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Latent High Tones in Limba (Thɔnkɔ Dialect), Sierra Leone

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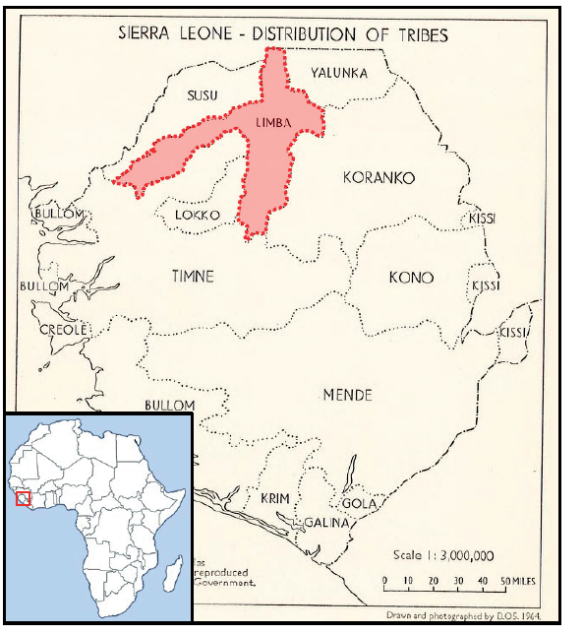
ABSTRACT

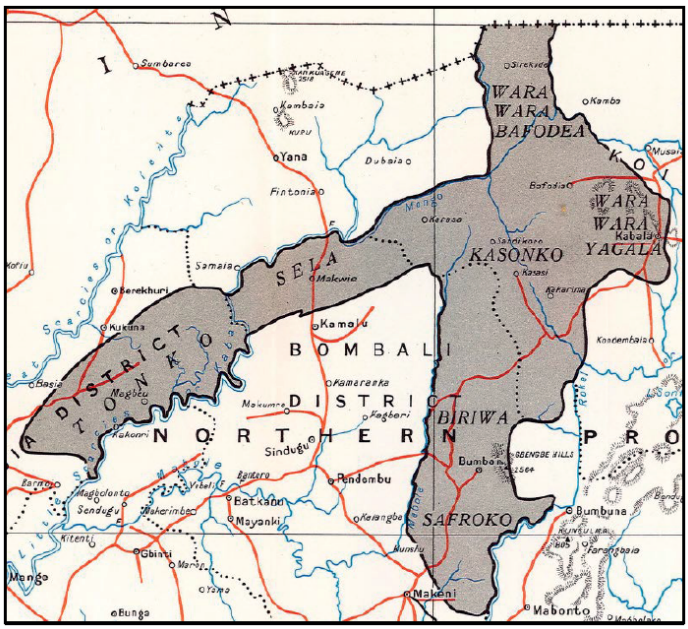
This paper presents an analysis of the rather unusual tone system of the almost totally undocumented Thɔnkɔ /t̪ɔŋkɔ/ dialect of Limba, a Niger-Congo language of Sierra Leone (and slight overlap into Guinée). As we will show, most words are all low tone in their citation form, but exhibit a wide range of tonal contrasts with different high tones popping up when words occur in context. We will illustrate, step by step, how the observed facts justify the proposed contrastive underlying forms and reveal tonal alternations which are best treated with such abstract representations. To show the opaqueness of the widespread tonal neutralization within the system which results from Final High Lowering (FHL), we begin with the interaction of nouns and their adnominal modifiers and then turn to the verb phrase and the clause. We show that the L% boundary tone triggering FHL occurs at the end of declarative and imperative utterances as well as yes-no questions but, interestingly, not at the end of WH questions.

Keywords: abstract phonology, final lowering, boundary tone, long-distance phonology

1. Introduction

The purpose of this paper is to analyze the opaque tone system of Thɔnkɔ /t̪ɔ́ŋkɔ́/ dialect of Limba, a Niger-Congo language of Sierra Leone (and a bit of Guinée). As seen in the following maps, Limba occupies a boomerang-shaped area in Northwest Sierra Leone. Although Finnegan (1965:144) estimates "13 or more" dialects, these cluster into three groups: Biriwa-Safrɔkɔ in the South, on which most of the previous work has been done, although nothing tonal, Wara Wara in the North, and Thɔnkɔ-Sɛla in the West.





(from Finnegan 1965; see also Rolle 2024 and Rolle et al 2024)

Besides Finnegan's ethnographic study, the major linguistic work on Limba is Clarke's (1922) Biriwa-Safrɔkɔ dictionary containing more than 4,000 entries which, however, in addition to other studies such as Thomas (1920), Berry (1958, 1960), Pichl (n.d.) and Conteh (2017), provides no indication of tone. In this study we present the basics of tone in the Thɔnkɔ /t̪ɔ́nkɔ́/ dialect.[1] We will show that when H(igh) tones become L(ow) tones by rule, they still stick around as "traces" on their respective TBUs. What we are thus calling "latent high tones" are present in underlying representations but require some digging. In §2 we first introduce Final High Lowering (FHL) as it affects prepausal H tones. In sections §3-§6 we then show how FHL further affects certain H tones that occur internally within the noun phrase, the verb phrase, the clause, and interrogative utterances. In §7 we reconsider the underlying representation of determiners and address the raised L phenomenon which is transcribed in earlier sections. A brief conclusion is provided in §8.

2. Final high tone lowering (FHL)

In Thɔnkɔ dialect of Limba, with two exceptions (see (3) below), words end with a L tone. Out of 504 nouns in our current lexicon, 403 are all L(ow) in their citation form. Examples are seen in (1a), where the lack of an acute accent on a vowel indicates L tone ("th" represents an unaspirated dental [t̪]).

(1)	a. *noun in isolation*		b. *noun + determiner*		*underlying*
	ma-pɛthande	'juncture'	ma-pɛthande maŋ	'the juncture'	/L-L.L.L/
	ma-sakala	'ground trap'	ma-sakalá maŋ H	'the ground trap'	/L-L.L.H/
	ma-lenthani	'ladder'	ma-lenthání maŋ H H	'the ladder'	/L-L.H.H/
	ma-koyoni	'rain water'	ma-kóyóní maŋ H H H	'the rain water'	/L-H.H.H/

However, in (1b), where H tone is marked by an acute accent, we see that when the class 9 determiner *maŋ* is added, the same nouns are realized with four different stem tones: all L, one final H, two final Hs, three final Hs. These alternations show that there is a process which lowers an underlying H or sequence of H tones before pause. As expressed informally in (2), we propose that the trigger of lowering is a final L% boundary tone.

(2) Final H Lowering (FHL) : $H^n \rightarrow L^n$ / ___] L% (to be autosegmentalized later)

The lowering process in (2) affects all word classes: nouns, verbs, adjectives, numerals, determiners etc. The only exceptions we have found are the three grammatical words in (3).[2]

(3) homá 'all, whole' e.g. ma-pɛthande homá 'a whole juncture'

[1] All of the materials presented here are based on the speech of the second author, who was raised in Kabasa village in Kambia Province where Thɔnkɔ is spoken. We would like to thank those who attended and commented on earlier presentations of this work at the UC Berkeley Phonetics and Phonology Forum, March 22, 2024, the Phonology & Morphology Pertinacity Workshop, Ettington Park, organized by Aditi Lahiri (Oxford University), September 23-25, 2024, and at the Valentin Vydrin's Theory of Tone Seminar, Langage, Langues et Cultures d'Afrique Research Unit (LLACAN), Villejuif, October 10, 2024.

[2] Strictly speaking, *namá* 'how' and gamá 'where' are not exceptions, since WH questions do not undergo FHL (see §6). All three end in what is clearly a morpheme /má/, which is especially clear in the case of *ga-má*, where *ga-* is the class 12 locative prefix. We do not know how extensive FHL is in dialects other than Thɔnkɔ. FHL clearly does not apply in the northern dialects. Thus, /L.H/ 'uncooked rice' is pronounced *paká* in Wara Wara (Rolle 2022-3, http://dx.doi.org/doi:10.7297/X2G73CM2) and *pagá* in the Guinée Limba materials that Valentin Vydrin shared with us. In Thɔnkɔ, *paga* is pronounced L-L but is clearly /L.H/ (cf. *pagá baŋ* 'the rice'). Unfortunately we have no tonal data from the southern Biriwa-Safrɔkɔ dialects.

namá ‘how’
gamá ‘where’

We thus have an opaque tone system: Words pronounced in isolation tell you almost nothing about their underlying tones. (See below in (9) for why we say “almost”.)

What this means is that for every noun, verb, etc. we have to place something after it in order to tell what the underlying tones are. And it is not just anything. For nouns, it usually works to place the CV*ŋ* determiner after it, as in (1b). But it doesn’t always work. Thus, consider the nouns in (4), as they appear before the singular class 3 determiner *goŋ* and its corresponding plural class 4 form *ŋaŋ*.[3]

(4)			*noun in isolation*		*noun + determiner*		*underlying*
a.	i.	gu-theŋ	‘dog’	gu-theŋ koŋ	‘the dog’	/L-L/
		ŋa-theŋ	‘dogs’	ŋa-theŋ ŋaŋ	‘the dogs’	
	ii.	ku-thala	‘branch’	ku-thala goŋ	‘the branch’	/L-L.L/
		ŋa-thala	‘branches’	ŋa-thala ŋaŋ	‘the branches’	
	iii.	gu-dagbala	‘slipper’	gu-dagbala goŋ	‘the slipper’	/L-L.L.L/
		ŋa-dagbala	‘slippers’	ŋa-dagbala ŋaŋ	‘the slippers’	
b.	i.	ku-bo	‘swamp’	ku-bo goŋ	‘the swamp’	/L-H/
		ŋa-bo	‘swamps’	ŋa-bó ŋaŋ H	‘the swamps’	
	ii.	ku-bulɔ	‘calabash’	ku-bulɔ goŋ	‘the calabash’	/L-L..H/
		ŋa-bulɔ	‘calabashes’	ŋa-bulɔ́ ŋaŋ H	‘the calabashes’	
	iii.	gu-thinkɔ	‘snail’	gu-thinkɔ goŋ	‘the snail’	/L-H.H/
		ŋa-thinkɔ	‘gowns’	ŋa-thínkɔ́ ŋaŋ H H	‘the snails’	
	iv.	gu-ramina	‘prayer’	gu-ramina goŋ	‘the prayer’	/L-H.H.H/
		ŋa-ramina	‘prayers’	ŋa-rámíná ŋaŋ H H H	‘the prayers’	

As seen, the nouns in (4) have all L tone in isolation. When followed by a determiner, the nouns in (4a) remain all L in both singular and plural. We can safely conclude that their stems are underlyingly /L/, as indicated in the last column.[4] In (4b), however, the nouns are realized all L in the singular before *goŋ*, but show one, two or three final H tones in the plural before *ŋaŋ*, similar to what we saw before the class 9 determiner *maŋ* in (1). Why should we get this difference before *goŋ* as opposed to *maŋ* and *ŋaŋ*?

The answer can be extrapolated from other adnominal forms which show noun class agreement, e.g. the locatives ‘here’ and ‘there’ which occur after the underlyingly /L-L/ of ‘dog(s)’ in (5b):

(5)	a.	*underlying noun*		b.	*noun + locative + determiner*	
	i.	/gu-theŋ/	‘dog’		gu-theŋ ku-dondo goŋ	‘this dog over here’
					gu-theŋ ku-ganka goŋ	‘that dog over there'

[3] Although we translate the determiners with the English definite article ‘the’, they can also have the proximate determiner meaning ‘this, these’. Note also in (4a) that there is an unusual process by which /g/ devoices to [k] postnasally, treated by Galvano & Kamara (2024a,b.). Hence, /goŋ/ is realized [koŋ] in *gu-theŋ koŋ* ‘the dog’. The contrast between /k/ and /g/ is quite limited in Thɔnkɔ, with variation. Thus class 3 *ku-bo ~ gu-bo* ‘swamp’ vs. only *gu-theŋ* ‘dog’. There is less [g] in other dialects.
[4] Although the last column shows the patterns with sequences of Ls and Hs, we assume a single /L/ or /H/ which links to all of the syllables of the stem.

ii. /ŋa-theŋ/ ‘dogs’ ŋa-theŋ ŋá-dondó ŋaŋ ‘these dogs over here'
H H
ŋa-theŋ ŋá-ganká ŋaŋ ‘those dogs over there'
H H

In (5b) we notice two things. First, the final tone of the two locatives shows the same difference we saw in (4): The two locatives are pronounced all L in the singular before the class 3 determiner *goŋ* in (5b.i), while a final H tone appears in the plural before the class 4 determiner *ŋaŋ* in (5b.ii), suggesting that /-dondó/ ‘here’ and /-ganká/ ‘there’ are both underlyingly /L.H/.

The second thing to notice is that the noun class agreement prefix is L tone /gu-/ (→ ku- after a nasal) in the singular in (5b.i), but H tone /ŋá-/ in the plural in (5b.ii). This tonal difference is quite robust in the language. However, it’s not specifically the singular-plural contrast that accounts for the tonal difference, rather the identity of the noun class. Thus, in other noun classes, the singulars and plurals have the same tone patterns, as in (6).

(6)

			underlying noun		*noun + locative + determiner*	
a.	i.	/hati/	‘child’	hati u-dondo oŋ	‘this child here’
				hati u-ganka oŋ	‘that child there'
	ii.	/mpati/	‘children’	mpati bi-dondo beŋ	‘these children here'
				mpati bi-ganka beŋ	‘these children here'
b.	i.	/mu-thu/	‘plant’	mu-thu mú-dondó muŋ H H	‘this plant here’
				mu-thu mú-ganká muŋ H H	‘that plant there’
	ii.	/mu-thu-niŋ/	‘plants’	mu-thu-niŋ mú-dondó muŋ H H	‘these plants here’
				mu-thu-niŋ mú-ganká muŋ H H	‘those plants there’

In (6a) both the class 1 singular and class 2 plural of ‘child(ren)’ show L tone agreement /u-/ and /bi-/, respectively (and the final /H/ of /-dondó/ and /-ganká/ is lowered), while in (6b), both *mu-thu* ‘plant’ and its plural *mu-thu-niŋ* ‘plants’ show the same class 11 H tone /mú-/ agreement and preservation of the final /H/ of /-dondó/ and /-ganká/. It is thus the noun class and not the singular vs. plural number that is responsible for the observed tonal differences.

To get a fuller picture, the Thɔnkɔ Limba noun classes are presented in (7), where we box in contrastive L tone agreement markers. (Noun and numeral prefixes are all L.) As indicated in the boxed forms, the hypothesis is that the determiners of classes 1-3 and (locative) class 11 are underlyingly /L/ (or more likely toneless—see below), while the determiners of other noun classes are underlyingly /H/. In the adjective/genitive column the prefixes of classes 5 and 12 have the opposite tone of the corresponding determiners. All prefixes are L on both nouns and on numerals. Note that the first six classes consist of the singular/plural class pairings 1/2, 3/4 and 5/6, while the remaining noun classes express both singulars and plurals with identical agreement, the plural taking a nasal suffix, e.g. class 8 *kunku baŋ* ‘the fence’, *kunku-iŋ baŋ* ‘the fences’.

(7)	*class*		*noun prefix*	*det.*	*adj./gen. prefix*	*num. prefix*	*includes:*
	1	sg.	Ø	/oŋ/	o-	u-	animates
	2	pl.	Ø	/beŋ/	bi-	bi-	animates
	3	sg.	gu- / ku-	/goŋ/	gu-	gu-	trees
	4	pl.	ŋa-	/ŋáŋ/	ŋá-	ŋa-	
	5	sg.	hu- / Ø	/háŋ/	hu-	hu-	body parts, fruit
	6	pl.	tha-	/tháŋ/	thá-	tha-	
	7	sg./pl.	N-	/gíŋ/	gí-	gi-	leaves
	8	sg./pl.	ba- / Ø	/báŋ/	bá-	ba-	
	9	sg./pl.	ma-	/máŋ/	má-	ma-	mass-liquids
	10	sg./pl.	bu-	/búŋ/	bú-	bu-	
	11	sg./pl.	mu-	/múŋ/	mú-	mu-	deverbal
	12	sg./pl.	ka- ~ ga-	/ka/	gá-	ga-	locative

In (8), the /H/ vs. /L/ contrast on agreement prefixes can also be seen with the genitive particle /-ga/.[5] Note that the plurals of classes 7-11 are marked with an /-(n)iŋ/ or /-ni/ suffix on the noun, with their noun class agreements being the same in singular and plural. The name /kabâ/ is underlyingly /L.H͡L/.

(8)	*class*		*noun1*	*gen.*	*noun2*	*det.*	
	1	sg.	hati	o-ga	Kabá	oŋ	‘Kaba’s child’
	2	pl.	mpati	bi-ga	Kabá	beŋ	‘Kaba’s children’
	3	sg.	gu-theŋ	ki-ga	Kabá	goŋ	‘Kaba’s dog’
	4	pl.	ŋa-theŋ	ŋá-ga	Kabá	ŋaŋ	‘Kaba’s dogs’
	5	sg.	hu-raŋ	hu-ga	Kabá	haŋ	‘Kaba’s bamboo’
	6	pl.	tha-raŋ	thá-ga	Kabá	thaŋ	‘Kaba’s bamboos’
	7	sg.	n-kala	gí-ga	Kabá	giŋ	‘Kaba’s rope’
		pl.	n-kale-ŋ	kí-ga	Kabá	giŋ	‘Kaba’s ropes’
	8	sg.	bara	bá-ga	Kabá	baŋ	‘Kaba’s meat’
		pl.	bare-ŋ	bá-ga	Kabá	baŋ	‘Kaba’s meats’
	9	sg.	ma-ndi	má-ga	Kabá	maŋ	‘Kaba’s water’
		pl.	ma-ndi-ŋ	má-ga	Kabá	maŋ	‘Kaba’s waters’
	10	sg.	bú	bú-ga	Kabá	buŋ	‘Kaba’s fire’
		pl.	bú-ní	bú-ga	Kabá	buŋ	‘Kaba’s fires’
	11	sg.	mu-thu	mú-ga	Kabá	muŋ	‘Kaba’s plant’
		pl.	mu-thu-niŋ	mú-ga	Kabá	muŋ	‘Kaba’s plants’
	12		ka-thuháŋ	ká-ga	Kabá	ga	‘Kaba’s overseas’

We now address why we earlier said that words pronounced in isolation tell you ALMOST nothing about their underlying tones. The answer is that 97 of the 504 nouns in our lexicon end with a final H͡L falling tone or a H.L bisyllabic sequence, which we represent as H.Ø in (9).

[5] The same H vs. L contrast is found on adjectives, except that the H tone prefixes are preceded by a floating L tone which causes a downstep (ꜜ) when wedged between H tones. Thus compare *banká bá-ga Kabá baŋ* ‘Kaba’s house’ (without downstep) vs. *banká ꜜbá-néné* ‘bad house’ (with downstep). We will see in §7 that the determiners also have a complex /LH/ tone.

(9)	a.	*noun in isolation*		b. *noun + determiner*		*underlying*
	i.	gu-sála H	‘hoe’	gu-sálá goŋ ⟋ H	‘the hoe’	/gu-sála goŋ/ H
		ŋa-sála H	‘hoes’	ŋa-sála ŋaŋ H	‘the hoes’	/ŋa-sála ŋáŋ/ H H
	ii.	gu-wádɛ H	‘umbrella’	gu-wádɛ́ goŋ ⟋ H	‘the umbrella’	/gu-wádɛ goŋ/ H
		ŋa-wádɛ H	‘umbrellas’	ŋa-wádɛ ŋaŋ H	‘the umbrellas’	/ŋa-wádɛ ŋáŋ/ H H

In the singular forms in (9b) we see that the penultimate /H/ spreads onto the final syllable of ‘hoe’ and ‘umbrella’. We thus need a rule of High Tone Spreading (HTS). However, the rule does not apply in the plural forms of ‘hoes’ and ‘umbrellas’. The reason is that HTS is blocked by the tone of /ŋáŋ/. The blocking effect of class 4 H tone /ŋá-/ agreement markers is seen more overtly in (10), where the prefixal /H/ of /ŋá-/ is realized in the output of /-dondó/ ‘here’ and /-ganká/ ‘there’.

(10)	a.	*underlying noun*		b. *noun + locative + determiner*	
	i.	/gu-sála/ H	‘hoe’	gu-sálá gu-dondo goŋ ⟋ H	‘this hoe over here’
				gu-sálá gu-ganka goŋ ⟋ H	‘that hoe over there’
	ii.	/ŋa-sála/ H	‘hoes’	ŋa-sála ŋá-dondó ŋaŋ H H H	‘these hoes over here’
				ŋa-sála ŋá-ganká ŋaŋ H H H	‘those hoes over there’
	iii.			*ŋa-sálá ŋá- ⟋ | H H	

HTS occurs in the singular forms in (10b.i.), but not in the plural forms in (10b.ii), because it would have produced a derived OCP violation, as indicated in (10b.iii). The H tone does not spread up to the next H.

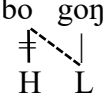
3. Internal FHL within the noun phrase

In the preceding section we saw that FHL causes the final H or Hs of a prepausal word to become L, thus merging with underlying /L/ in the output. We also saw in (9) that the ultimately lowered H of /H/ determiners blocks HTS.[6] While the above works well, we have not accounted for the lowering of /H/ before L tone determiners, e.g. /goŋ/ in (4). There seem to be two logical hypotheses as why L tone determiners such as /goŋ/ have a lowering effect on what precedes.

[6] While this is accounted for by assuming HTS to apply before FHL, a reanalysis of /H/ determiners is presented in §7.

The first hypothesis is that the class 1-3 determiners have a /L/ tone that spreads onto the preceding H or Hs, causing these to delink, as shown in (11).

(11) ku-bo goŋ [kù-bò gòŋ] ‘the swamp’



According to this view, the /H/ of /ku-bó/ ‘swamp’ is delinked by an unusual process of anticipatory L tone spreading. This assumes that /goŋ/ has a marked /L/ tone. Note, however, that /goŋ/ is only able to do this if it is prepausal. Thus, in (12a), instead of /goŋ/ lowering the preceding /H/, the /H/ of /ku-bó/ ‘swamp’ spreads both onto /goŋ/ and /homá/ ‘whole, all’.

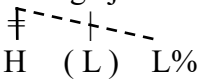
(12)

	noun + *det.* + *quantifier*		*output*	
a.	/ku-bó/ + /goŋ/ + /homá/	→	ku-bó góŋ hó$^{\downarrow}$má	‘the whole swamp’
	L H L L H		L H L L H	
b.	/gu-theŋ/ + /goŋ/ + /homá/	→	gu-theŋ koŋ homá	‘the whole dog’
	L L L L H		L L L L H	

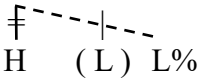
In (12a) $^{\downarrow}$ represents a downstepped H tone which results from HTS spreading and delinking of the initial L of /homá/ ‘whole, all’, whose underlying /L.H/ is realized without change after a L, as in (12b). Since the apparent lowering effect of /goŋ/ can only be effected when this determiner is prepausal, we assume that it is not the trigger of what we will refer to as “internal FHL”.

This brings us to the second hypothesis: Internal FHL is triggered by the L% boundary tone proposed in (2)—which can “see through” the class 1-3 determiners. There are two ways this might be implemented. The first is that the /L/ of the class 1-3 determiners is “extraprosodic” and hence invisible to L%. Since the /H/ of /ku-bó/ ‘swamp’ is now adjacent to L%, it delinks, as in (13a).[7]

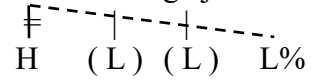
(13) a. ku-bo goŋ ‘the swamp’



b. ku-bo nda ‘your sg. swamp’



c. ku-$^{\uparrow}$bo[8] nda goŋ ‘your sg. swamp, the swamp of yours sg.’



There is however, a potential problem with this view. Observe first in (13b) that FHL can also see through /nda/ 'your sg.’ whose /L/ would similarly have to be extraprosodic. The potential problem occurs in (13c), where the two adnominal dependents can occur in sequence. While we have placed the /L/ of both in

[7] We needn’t be concerned about the apparent line crossing, since the association line of an extraprosodic tone is assumed to be not visible.

[8] In (13c) and subsequent examples, $^{\uparrow}$ indicates a slight rise in pitch that optionally occurs at the point where such long distance H has been lowered. As can be seen by the absence of $^{\uparrow}$ in (1a), such a rise in pitch does not occur on an utterance-final word that has undergone FHL. In that context there is complete tonal merger with L. We will transcribe $^{\uparrow}$ only where the slight right is possible (it is never obligatory), which we further address in section 7. For the time being, the $^{\uparrow}$ marks can be ignored.

parentheses, this is not the way extraprosodicity (extrametricality) is supposed to work. Rather, the outer constituent should have made the /L/ of 'your sg.' visible, which would then incorrectly block FHL.

A second approach which we think is superior is to derive the invisibility effects from underspecification: Those words which allow L% to see through them are underlyingly toneless, as in (14), where again FHL is expressed as L% delinking the /H/ of 'swamp' .[9]

(14) a. ku-bo goŋ 'the swamp'
H L%

b. ku-bo nda 'your sg. swamp'
H L%

c. ku-ˆbo nda goŋ 'your sg. swamp, the swamp of yours sg.'
H L%

As seen, the result of underspecification is that the /H/ of 'swamp' is adjacent to L% on the same tier, hence the remote effect on the H can be expressed as a local process.

This, however, raises a new problem: Underspecification of certain non-H tone-bearing units is word-specific in Thɔnkɔ. We thus not only need to know which surface L tones are underlyingly /H/, but also which L tones are underlyingly Ø. The examples in (15) show the six possessive pronouns appearing after /ku-bó/ and /ŋa-bó/ 'swamp(s)' with and without a determiner following.[10] As seen in comparing the boxed forms, only the pronoun /nda/ 'your sg.' allows the lowering of a preceding H, since it is the only possessive pronoun that lacks an underlying /H/ tone.

(15)

a. /ku-bó/ 'swamp' + *poss.* + *det.*		b. /ŋa-bó/ 'swamps' + *poss.* + *det.*	
ku-bó nîŋ	'my swamp'	ŋa-bó nîŋ	'my swamps'
ku-bó nîŋ koŋ		ŋa-bó nîŋ ŋaŋ	
ku-bo nda	'your sg. swamp'	ŋa-bo nda	'your sg. swamps'
ku-bo nda goŋ	/nda/ + /goŋ/	ŋa-bó ndá ŋaŋ	/nda/ + /ŋáŋ/
ku-bó ntuŋ	'our swamp'	ŋa-bó ntuŋ	'our swamps'
ku-bó ntuŋ koŋ	/ṅ.túŋ/ + /goŋ/	ŋa-bó ˇntúŋ ŋaŋ	/ṅ.túŋ/ + /ŋáŋ/
ku-bó ndeŋ	'your pl. swamp'	ŋa-bó ndeŋ	'your pl. swamps'
ku-bó ndeŋ koŋ	/ṅ.déŋ/ + /goŋ/	ŋa-bó ˇndéŋ ŋaŋ	/ṅ.déŋ/ + /ŋáŋ/
ku-bó náma	'his/her swamp'	ŋa-bó náma	'his/her swamps'
ku-bó náma goŋ		ŋa-bó náma ŋaŋ	
ku-bó náməŋ	'their swamp'	ŋa-bó néməŋ	'their swamps'
ku-bó náməŋ koŋ		ŋa-bó néməŋ ŋaŋ	

In (15), final /nda/ allows the lowering of the /H/ of both the singular and plural of 'swamp(s)'. When the determiner follows, lowering still occurs in the singular, but not in the plural. where instead the /H/ of /ŋa-bó/ spreads onto the pronoun. The reason is seen in the derivations in (16).

[9] Recall that L% can only lower a word-final H or Hs, also when *goŋ* intervenes: *gu-sála* 'hoe', *gu-sálá goŋ* 'the umbrella' (with HTS), **gu-sala goŋ*.

[10] There is a strong preference for the determiner to accompany possessives, its absence feeling a bit "awkward".

(16) a. /ku-bó nda goŋ/ → ku-bo nda goŋ ‘your sg. swamp’ (cf. ku-bo nda)

H H L%

b. /ŋa-bó nda ŋáŋ/ → ŋa-bó ndá ŋaŋ ‘your sg. swamps’ (cf. ŋa-bo nda)

H H H H L%

In (16a), the L% boundary tone reaches the /H/ of /ku-bó/ ‘swamp’ through the toneless sequence of /nda/ ‘your sg.’ and /goŋ/ ‘class 3 determiner’. In (16b), however, L% cannot affect the /H/ of /ŋa-bó/ ‘swamps’ through /nda/, since the determiner /ŋáŋ/ is underlyingly /H/. Instead, the /H/ of ‘swamps’ spreads onto the possessive pronoun, and /ŋáŋ/ undergoes FHL, as indicated.

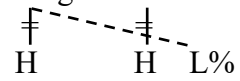
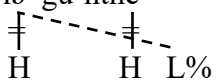
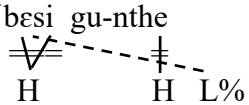
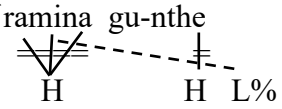
Although we have illustrated internal FHL with /goŋ/ and /nda/, they are not alone in showing transparency to FHL. Some adjectives and the numeral /-nthé/ ‘one’ are also transparent to L%. We illustrate this first with the adjective /-ŋama/ ‘new’ in (17).

(17)		*noun in isolation*		*noun + adjective*		*underlying*
	a.	gu-theŋ	‘dog’	gu-theŋ ku-ŋama L%	‘new dog’	/Ø-L/
	b.	ku-bo (H)	‘swamp’	ku-ˆbo gu-ŋama H L%	‘new swamp’	/Ø-H/
	c.	ku-bulɔ (H)	‘calabash’	ku-buˆlɔ gu-ŋama H L%	‘new calabash’	/Ø-LH/
	d.	ku-bɛsi (H H)	‘bunch’	ku-ˆbɛsi gu-ŋama H L%	‘new bunch’	/Ø-HH/
	e.	gu-ramina (H H H)	‘prayer’	gu-ˆramina gu-ŋama H L%	‘new prayer’	/Ø-HHH/

In (17) we again see that all of the nouns are realized all L in isolation, although those in (17b-e) have one or more underlying /H/ syllable. In (17a) the L% boundary tone has a vacuous effect on the gradually lowering all L sequence which begins quite low on the noun /gu-theŋ/ ‘dog’. In each of the remaining examples, L% triggers lowering of one to three H tone syllables. Although there is an optional slight raising of the L of the first /H/ syllable of each noun stem (see note 8), the result is again a gradually lowering sequence pitch from that point, with a L falling contour on the last syllable of the adjective.

A similar output is observed when these nouns are followed by the numeral /-nthé/ ‘one’ in (18), which will our first example where a delinked final /H/ allows FHL to affect preceding /H/ tones (see also §7).

(18)		*noun in isolation*		*noun + ‘one’*		*underlying*
	a.	gu-theŋ	‘dog’	gu-theŋ ku-nthe H L%	‘one dog’	/Ø-L/

b.	ku-bo (H)	‘swamp’	ku-↑bo gu-nthe 	‘one swamp’	/Ø-H/
c.	ku-bulɔ (H)	‘calabash’	ku-bu↑lɔ gu-nthe 	‘one calabash’	/Ø-LH/
d.	ku-bɛsi (H H)	‘bunch’	ku-↑bɛsi gu-nthe 	‘one bunch’	/Ø-HH/
e.	gu-ramina (H H H)	‘prayer’	gu-↑ramina gu-nthe 	‘one prayer’	/Ø-HHH/

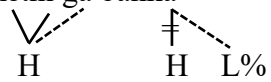
With the above, we have identified the all L adnominal constituents we have found that are transparent to FHL. With the exception of the numeral ‘one’ in (18), those which have an underlying /H/ are not transparent to FHL, nor are numerals ‘two’ and higher, which must be analyzed with /L/. Thus, class 2 /bi-yɛthéŋ/ ‘men’ + /bi-ye/ ‘two’ is realized as *bi-yɛthéŋ bí-ye* with HTS onto the numeral prefix rather than **bi-yɛthɛŋ bi-ye* by internal FHL. We now consider how internal FHL applies within the clause.

4. Internal FHL within the verb phrase

Given that we have introduced a L vs. Ø contrast, the question is which surface all L words have to be underspecified to capture their transparency to L%?[11] So far we have only seen closed-class monosyllabic non-H tone grammatical words triggering internal FHL on a head noun. When we turn to verbs, the class of internal FHL triggers expands in two ways.

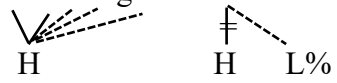
First, transparent grammatical words need not be monosyllabic. In (19) the verb is assigned an all H tone pattern in the aorist. While /héthí/ undergoes FHL in (19a), the H tones are preserved in (19b), where the prepositional phrase /ga banká/ ‘at home’ follows.

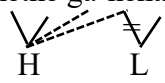
(19) a. ndɛ hɛthi ‘s/he laughed’
(H H)

b. ndɛ héthí gá banka ‘s/he laughed at home’


c. ndɛ ↑hɛthi hɛ ‘s/he laughed today’
ndɛ ↑hɛthi ga-tha ‘s/he laughed somewhere’
ndɛ ↑hɛthi tete ‘s/he laughed now’

d. ndɛ ↑hɛthi ga-tha tete ‘s/he laughed somewhere now’

e. ndɛ héthí tété gá banka ‘s/he laughed now at home’


f. ndɛ héthé gá-héna ‘s/he laughed elsewhere’


[11] Since FHL only targets word-final H tones, potentially through toneless words, there is no reason to distinguish between /HØ/ and /HL/. The numeral /-nthé/ ‘one’ data in (18) suggest that L noun class prefixes should be Ø rather than /L/.

While it may not be surprising that the monosyllabic adverb /hɛ/ ‘today’ triggers lowering in (19c), so does locative class 12 /ga-tha/ ‘somewhere’ as well as the temporal adverb /tete/ ‘now’, both of these being bisyllabic, but still closed class.[12] (19d) shows that lowering will occur before two (and potentially more) toneless words in succession, while (19e) shows that these words must be in final position. The example in (19f) shows that the class 11 locative /ga-hɛna/ is not a trigger, hence presumably has to be analyzed with a /L/ tone stem, as shown.[13]

So far all of the transparent “interveners” of internal FHL have been grammatical words. The sentences in (20) illustrate that all L lexical nouns are not transparent.

(20) a. ndɛ yuye ‘s/he heard’ /yúyé/
ndɛ hɛthi ‘s/he laughed’ /hɛ́thí/

b. ndɛ yúyé sô ‘s/he heard a horse’ /so/ ‘horse’
H L L%

c. ndɛ yúyé báhu ‘s/he heard a goat’ /bahu/ ‘goat’
H L L%

d. ndɛ hɛ́thí ga banka ‘s/he laughed in the house’ /banká/ ‘house’
H L H L%

As before, the verbs in (20) take an all H tone pattern in the aorist. In (20a) the two verbs are L.L, since the utterance-final /H/ tone melody undergoes FHL. In (20b-d) the H of the verb spreads onto the following word. (20b) shows that this includes a monosyllabic /L/ noun such as /so/ ‘horse’, where a H͡L falling tone results from HTS.[14] We also see that the first branch of /bahu/ ‘goat’ is delinked in (18c). We have represented the locative preposition /ga/ ‘to, at, in’ as toneless in (20d), while L% delinks the /H/ of /banká/ ‘house’.

While lexical nouns normally block internal FHL, e.g. /ma-ndi/ ‘water’ in (21a), there are, surprisingly, a few exceptions which we also consider to be underlyingly toneless. A complete list of the nouns we have found to be transparent to FHL is given in (21b), where the underlying /H.H/ of the verb /dɛ́th-í/ ‘look at.AORIST’ undergoes internal FHL:

(21) a. ndɛ dɛ́thí má-ndi ‘s/he looked at water’
H

b. ndɛ dɛthi wɔ ‘s/he looked at someone’
ndɛ ↑dɛthi biya ‘s/he looked at people’
ndɛ ↑dɛthi hati ‘s/he looked at a child’
ndɛ ↑dɛthi mpati ‘s/he looked at children’
ndɛ dɛthi n-tha ‘s/he looked at something’

[12] /hɛ/ is demonstrably not a noun, since it cannot take any adnominal modifiers, while /ga-tha/ is a noun which can be modified, however only by an adjective or a numeral. The same stem appears in /n-tha/ ‘something’ in (21b) below.

[13] Another, perhaps less likely possibility is that it blocks FHL because it is trisyllabic. Note that the stem *hɛna* actually means ‘(an)other’, as in *ku-bó gú-héna* ‘another swamp’, where HTS also applies.

[14] Since there is no surface final vowel length contrast, it is possible that such monosyllabic lexical words are underlyingly bimoraic, i.e. /soo/.

c. ndɛ dɛ́thí mú-nku ‘s/he looked at things’
H

d. ndɛ ˆdɛthi hati oŋ ‘s/he looked at the child’
ndɛ ˆdɛthi mpati beŋ ‘s/he looked at the children’

e. ndɛ ˆdɛthi hati hɛ ‘s/he looked at a child today’
ndɛ ˆdɛthi hati tete ‘s/he looked at a child now’

f. ndɛ dɛ́thí hátí gá banka ‘s/he looked at a child in the house’
H H L%

It may be significant that the singulars /wɔ/ ‘person, someone’ and /n-tha/ ‘(some)thing’ have a generic interpretation, maybe also /hati/ ‘child’, but the plurals /biya/ ‘people’ and /mpati/ ‘children’ are also transparent to FHL. /mu-nku/ ‘things’, the suppletive plural of /n-tha/ ‘(some)thing’ in (21c), is not transparent to FHL. It also should be noted that these are real nouns which take adnominal modifiers, for example, adjectives (*wɔ o-nɛnɛ* ‘bad person’, *n-tha gí-ŋáma* ‘new thing’). (21d) shows that lowering will still occur when ‘child’ and ‘children’ are modified by their toneless class 1 and 2 determiners. Also, as seen in (21e), such Ø words need not be in the same NP constituent. However, as in other examples, (21f) shows that the toneless interveners must be in final position or lowering will not occur. We have to underscore that both the existence and stacking of a small class Ø lexical words are unusual cross-linguistically.

5. Internal FHL within the clause

We have thus far established that FHL is triggered by prepausal L%. Since the end of an utterance is also the end of a phonological phrase and an intonational phrase, the question is whether there is any utterance-internal domain at the end of which FHL applies. In order to test this, we considered a few syntactic environments where a phonological phrase break is found in other languages. The first that we considered is the break between a subject noun phrase and the verb. Consider again the four-way tonal contrast on the nouns we saw in (1), repeated in (22a). In (22b) these nouns occur as subject of /ŋɔti/ ‘fall’ which receives an all /H/ tone pattern in the aorist: *ma-pɛthande ŋɔ́tí ga banka* ‘a juncture fell in the house’. In prepausal position, however, the aorist /H/ is delinked. As seen, FHL also affects the three subject nouns in (22b.ii-iv).

(22)

	a. *noun + determiner*		b. *subject noun + verb*	
i.	ma-pɛthande maŋ	‘the juncture’	ma-pɛthande ŋɔti	‘a juncture fell’
ii.	ma-sakalá maŋ H	‘the ground trap’	ma-saka ˆla ŋɔti	‘a ground trap fell’
iii.	ma-lenthání maŋ H H	‘the ladder’	ma-len ˆtani ŋɔti	‘a ladder fell’
iv.	ma-kóyóní maŋ H H H	‘the rain water’	ma- ˆkoyoni ŋɔti	‘rain water fell’

As in previous examples, FHL is triggered by L%, which first lowers the all H aorist tone of /ŋɔt-i/ ‘fall’ and then the final H or Hs of the subject noun, similarly to what we saw with the numeral /-nthé/ in (18), apparently making FHL an iterative rule (cf. section 7 below). This is seen clearly in (23), where the all H aorist melody is realized, since /ga banká/ ‘at home’ follows. In this case the subject nouns realize their four distinctive tone patterns:

(23) a. ma-pɛthande ŋɔ́tí gá banka ‘a juncture fell in the house’
H H L%

b. ma-sakalá ŋɔ́tí gá banka ‘a ground trap fell in the house’
H H H L%

c. ma-lentání ŋɔ́tí gá banka ‘a ladder fell in the house’
H H H L%

d. ma-kóyóní ŋɔ́tí gá banka ‘rain water fell in the house’
H H H L%

While most verbs in our lexicon take an all H melody in the aorist, a smaller set of verbs instead have a /HLH/ melody, where the second /H/ appears on the final vowel, and hence potentially undergoes FHL. In (24) the /HLH/ of /póòthí/ ‘be dirty.AORIST’ is realized HL before pause, further demonstrating that the subject noun does not undergo lowering whenever the verb has a H tone:[15]

(24) a. ma-pɛthande póòthi ‘a juncture is dirty’
H

b. ma-sakalá póòthi ‘a ground trap is dirty’
H H

c. ma-lenthání póòthi ‘a ladder is dirty’
H H H

d. ma-kóyóní póòthi ‘rain water is dirty’
H H H H

We thus safely assume that FHL does not independently target the end of a subject NP, which therefore is not marked by a final L% boundary tone.

Testing for other possible clause-internal occurrences of L%, another common phonological phrase break is between two XPs within the verb phrase. The examples in (25) and (26) show that the first of two post-verbal XP constituents is not subject to FHL:

(25) a. ndɛ bóheŋ bá dɛtha ma-pɛthande ga banka ‘s/he will look at a juncture in the house’
H H

b. ndɛ bóheŋ bá dɛtha ma-sakalá gá banka ‘s/he will look at a ground trap in the house’
H H H

c. ndɛ bóheŋ ba dɛtha ma-lentání gá banka ‘s/he will look at a ladder in the house’
H H H H

d. ndɛ bóheŋ ba dɛtha ma-kóyóní gá banka ‘s/he will look at rain water in the house’
H H H H H

[15] Compare *ma-kóyóní póòthí ga banka* ‘rain water is dirty at home’, where the verb realizes the HLH pattern. (We use the grave accent (`) to indicate the L of a HL contour on a long vowel.) While full coverage of Limba verb stem tonology is not possible here, the first H of the HLH is the same aorist H of the all H pattern of the majority verbs, while the second H is from the verb root. Verb roots which take the all H aorist pattern can be analyzed as either /L/ or Ø. For more information on the phonology and morphology of the verb stem, including tone, see Hyman & Kamara (2025).

(26) a. ndɛ bóheŋ bá dɛtha ma-pɛthande ba yɛrɛmɛ oŋ ‘s/he will look at a juncture for the woman’
H H

b. ndɛ bóheŋ bá dɛtha ma-sakalá bá yɛrɛmɛ oŋ ‘s/he will look at a ground trap for the woman’
H H H

c. ndɛ bóheŋ bá dɛtha ma-lentání bá yɛrɛmɛ oŋ ‘s/he will look at a ladder for the woman’
H H H H

d. ndɛ bóheŋ bá dɛtha ma-kóyóní bá yɛrɛmɛ oŋ ‘s/he will look at rain water for the woman’
H H H H H

As seen, the three nouns in (25b-d) and (26b-d) realize their H tones, with HTS applying onto the prepositions /ga/ ‘at, to, in’ and /ba/ ‘for’. As in many other languages, the head noun or verb only phrases with the adjacent dependent XP, while successive XPs are phrased separately. Based on these and the subject facts, we conclude that FHL is not a process which applies at the end of a phonological phrase. So far, L% only appears pre-pausally.

6. Interrogative utterances

Returning to the effect of utterance-final position, we have thus far only exemplified the citation form of words and phrases in isolation and in declarative sentences. Besides declaratives, FHL also applies in imperative utterances. Thus the four nouns in (27a) merge as all L in (27b).

(27)

	a. *noun + determiner*		b. *imperative verb + noun*	
i.	ma-pɛthande maŋ	‘the juncture’	dɛth-a ma-pɛthande	‘look at a juncture!’
ii.	ma-sakalá maŋ H	‘the ground trap’	dɛth-a ma-sakala	‘look at a ground trap!’
iii.	ma-lenthání maŋ H H	‘the ladder’	dɛth-a ma-lentani	‘look at a ladder!’
iv.	ma-kóyóní maŋ H H H	‘the rain water’	dɛth-a ma-koyoni	‘look at rain water!’

In some tone languages which have a pre-pausal lowering effect, the process is suspended in yes-no questions. This is, however, not the case in Thɔnkɔ Limba, where the yes-no questions in (28b) differ from the corresponding declarative utterances in (28a) by the presence of an initial /H/ tone question marker /ɛ́/ and a H tone on the utterance-final vowel.

(28)

a.	ndɛ bóheŋ bá dɛtha ma-pɛthande	‘s/he will look at a juncture’	/ma-pɛthande/
	ndɛ bóheŋ bá dɛtha ma-sakala	‘s/he will look at a trap’	/ma-sakalá/
	ndɛ bóheŋ bá dɛtha ma-lenthani	‘s/he will look at a ladder’	/ma-lenthání/
	ndɛ bóheŋ bá dɛtha ma-koyoni	‘s/he will look at rain water’	/ma-kóyóní/
b.	ɛ́ ndɛ bóheŋ bá detha ma-pɛthandé	‘will s/he look at a juncture?’	/ma-pɛthande/
	ɛ́ ndɛ bóheŋ bá detha ma-sakalá	‘will s/he look at a trap?’	/ma-sakalá/
	ɛ́ ndɛ bóheŋ bá detha ma-lenthaní	‘will s/he look at a ladder?’	/ma-lenthání/
	ɛ́ ndɛ bóheŋ bá detha ma-koyoní	‘will s/he look at rain water?’	/ma-kóyóní/

In both the statements and yes-no questions, the four tone patterns of the underlying forms in the rightmost column are neutralized. It thus appears necessary to postulate a H% yes-no interrogative boundary tone to follow the prepausal L% that we have seen in declarative examples.

However, as seen now in (29), a different situation arises in WH-questions:

(29)	a.	mbɛ́ o dɛthɛ ma-pɛthande	‘who looked at a juncture?’	/ma-pɛthande/
	b.	mbɛ́ o dɛthɛ ma-sakalá	‘who looked at a ground trap?’	/ma-sakalá/
	c.	mbɛ́ o dɛthɛ ma-lenthání	‘who looked at a ladder?’	/ma-lenthání/
	d.	mbɛ́ o dɛthɛ ma-kóyóní	‘who looked at rain water?’	/ma-kóyóní/

In these sentences FHL does not apply to the last word. Consider also the following examples where the same four nouns occur in the /mbɛ́ … na/ ‘which’ construction:

(30)	a.	mbɛ́ ma-pɛthandɛ na	‘which juncture?’
	b.	mbɛ́ ma-sakalá ná	‘which ground trap? ’
	c.	mbɛ́ ma-lenthání ná	‘which ladder?’
	d.	mbɛ́ ma-kóyóní ná	‘which rain water?’

Accounting for the final Hs in both (29) and (30) is rather straightforward: While L% is present in declarative utterances, yes-no questions, and imperatives, it is absent in WH questions. This not only allows the final /H/ tones to be realized in WH questions, as in (29), but also allows HTS to apply onto the focus marker /na/ in (30). Had L% been present, we would have expected the toneless focus marker /na/ to allow internal FHL to affect the preceding noun (cf. *makoyoni na* ‘it’s rain water’).

This leads us to wonder if there are other contexts where the underlying final input /H/ tones are allowed to surface in final position. We first tried WH echo questions (“contingent queries”) which came out the same as in (29), but with a superhigh (˝) tone on the last syllable, indicating surprise:

(31)	a.	mbɛ́ ɔ dɛthɛ ma-pɛthandɛ̋	‘WHO looked at a juncture!?’
	b.	mbɛ́ ɔ dɛthɛ ma-sakalá̋	‘WHO looked at a ground trap!?’
	c.	mbɛ́ ɔ dɛthɛ ma-lenthání̋	‘WHO looked at a ladder!?’
	d.	mbɛ́ ɔ dɛthɛ ma-kóyóní̋	‘WHO looked at rain water!?’

Yes-no echo questions undergo FHL like regular yes-no questoins, but with a superhigh rather than H tone on the last syllable. Thus, the four object nouns in (32) are all L tone except for the one final super H tone.

(32)	a.	ndɛ bóheŋ bá dɛtha ma-pɛthandɛ̋	‘s/he will look at a juncture!?’
	b.	ndɛ bóheŋ bá dɛtha ma-sakalá̋	‘s/he will look at a trap!?’
	c.	ndɛ bóheŋ bá dɛtha ma-lenthaní̋	‘s/he will look at a ladder!?’
	d.	ndɛ bóheŋ bá dɛtha ma-koyoní̋	‘s/he will look at rain water!?’

Another context we have found in which FHL applies is in paused lists. In this case there are two options illustrated below after the all L infinitive form *a-dɛthi* ‘to look at’. In (33a) each item receives L%, while in (33b) each non-final item gets both L% and a following H%, as we saw in yes-no questions in (28b).

(33)	a.	ndɛ bóheŋ ba dɛth-a ma-pɛthande… ma-sakala… malenthani… ma-koyoni
	b.	ndɛ bóheŋN ba dɛth-a ma-pɛthandé… ma-sakalá… malenthaní… ma-koyoni
		‘s/he will look at a juncture… a ground trap… a ladder… rain water’

Finally, L% is present clause finally within an utterance, e.g. at the end of a temporal or conditional clause, or when followed by a conjoined clause:

(34) a. na kúté ndɛ́ yaba, ndɛ hethe ‘when s/he saw clothes, s/he laughed’
H H L% H L% /yabá/ ‘clothes’

b. mɛ́né ndɛ ˆdɛthi gubo, yaŋ ndo kê ‘if s/he looks at a swamp, I will leave’
H L% HL

c. ndɛ se, yaŋ kúté niŋ ‘s/he came and I saw him/her’
H L% H

In conclusion, we can thus identify L% as occurring at the end of a non-WH question intonational phrase.

7. Further issues

In the preceding discussion we have confronted a number of issues and complications in what we have termed an opaque tone system. In this section we first return to the tone of determiners and then consider the raised L tone that has been transcribed in some of our examples.

Recall from (7) that the determiners of classes 1, 2, 3, and 12 were said to be toneless, while the determiners in other classes are /H/. This accounted for the application of internal FHL to the singular class 3 noun /ku-bó/ ‘swamp’, in (35a), but its failure to apply to the corresponding plural class 4 /ŋa-bó/ ‘swamps’ in (35b).

(35) a. ku-bo goŋ [kù-bò gòŋ] ‘the swamp’
H L%

b. ŋa-bo ŋaŋ [ŋà-bó gòŋ] ‘the swamp’
H H L%

As schematized in (35b), we originally proposed that the /H/ of /ŋáŋ/ stops L% from affecting /ŋa-bó/. However, there is a problem. As we saw in (18b), repeated in (36a), L% delinks the final /H/ of class 3 /gu-nthé/ ‘one’ and then goes on to delink the /H/ of /ku-bó/ ‘swamp’ (and the final Hs of other nouns in (18b)).

(36) a. /ku-bó/ ‘swamp’ ku-ˆbo gu-nthe ‘one swamp’
H H H L%

b. /ma-sakalá/ ‘ground trap’ ma-sakaˆla ŋɔti ‘a ground trap fell’
H H H L%

Similarly, as we saw in (22b), schematized in (36b), FHL first lowers the all H aorist melody of /ŋɔ́tí/ ‘fall.AORIST’ and then goes on to lower the final H of /ma-sakalá/ ‘ground trap’ (and the final Hs of the other subject nouns in (22b)). If we compare the inputs of (36a,b) with (35b), the question arises as to why the /H/ of /ŋa-bó/ ‘swamps’ is not also lowered in (35b).

In examining this inconsistency, we discovered that the so-called H determiners show further tonal alternations that require a reanalysis of their underlying tone. In (37) and (38) we show how the class 3 and 4 determiners are realized in the eight tonal contexts indicated in the first column.

(37)	a.	L + goŋ + L	gutheŋ koŋ homá	‘the whole dog’
	b.	H + goŋ + L	gubó góŋ hó$^{\downarrow}$má	‘the whole swamp’
	c.	L + goŋ + H	gutheŋ koŋ póoti	‘the dog got dirty’
	d.	H + goŋ + H	gubó góŋ póoti√	‘the swamp got dirty’
	e.	L + goŋ + L%	gutheŋ koŋ	‘the dog’
	f.	H + goŋ + L%	gubo goŋ	‘the swamp’
	g.	L + goŋ + //	mbɛ́ o dɛthɛ gutheŋ koŋ	‘who looked at the dog?’
	h.	H + goŋ + //	mbɛ́ o dɛthɛ gubó góŋ	‘who looked at the swamp?’

H

(38)	a.	L + ŋǎŋ + L	ŋatheŋ ŋáŋ hó$^{\downarrow}$má	‘all the dogs’
	b.	H + ŋǎŋ + L	ŋabó ŋaŋ hó$^{\downarrow}$má	‘all the swamps’
	c.	L + ŋǎŋ + H	ŋatheŋ ŋáŋ póothi	‘the dogs got dirty’
	d.	H + ŋǎŋ + H	ŋabó ŋaŋ póothi	‘the swamps got dirty’
	e.	L + ŋǎŋ+ L%	ŋatheŋ ŋaŋ	‘the dog’
	f.	H + ŋǎŋ + L%	ŋabó ŋaŋ	‘the swamp’
	g.	L + ŋǎŋ + //	mbɛ́ o dɛthɛ ŋatheŋ ŋáŋ	‘who looked at the dog?’
	h.	H + ŋǎŋ + //	mbɛ́ o dɛthɛ ŋabó $^{\downarrow}$ŋáŋ	

H L H

The four grammatical frames are as follows:

(39)	a.	noun + determiner + /homá/ ‘while, all’	(37a,b), (38a,b)
	b.	noun + determiner + /póothi/ ‘got dirty’	(37c,d), (38c,d)
	c.	noun + determiner + L% boundary tone	(37e,f), (38e,f)
	d.	noun + determiner + pause (//, no L%)	(37g,h), (38g,h)

The outputs with toneless class 3 *goŋ* in (37) show no surprises. In (37f) the /H/ of /gu-bó/ ‘swamp’ is lowered by L% through the transparent toneless determiner /goŋ/, as we saw in (4b). In (37b,d,h), where FHL cannot apply, the /H/ of /gu-bó/ spreads onto the determiner, as schematized for (37h).

As indicated in (38), the plural forms motivate a /LH/ underlying representation of so-called H determiners. Since rising tones are not allowed in the language, the underlying /LH/ is simplified to either H or L, depending on the surrounding environment:

(i) After the preceding L in (38a,c,g), /ŋǎŋ/ is simplified to H by delinking the L part of the LH rising tone. In (38a), the H spreads onto /homá/ ‘whole, all’, creating the downstep of [hó$^{\downarrow}$má] by delinking its initial L (cf. (12a)).

(ii) After the preceding H in (38b,d) /ŋǎŋ/ is simplified to L by delinking the H part of the LH rising tone—which however spreads onto the following L in (38b), again producing the downstep of [hó$^{\downarrow}$má].

(iii) /ŋǎŋ/ is realized L by FHL in both (38e) and (38f).

(iv) This leaves (38h), where /ŋǎŋ/ is preceded by a H and occurs finally in a WH question (where L% is not present). This is the only context where it is realized on a downstepped $^{\downarrow}$H tone.[16]

[16] Before pause, a single $^{\downarrow}$H tone syllable can optionally be lowered even further to a level L˚ tone which most commonly is analyzed as a linked L followed by a floating H. Thus, (38h) has two possible outputs: (i) *mbé o dɛthɛ ŋabó $^{\downarrow}$ŋáŋ*, where the downstep is conditioned by the floating L of *ŋabó ˋŋáŋ*; (ii) mbé o dɛthɛ ŋabó ŋàŋ˚, where the non-falling L˚ is conditioned by the final floating H of ŋabó ŋàŋ ´. The same variation *hó$^{\downarrow}$má ~ hóma˚* was also observed.

To summarize, we suggest that the reason why "H" determiners such as class 4 /ŋ̌ǎŋ/ do not allow subsequent internal lowering in forms like ŋa-bó ŋaŋ 'the swamps', is because of the presence of the L of /LH/ underlying tone.[17] This might suggest that FHL applies iteratively unless there is an intervening L. The main obstacle comes from post-verbal nouns which have a /H/ tone. As seen in the examples in (40), when the final H or H.H of an object noun undergoes FHL, the H.H tone of the verb /dɛ́thí/ 'look at.AORIST' is not affected. Instead, its final H spreads onto the noun in (40a-c,e)

(40	a.	/gu-bó/	'swamp'	ndɛ dɛ́thí gú-bô	's/he looked at a swamp'
	b.	/gu-bulɔ́	'calabash'	ndɛ dɛ́thí gú-búlɔ	's/he looked at a calabash'
	c.	/gu-thínkɔ́/	'snail'	ndɛ dɛ́thí gú-thinkɔ	's/he looked at a snail'
	d.	/bú/	'fire'	ndɛ dɛ́thí bu	's/he looked at a fire'
	e.	/yabá/	'shirt'	ndɛ dɛ́thí yába	's/he looked at a shirt'
	b.	/kógí/	'rooster'	ndɛ dɛ́thí kogi	's/he looked at a rooster'

In the case of (40a-c), it would suffice to assume that the class 3 prefix /gu-/ has a /L/ tone on nouns (vs. the numeral 'one' and adjectives), which would block internal FHL like the L of /ŋ̌ǎŋ/. For this to work for the prefixless nouns in (40d-e), we would need a floating L prefix. While there is evidence of lost prefixes, we postpone further discussion of this to a study we are preparing on HTS in Thɔnkɔ.

The second issue concerns the optional raised ˆL, which we have transcribed, but not commented on. The ˆL is not only variable but, when present, can easily be missed if one is not paying attention to it. This is not only because the rise is slight, but especially because the entire sequence of Ls following ˆ gradually lowers in pitch, just like a sequence of Ls without ˆ. As can be seen in the previous examples, ˆL only occurs in what we have called internal FHL. Any H or sequence of Hs that is lowered before pause will be realized on non-raised L pitch. The ˆL tone is instead possible only on a non-prepausal word. Our impression is that the ˆL option is more likely when the intervening toneless word is polysyllabic, as in the case of /gu-ŋama/ 'new (class 3)' in (17). In fact we have never encountered ˆL when the final tonal word is monosyllabic, e.g. the class 3 determiner /goŋ/ in (4b). ˆL also seems more common when the lowered /H/ occurs on the subject, as in (22b) above. Although we recorded a lot of examples, including those in (41), where all of the consonants are sonorants, the limited number of pitch tracks we looked at (with thanks to Ron Sprouse) were variably and did not consistently show the differences we could detect.

(41)	a.	mama yuyo	'an animal was heard'	/mama/	'animal'
	b.	ya ˆma yuyo H	'a crowd was heard'	/yamá/	'crowd'

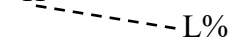
We therefore postpone further discussion of the phonetics and focus instead on how to characterize the ˆL tone phonologically.

Recall the following example from (17b), where the /H/ of /ku-bó/ 'swamp' undergoes internal FHL.

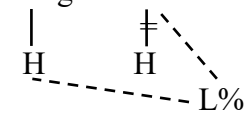
(42)	a.	ku-bo (H)	'swamp'	ku-ˆbo gu-ŋama H L%	'new swamp'
	b.	ku-bo (H)	'swamp'	ku-bo gu-ŋama H L%	'new swamp'

[17] Rolle (2024) reports that the /LH/ determiners are realized with a surface LH rising tone in Wara Wara dialect: *ŋ̌ǎŋ* (class 4), *thǎŋ* (class 6), *bŭŋ* (class 10) etc.

c. ku-bo (H) ‘swamp’ ku-ˆbo gu-ŋama ‘new swamp’



d ku-bo (H) ‘swamp’ ku-ˆbo gu-nthe ‘one swamp’



As seen in (42a), we proposed that the L% boundary tone was able to see through the class 3 toneless adjective /gu-ŋama/ to delink the /H/ of /ku-bó/. However, if it just did that, we would simply expect an all L sequence without the rise, as in (41b). There are a number of possibilities in tonal feature geometry that could allow us to capture the ˆL tone. One is to consider that the L% can function either as a regular L tone, as in (42b), thereby delinking the H, or as a register tone that we informally show linking to the H tone rather than delinking it in (42c). The lowering effect on the H would have to be rather significant, since the result is a pitch much closer to normal L than it is to H or even ˇH. There also would be the awkwardness shown in (42d), where L% would have to delink the final /H/ of /gu-nthé/ ‘one’ (class 3), but only affect the register of the /H/ of /ku-bó/. Before we can go any further with other possible interpretations of the optional raised L, more phonetic analysis is needed, especially with more speakers.

8. Conclusion

To conclude, we have presented an analysis of a rather “opaque” tone system, where many underlying /H/ tones are not realized and different /H/ tone patterns merge on the surface. Athough we have distinguished /H/, /L/ and Ø, tonal underspecification (Ø) has been justified only from the right edge of utterances where we need certain low pitch syllables to be transparent to the L% boundary tone delinking a final H or sequence of H tones. It may be that we will need more underspecification. We also saw two cases with FHL delinking an utterance-final H tone(s) and then affecting the final H(s) of the preceding word: the numeral ‘one’ in (18) and the all H aorist tone pattern in (22b). The all H pattern of the aorist is, in fact, found only on verb stems which have no underlying /H/ of their own. The verb tone patterns vary not only by tense-aspect-mood and negation, but also differ according to whether a verb root or a verb extensions has an underlying /H/ or not (Hyman & Kamara 2025), in which case we obtain a HLH sequence whose final H is lowered to L before pause, as expected (cf. (24) and note 14).

We also saw that the L% is not present in WH questions. It is present in yes-no questions which are built on the declarative, involving an initial /ɛ́/ marker and two final boundary tones L% and H%. It is quite ironic that we only discovered how useful WH questions are after devoting considerable time and effort looking at words in isolation, phrases and simple declarative sentences. As we have seen, not only are the underlying tones obscured by FHL, but also by H tone spreading. What this means is that the best frame for eliciting tones that come closest their inputs is between L tone and the end of a WH question, as we saw with the determiners in (37f,g) and (38f,g). Luckily the word order properties of Limba show enough variety to test even subject pronoun tones in this way, as seen in (42), where the subject pronouns follow the verb:

(43) a. mbɛ́ o dɛthɛ yaŋ ‘who did I look at?’
b. mbɛ́ o dɛthɛ yi ‘who did you sg. look at?’
c. mbɛ́ o dɛthɛ ndɛ́ ‘who did s/he look at?’
d. mbɛ́ o dɛthɛ miŋ ‘who did we look at?’
e. mbɛ́ o dɛthɛ beŋ ‘who did you pl. look at?’
f. mbɛ́ o dɛthɛ bindɛ́ ‘who did they look at?’

As seen, the first and second person pronouns are L tone, while the third person morpheme /ndé/ is H, appearing both alone as singular class 1 ‘s/he’ and with a class 2 prefix *bi-* as plural ‘they’. In our ongoing research we are currently exploiting this very useful tonal frame checking virtually every word and morpheme that can occur at the end of a WH question.

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