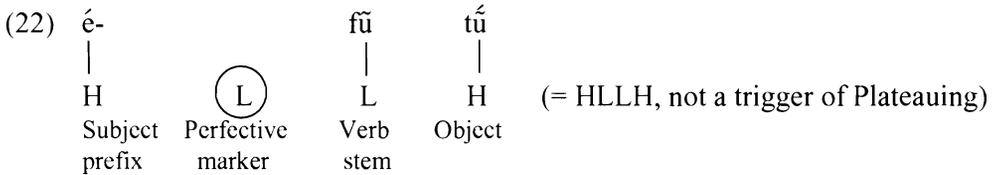
If this downstep is indeed the result of a floating L tone that marks the perfective, we predict that this tone should interfere with the tone rules described above, the HL rule and Plateauing. As mentioned above, this prediction is confirmed, since the perfective is a systematic surface counterexample to both rules. We find prepausal HL sequences in the perfective, constituting surface counterexamples to the HL rule. In the subordinate forms in (17a), the HL rule applies as predicted, so that the underlyingly L-toned stem surfaces with downstepped H when preceded by the H-toned subject prefix and followed by pause. In (17b), the HL rule fails to apply to the perfective forms. This results in HL sequences before pause.

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|---------|---------------------|-----------------|----|-------|-----------------|
| (17) a. | é- ¹ chá | ‘that he dig’ | b. | é-cha | ‘he has dug’ |
| | é- ¹ jó | ‘that he dance’ | | é-jo | ‘he has danced’ |
| | é- ¹ fó | ‘that he cut’ | | é-fo | ‘he has cut’ |
| | é- ¹ nú | ‘that he drink’ | | é-nũ | ‘he has drunk’ |

As schematized in (18), this failure of the HL rule in the perfective is explainable given the floating L tone perfective marker that we posited above. The combination of the H-toned subject prefix, floating L tone perfective marker, and L-toned stem actually produces the sequence HLL, not HL. As was shown in section 2, HLL does not undergo the HL rule, so the failure of the HL rule in the perfective is expected based on our formulation of that rule and the existence of a floating L tone in the perfective.

- b. é-¹gbé ákú ‘that he kill Aku’ é-¹fó ákú ‘that he cut Aku’
 é-¹kǒ ákú ‘that he bite Aku’ é-¹fũ tú ‘that he bury a gun’
- c. é-gbe ákú ‘he has killed Aku’ é-fo ákú ‘he has cut Aku’
 é-kǒ ákú ‘he has bitten Aku’ é-fũ tú ‘he has buried a gun’

Again, the floating L tone marker explains the blockage of Plateauing. The floating L tone of the perfective appears between the subject prefix and stem. This produces the sequence HLLH, not HLH, so Plateauing does not apply (22).



As demonstrated, a floating L tone prefix indirectly affects stem tones in the perfective by causing downsteps, blocking the HL rule, and blocking Plateauing. In the following section, I describe a different set of floating tone prefixes that are more directly manifested because they associate to subject prefixes.

4. Subject prefix-altering grammatical tones

In this section, I show that in addition to the floating tone prefixes just described which do not associate, there are grammatical floating tone prefixes which do associate to subject prefixes. A comparison of the realization of these floating tones in different verb tenses gives evidence for the underlying forms of the subject prefixes, which are toneless with the exception of the first person singular.

As shown in (23a), the first person singular prefix is H-toned in the habitual. The possessive prefix, which I assume to be identical to the subject prefix, is also H-toned in the first person singular (23b). All of the other subject prefixes are pronounced with L tone in the habitual (23c) and in the possessive forms (23d).

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|---------|-----------------------|-----------------|-------------------------|-------|----------|------------------|
| (23) a. | mí- ^ˈ lá-a | ‘I sing (hab.)’ | b. | mí-tú | ‘my gun’ | |
| | c. | o-lá-a | ‘you sing (hab.)’ | d. | o-tú | ‘your gun’ |
| | | e-lá-a | ‘he sings (hab.)’ | | e-tú | ‘his gun’ |
| | | wɔ-lá-a | ‘we sing (hab.)’ | | wɔ-tú | ‘our gun’ |
| | | nyẽ-lá-a | ‘you (pl.) sing (hab.)’ | | nyẽ-tú | ‘your (pl.) gun’ |
| | | amẽ-lá-a | ‘they sing (hab.)’ | | amẽ-tú | ‘their gun’ |

Although the subject prefixes surface with L tone in (23c) and (23d), I will show that they are best analyzed as underlyingly toneless rather than L-toned. There is a phonological distinction between underlyingly L-toned vs. toneless syllables, though this distinction is neutralized in surface forms where toneless syllables are pronounced with L tone by default. (24) schematizes the difference between the first person singular prefix (1sg) and the other prefixes, exemplified by the third person singular (3sg). While the first person singular prefix (24a) has underlying H tone and undergoes no tone change in the unmarked forms, the underlyingly toneless prefixes (24b) get a default L tone when in verbal categories that do not supply grammatical prefix tones.

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|---------|--------------------|----|--------------------|
| (24) a. | 1sg subject prefix | b. | 3sg subject prefix |
| | mí | | e → e |
| | | | |
| | H | | L |

In the perfective (25a) and subordinate (25b), all subject prefixes have H tone. The systematic appearance of H on the subject prefixes can be explained by positing floating H tones marking the perfective and subordinate. Unlike the floating L of the perfective (section 3), these floating H tones dock to subject prefixes and are directly phonetically manifested.

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|---------|---------|----------------------|----|--------|-----------------------|
| (25) a. | mí-cha | ‘I have dug’ | b. | má-lá | ‘that I sing’ |
| | ó-cha | ‘you have dug’ | | ó-lá | ‘that you sing’ |
| | é-cha | ‘he has dug’ | | é-lá | ‘that he sing’ |
| | wó-cha | ‘we have dug’ | | wó-lá | ‘that we sing’ |
| | nyé-cha | ‘you (pl.) have dug’ | | nyé-lá | ‘that you (pl.) sing’ |
| | amé-cha | ‘they have dug’ | | amé-lá | ‘that they sing’ |

we have seen other instances where floating tones are crucial to the analysis of verbal tone (e.g., the perfective (section 3)), the ‘abstract’ concept of a floating tone is still required to analyze the tonal system of the language. For these reasons, I assume that the H-toned subject prefixes of the subordinate (including the 1sg, which also has a segmental change of /i/ to [a]) are portmanteaux that mark person/number as well as the subordinate verb form. The realization of the /á-/ subordinate marker, which surfaces when the subject is an NP, is morphologically blocked when the subject is a prefix since the H-toned prefixes already convey the subordinate mood.

There is also a floating L tone prefix that associates to the subject prefix to mark the simple past. In the simple past, all of the prefixes surface as L, including the underlyingly H-toned first person singular (27).

(27)	mĩ-dú	‘I cultivated’	mĩ-cha	‘I dug’
	o-dú	‘you cultivated’	o-cha	‘you dug’
	e-dú	‘he cultivated’	e-cha	‘he dug’
	wɔ-dú	‘we cultivated’	wɔ-cha	‘we dug’
	nyẽ-dú	‘you (pl.) cultivated’	nyẽ-cha	‘you (pl.) dug’
	amẽ-dú	‘they cultivated’	amẽ-cha	‘they dug’
	mĩ-chósé	‘I trained’	mĩ-hala	‘I collected’
	o-chósé	‘you trained’	o-hala	‘you collected’
	e-chósé	‘he trained’	e-hala	‘he collected’
	wɔ-chósé	‘we trained’	wɔ-hala	‘we collected’
	nyẽ-chósé	‘you (pl.) trained’	nyẽ-hala	‘you (pl.) collected’
	amẽ-chósé	‘they trained’	amẽ-hala	‘they collected’

The derivation of prefix tones in the simple past is illustrated below. In (28a), the floating L tone of the simple past associates to the H-toned 1sg subject prefix, and the underlying H tone of the subject prefix delinks so that the prefix surfaces with L tone. In (28b), the floating L tone associates to an underlyingly toneless subject prefix, and the prefix surfaces with L tone.

tive marks subject prefixes with a H tone (30a). Unlike in other verbal categories that do not mark prefixes with H tone, in the perfective the addition of the subject 'Aku' does not allow deletion of the subject prefix (30b).

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|---------|---------------------|---------------------|----|-------------------------|----------------------|
| (30) a. | é- ¹ lá | 'he has sung' | b. | ákú é- ¹ lá | 'Aku has sung' |
| | é- ¹ bé | 'he has quarrelled' | | ákú é- ¹ bé | 'Aku has quarrelled' |
| | é- ¹ yóó | 'he has recognized' | | ákú é- ¹ yóó | 'Aku has recognized' |
| | é- ¹ ǫté | 'he has poured' | | ákú é- ¹ ǫté | 'Aku has poured' |

Based on (29) and (30), it seems that subject prefix deletion applies to toneless subject prefixes when preceded by a noun phrase subject. However, a complication arises when we consider categories where the subject prefix is marked by a phonological L tone (in contrast to the toneless prefix in (29), which is pronounced with L tone by default). (31a) shows simple past examples with no noun phrase subject. In (31b), when the subject 'Aku' is added, the subject prefix is deleted, and a downstep appears. Thus, the correct statement of the subject prefix deletion rule is that it deletes non-H (both toneless and L-toned) subject prefixes following a noun phrase subject.⁴

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|---------|--------------------|-----------------|----|------------------------|------------------|
| (31) a. | e- ^ǫ dú | 'he cultivated' | b. | ákú ^ǫ dú | 'Aku cultivated' |
| | e-lá | 'he sang' | | ákú ^ǫ lá | 'Aku sang' |
| | e-yóó | 'he recognized' | | ákú ^ǫ yóó | 'Aku recognized' |
| | e-gbélé | 'he opened' | | ákú ^ǫ gbélé | 'Aku opened' |

The contrast between the forms in (31b) vs. the negative perfective forms (29b) where subject prefix deletion did not result in a downstep may seem surprising, but this follows naturally from the present analysis: the downstep in (31b) appears because the subject prefix deletion rule deletes only the segmental portion of the subject prefix, leaving its L tone behind. Further evidence that subject prefix deletion leaves behind the L prefix tone of the simple past is that the HL rule and Plateauing do not apply when the subject prefix has been deleted. When the L-toned subject prefix of the simple past (32a) is deleted before L-toned roots, the HL rule is blocked (32b).

⁴ The rule crucially refers only to subject prefixes, and the effect cannot be attributed to a general vowel hiatus rule since, as we have seen, derived V-V sequences are allowed, as in plural nouns (e.g., [kpúlu-i] 'cups'), definite nouns (e.g., [nuú'ɛ] 'the man'), nouns modified by adjectives (e.g., [cho agbo] 'big tree'), and habitual verbs (e.g., [e-nũ-ɔ̃] 'he drinks (hab.)').

- | | | | | | |
|---------|-------|-------------|----|---------|--------------|
| (32) a. | e-cha | ‘he dug’ | b. | ákú cha | ‘Aku dug’ |
| | e-fũ | ‘he buried’ | | ákú fũ | ‘Aku buried’ |
| | e-kɔ | ‘he bit’ | | ákú kɔ | ‘Aku bit’ |
| | e-mã | ‘he built’ | | ákú mã | ‘Aku built’ |

Plateauing is also blocked by the L tone left behind by subject prefix deletion. (33a) shows the L-toned prefix of the simple past, and in (33b), when the prefix is deleted, Plateauing does not apply to LH roots, and the result is a surface HLH sequence.

- | | | | | | |
|---------|----------|------------------|----|------------|-------------------|
| (33) a. | e-chwalá | ‘he beat (rice)’ | b. | ákú chwalá | ‘Aku beat (rice)’ |
| | e-balá | ‘he wrapped’ | | ákú balá | ‘Aku wrapped’ |
| | e-hulú | ‘he jumped’ | | ákú hulú | ‘Aku jumped’ |
| | e-kujú | ‘he judged’ | | ákú kujú | ‘Aku judged’ |

The diagram in (34) illustrates the difference between the L-toned vs. toneless prefixes with respect to the subject prefix deletion rule. In the simple past (34a), deletion of the prefix leaves behind a L tone which causes a downstep before the high-toned stem. In the negative perfective (34b), the subject prefix is toneless, so no tone is left behind after deletion, and there is no downstep before the stem.

- | | | | | | | | | |
|---------|------------|---|------|----|-------------------|---|------|------------|
| (34) a. | ákú | e → ∅ | ‘lá | b. | ákú | e → ∅ | lá | -kɔ |
| | ∨ | | | | ∨ | | | |
| | H | L | H | | H | | H | L |
| | NP | L-toned | Verb | | NP | Toneless | Verb | Negative |
| | subject | subject | stem | | subject | subject | stem | perfective |
| | | prefix | | | prefix | | | suffix |
| | ‘Aku sang’ | | | | ‘Aku hasn’t sung’ | | | |

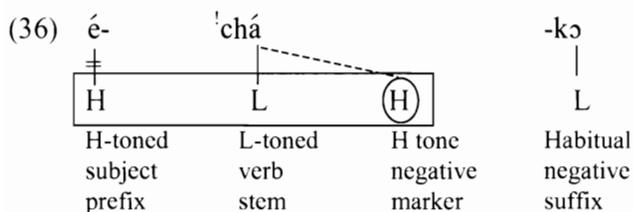
5. Stem-altering grammatical tones

A final way that floating tones play a significant role in distinguishing verb tense/aspect/mood is by associating to stems. In the negative perfective, negative future, and imperative, suffixed floating tones associate to the verb stem itself, rather than associating to the subject prefix or floating between the prefix and verb stem as was seen in the preceding sections. For example, the negative perfective is characterized by a H tone that associates to verb stems, so that L-toned

stems surface with a downstepped H tone. (35a) gives citation forms of these L-toned verbs in the simple past. The negative perfective forms (35b) have downstepped H tone.

- | | | | | | |
|---------|--------|--------------|----|-------------------------|----------------------|
| (35) a. | e-cha | ‘he dug’ | b. | é- ¹ chá-kɔ | ‘he has not dug’ |
| | e-jo | ‘he danced’ | | é- ¹ jó-kɔ | ‘he has not danced’ |
| | e-gbɔɔ | ‘he hunted’ | | é- ¹ gbɔɔ-kɔ | ‘he has not hunted’ |
| | e-hao | ‘he worried’ | | é- ¹ háó-kɔ | ‘he has not worried’ |

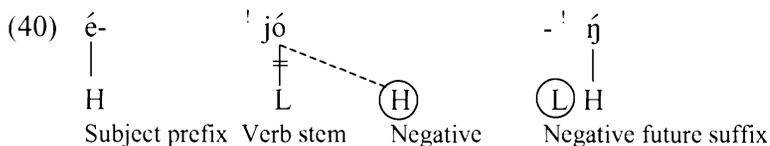
(36) illustrates how the suffixed H tone of the negative perfective links to the stem, creating the HLH sequence required so that Plateauing delinks the underlying L tone of the stem, resulting in a downstepped H in the stem.



When 2-syllable HL stems appear in the negative perfective, the H tone surfaces on the second stem syllable, justifying the characterization of the floating tone as a suffix. The forms in (37a) show the underlying HL tone pattern surfacing unchanged in the habitual. In the negative perfective (37b), these stems surface as H¹H. Without the floating H, this is not explainable by the HL rule, Plateauing, or any other regular rule of the language. Thus, the tone change must be due to the grammatical H tone of the negative perfective.

- | | | |
|---------|--------------------------|----------------------|
| (37) a. | e-káne-ɔ | ‘he counts (hab.)’ |
| | e-chála-a | ‘he mends (hab.)’ |
| | e-bóte-ɔ | ‘he enters (hab.)’ |
| | e-kpála-a | ‘he herds (hab.)’ |
| b. | e-ká ¹ né-kɔ | ‘he has not counted’ |
| | e-chá ¹ lá-kɔ | ‘he has not mended’ |
| | e-bó ¹ té-kɔ | ‘he has not entered’ |
| | e-kpá ¹ lá-kɔ | ‘he has not herded’ |

(38) compares the habitual with the negative perfective, showing how the stem



The imperative is marked by a H tone suffix that behaves like those of the negative perfective and negative future described above, with one exception. Since the imperative does not use subject prefixes, Plateauing does not apply when the grammatical H tone associates to L-toned roots. The result is that both the L tone of the stem and the H tone of the imperative surface on the stem, which is pronounced with a rising tone (41).

(41)	e-cha	‘he dug’	cháá	‘dig!’
	e-jo	‘he danced’	joó	‘dance!’
	e-fo	‘he cut’	foó	‘cut!’
	e-tĩ	‘he scratched’	tĩĩ	‘scratch!’

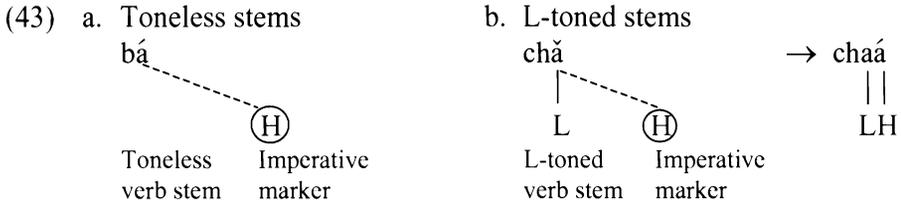
The lengthening of the vowel in the imperative forms in (41) is the result of a regular process of rising tone lengthening, whereby a short (monomoraic) vowel bearing a rising tone becomes a long (bimoraic) vowel (Paster 2000).

I have demonstrated why the L vs. toneless distinction is crucial to an analysis of subject prefix tone, since the two behave differently with respect to the rule of subject prefix deletion described in section 4. However, we have not yet seen evidence for a L vs. toneless distinction among verb stems. In fact, the behavior of the H tone imperative marker provides evidence for this contrast. As shown in (42), although toneless stems in are indistinguishable from L-toned stems in the simple past and perfective, in the imperative they behave differently from the L-toned stems that were shown in (41).

(42)	e-ba	‘he came’	bá	‘come!’
	e-ho	‘he passed by’	hó	‘pass by!’
	e-wo	‘he wore’	wó	‘wear!’
	e-wɔ	‘he slept’	wó	‘sleep!’
	e-hao	‘he worried’	háó-mǎ	‘worry!’ ⁶
	e-sɔɔ	‘he caught’	sóó-mǎ	‘catch!’
	e-doo	‘he roasted’	dóó-mǎ	‘roast!’

⁶ The imperative suffix appears only with certain stem types (Paster 2000); its distribution is not relevant to the discussion of the grammatical tone.

As illustrated below, toneless stems (43a) take on the H tone of the imperative straightforwardly, while L-toned stems (43b) retain the underlying L tone, resulting in a rising tone, which induces lengthening of the vowel. The difference between these two types of stems, which are indistinguishable in verbal categories that do not mark the stem with a tone, is explainable if we assume a L vs. toneless contrast in verb stems.



The L vs. toneless distinction in verb stems is confirmed in the negative forms, which mark the stem with a H tone. In the negative past (44a), negative perfective (44b), and negative future (44c), toneless roots pattern with H-toned roots rather than L-toned roots. This is because while toneless roots take on the H tone straightforwardly and H-toned roots retain their H tone (or the grammatical H merges with the lexical H — there is no evidence for one analysis over the other), the lexical L of L-toned stems remains and is manifested as downstep before the grammatical H.

<p>(44) a. H-toned roots</p> <p style="margin-left: 2em;">e-lá-áâ ‘he did not sing’</p> <p style="margin-left: 2em;">e-kpé-éê ‘he did not chew’</p> <p style="margin-left: 2em;">Toneless roots</p> <p style="margin-left: 2em;">e-hó-óô ‘he did not pass by’</p> <p style="margin-left: 2em;">e-lé-éê ‘he did not know’</p> <p style="margin-left: 2em;">L-toned roots</p> <p style="margin-left: 2em;">é-¹chá-áâ ‘he did not dig’</p> <p style="margin-left: 2em;">é-¹má-áâ ‘he did not build’</p>	<p>b. H-toned roots</p> <p style="margin-left: 2em;">e-lá-kɔ ‘he has not sung’</p> <p style="margin-left: 2em;">e-chú-kɔ ‘he has not sent’</p> <p style="margin-left: 2em;">Toneless roots</p> <p style="margin-left: 2em;">e-hó-kɔ ‘he has not passed by’</p> <p style="margin-left: 2em;">e-lé-kɔ ‘he has not known’</p> <p style="margin-left: 2em;">L-toned roots</p> <p style="margin-left: 2em;">é-¹chá-kɔ ‘he has not dug’</p> <p style="margin-left: 2em;">é-¹má-kɔ ‘he has not built’</p>
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c. H-toned roots

e-lá-¹ŋ ‘he will not sing’
 e-kpé-¹ŋ ‘he will not chew’

Toneless roots

e-hó-¹ŋ ‘he will not pass by’
 e-lé-¹ŋ ‘he will not know’

L-toned roots

é-¹chá-¹ŋ ‘he will not dig’
 é-¹lá-¹ŋ ‘he will not dream’

6. Conclusion

The Gã verb system makes use of floating tones in a variety of ways. Floating tone prefixes and suffixes interact with lexical tones to produce the verbal distinctions that have been described. Some tenses, such as the perfective, are marked by a floating L tone prefix between the subject prefix and verb stem. Some, including the subordinate, are marked by a prefixed floating H tone which associates to the subject prefix. The simple past, on the other hand, has a floating L tone prefix which replaces the lexical tone of subject prefixes; the deletion of non-H-toned subject prefixes following a noun phrase subject leaves floating tone prefixes behind, giving us clear evidence for the floating tone. Floating tone markers which occur as suffixes alter the tone of verb stems in some tenses, such as the negative future. The behavior of the suffixes affecting stem tone indicates an underlying L vs. toneless contrast. The existence of this contrast is evidence that, in combination with the evidence from floating tones, strongly reaffirms the claim of Autosegmental Phonology that the number of tones is independent of the number of TBUs. There are numerous further examples of floating tones in Gã (Paster 2000); this paper has presented some of the many ways that they contribute to tense/aspect/mood distinctions in verbs.

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