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TONE SPLITTING AND VOWEL QUALITY: EVIDENCE FROM LUGBARA*

Torben Andersen
University of Aalborg

In recent surveys of tonal phenomena it is suggested that vowel quality rarely affects tone. In the present paper it is argued that one such case can be found in Lugbara. Internal and comparative evidence is presented that the vowel feature Advanced Tongue Root (ATR) has had an initiating role in tone splitting in Western Lugbara. It is demonstrated that the pitch of a vowel with a high tone was raised if the vowel was [+ATR], and it is suggested that the resulting tonal allophony was later phonemicized due to vowel merger and reduction or loss of segments.

1. Introduction

It is well attested that features of consonants can be part of the condition for the application of tone rules in tone languages and that they can play a crucial role in tonogenesis (see Hombert [1978], Schuh [1978], and Maddieson [1978] for recent surveys of tonal phenomena). Features of vowels, on the other hand, seem rarely to have influenced the historical development of tone (see Hombert [1978:96], Schuh [1978:224], and Maddieson [1978:354] for comments on putative cases). While it is widely recognized that high vowels generally have higher F_0 than low vowels, this phonetic correlation appears not to have phonological consequences. In the present paper it will be argued that, in Lugbara, tone has been affected by another dimension of vowel quality.

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2. Tone Systems of Lugbara and Related Languages

Recent information on the Moru-Madi langauges, which are spoken in the Zaire-Uganda-Sudan border area, indicates that they are discrete-level tone languages with three level tones (cf. Callinan [1981], Goyvaerts [1983], and Andersen [1984]).[1] However, in Lugbara, one of the languages of this group, there is dialectal variation as to the number of tones. The Terego dialect of Ugandan Lugbara has three tones like the other Moru-Madi languages, whereas at least some of the dialects of Lugbara spoken in Zaire have four. These two varieties will henceforth be referred to as Eastern and Western Lugbara, respectively.

The phonemic status of the four pitch levels in Western Lugbara is shown by minimal sets like the following:[2]

(1)	L	(=low)	fɪ̀	'it exploded'
	M	(=mid)	fɪ̄	'he entered'
	H	(=high)	fɪ́	'intestines'
	E	(=extra high)	fɪ̋	'they entered'
(2)			tɛ̀	'he waited'
			tɛ̄	'but'
			tɛ́	'to be thick'
			tɛ̋	particle indicating Recent Past
(3)			rà	'all'
			rā	'it flowed'
			rá	particle indicating Completed Action
			rā́	'they flowed'

[1]The Moru-Madi group includes the following languages: Moru, Avokaya, Logo, Kaliko, Lugbara, Madi, Lulubo. In Greenberg's [1966] classification, the group is a member of the Central Sudanic branch of the Chari-Nile family, which is a subfamily of the Nilo-Saharan phylum.

[2]In his description of (Western) Lugbara, Crazzolara [1960:11] is somewhat self-contradictory or vague as to the number of tones. On the one hand he distinguishes three tones throughout his grammar and dictionary, but on the other hand he claims there to be five distinct tone levels, his mid-tone comprising

It should be noted, however, that there seems to be no minimal set in which tone distinguishes four words belonging to the same distributional class, such as four nouns or four verb stems.

Both H and E in Western Lugbara correspond to H in Eastern Lugbara and in the other languages, while M and L correspond to M and L, respectively. Cf. the examples of cognate series in Table 1 (next page) which only includes languages from which the present author has collected data himself.[3] Conclusions regarding Avokaya and Logo rely on Callinan [1981] and Goyvaerts [1983]. The regular tone correspondences indicate that the 4-tone system in Western Lugbara has developed from a 3-tone system by splitting of H into H and E or that the 3-tone systems of the other languages have developed from 4-tone systems by merging of E with H. Before any conclusion can be reached on this matter, the distribution of the tones in Western Lugbara will be examined. As vowel quality turns out to be a crucial factor in the tonal distribution, the vowel system of Lugbara will be outlined first.

3. Vowel System of Lugbara

At the phonemic level Western Lugbara has a symmetrical 7-vowel system:

(4)

i		u
ɪ		ʊ
ɛ		ɔ
	a	

At the phonetic level, however, there are 9 vowel qualities. The phonemes /ɛ/ and /ɔ/ are phonetically [e] and [o], respectively, when they cooccur

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three tone levels. In addition he says that "an ordinary high tone may sometimes be surpassed by a higher syllable". While the last statement probably reflects his perception of the extra high tone, his claim about three mid tone levels is not confirmed by the findings of the present author.

[3]The Moru data contained in the present article are from the Miza dialect, which is spoken in the northern part of the Moru area. Both Moru and Lulubo are spoken exclusively in the Sudan. 'S(outhern) Madi' refers to a variety of Madi spoken in Uganda, while 'N(orthern) Madi' refers to Burulo, the northernmost Madi dialect, which is spoken in the Sudan. The Proto-Moru-Madi forms are reconstructions by the present author.

Table 1. Tonal correspondences among Moru-Madi languages

		W.Lugbara	E.Lugbara	S.Madi	N.Madi	Lulobo	Moru Miza	Proto-Moru-Madi
L	'two'	èrì	ìrì	èrì	èrì	rì	rì	*èrì
	'to go out'	fɔ̀	fɔ̀	fɔ̀	fɔ̀	fɔ̀†	fɔ̀	*pɔ̀
	'to die	drà	drà	drà	dà	ɖà	drà	*drà
M	'not'	kɔ̄	kɔ̄	kɔ̄	kɔ̄	kɔ̄	kɔ̄	*kɔ̄
	'stomach'	ʔā	ʔā	ʔā	ʔā	ʔā	yā	*ʔā
	'to spear'	ʃī	ʃī	ʃī	ʃī	ʃī	ʃī	*ʃī
H	'foot'	pá	pá	pá	pá	pá	pá	*pá
	'child'	mvá	mvá	ŋgwá	ŋgwá	ŋgwá	ŋgɔ́	*ŋgwá
	'blood'	àrí	àrí	àrí	èrí	èrí	kàrí	*(k-)àrí
E	'field'	ámvű	ámvú	ámvú	ámvú	ámbú	ʌ́mvú	*ʌ́mbú
	'tooth'	sî	sî	sî	sî	sî	sî	*sî
	'spear'	àdzű	àdzú	àdzú	àdzú	àdzú	ʌ̀zú	*ʌ̀dzú

†'to appear'

with /i/ or /u/ within a word. Furthermore, /i/ and /u/ do not cooccur with /ɪ/ and /ɔ/ . Thus, Western Lugbara has vowel harmony defined by the following sets of vowels:[4]

(5)

[+ATR]			[-ATR]		
/i/		/u/	/ɪ/		/ɔ/
[e]	[o]		/ɛ/	/ɔ/	
/a/			/a/		

The two sets are distinguished by the feature Advanced Tongue Root (ATR), which was suggested by Stewart [1967] to account for the type of vowel harmony found in the Akan language of Ghana and in many other African languages as well. In Western Lugbara /a/ is phonetically [-ATR] in both sets. In Eastern Lugbara, which has the same vowel system, /a/ is phonetically [+ATR], transcribed [ʌ], in the [+ATR] set.

4. Distribution of Tones

Although the four tones in Western Lugbara are phonemically distinct, there are certain restrictions on their distribution. As the restrictions are clearest in the case of verb stems, this subsystem of the language will be dealt with first. Inflected verb forms, which behave in a different way tonally, will be taken up in section 5.3.

4.1. Verb stems. The segmental structure of a verb stem is either CV, VCV, or VCVCV. For monosyllabic stems, only low and mid tones are possible. With disyllabic stems the following tone patterns occur:

(6)

V̀CV̀	àlɛ̀	'buy'	ɔ̀pì	'close'
V̄CV̄	ɛ̄rɪ̄	'hear'	ādɗ̄ī	'tie'
V́CV́	ávɪ́	'play'	édɗ́á	'show'
V́CV̋	édɗ́ű̋	'bring'	átsɪ̋	'walk'

Finally, there are two possible tone patterns for trisyllabic stems:

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[4]Crazzolara [1960] is vague as to the number of vowel phonemes in Lugbara, and he did not realize the existence of vowel harmony in the language.

(7) V́CV́CV̀ ɔ́kɔ́nà 'collect'
V́CV̋CV̀ ɛ́yɪ̋kɪ̀ 'think'

V́CV̋ and V́CV̋CV̀ stems have the tonal variants V̄CV̋ and V̄CV̋CV̀.

Whereas the final vowel can be either [+ATR] or [-ATR], in V̀CV̀ and V̄CV̄ stems it can only be [-ATR] in V́CV́ stems and only [+ATR] in V́CV̋ stems. Similarly the penultimate vowel of V́CV́CV̀ and V́CV̋CV̀ stems can only be [-ATR] and [+ATR] respectively. Thus, H and E are in complementary distribution in verb stems, H occurring only on [-ATR] vowels and E only on [+ATR] vowels. Within this subsystem of the language, H and E might, accordingly, be considered variants of one tone, say H. The occurrence of E could then be accounted for by a phonological rule to the effect that the pitch of H is raised if supported by a [+ATR] vowel. Taking into account the language as a whole, however, the phenomenon is more adequately treated as neutralization between H and E. Note also that there is free variation between M and H before E, another case of neutralization.

4.2. Nouns. In nouns (and adjectives) the distribution of the four tones is less straightforward than in verb stems. Like for the latter, there are no restrictions on the occurrence of L and M in terms of vowel quality. But whereas H normally does not occur on [+ATR] vowels, E occurs on both [+ATR] and [-ATR] vowels.[5] Thus there is a 4-way tonal contrast in [-ATR] words, but only a 3-way contrast in [+ATR] words (cf. (8) and (9) respectively):

(8)	L	bà	'breast'	àŋgɔ̀	'place'
	M	ʔā	'stomach'	ɔ̀tɔ̄	'navel'
	H	ɓɪ́	'hair'	àrɪ́	'blood'
	E	zɔ̋	'house'	ɔ̀tsɛ̋	'dog'
(9)	L	ɓù	'sky'	àbì	'wall'
	M	tī	'mouth'	ɔ̀mvū	'nose'
	E	bɪ̋	'eye'	ɔ̀ɗű	'thigh'

[5]In some nouns H does occur on a [-ATR] vowel, e.g. kùmútī 'knee' and ɔ̀kɪ́ⁿ 'wife'. But in such nouns the [+ATR] vowel comes from a [-ATR] vowel which has been assimilated to a following [+ATR] vowel. In the Zaki dialect of Western Lugbara the word for 'knee' is kɔ̀mɔ́ , to which other dialects have added the suffix -tī (which is also the word for 'mouth'). ɔ̀kɪ́ⁿ 'wife' probably comes from *ɔ̀kɔ́-pī , which consists of ɔ̀kɔ́ 'woman' and the kinship suffix -pī occurring as, for example, in ágű-pɪ̋ < *ágű-pī 'husband'.

At least two historical layers of nouns can be identified. All nouns which can be proved to belong to the Moru-Madi proto-language are either monosyllabic or begin with a vowel (and are most often disyllabic). From this fact it may be inferred that consonant-initial di- or polysyllabic nouns, unless they are compounds, are likely to be loanwords borrowed after the proto-Moru-Madi period. Nouns belonging to the older layer (exemplified in (8-9) above) resemble verb stems by not having extra high tone on word-initial vowels, whether the word is [+ATR] or [-ATR]:

(10) énɪ́ 'skin'
énɪ̋ [énɪ̋] 'night'

By contrast, nouns belonging to the newer layer may have extra high tone on any syllable:

(11) sɛ̋ndɛ̄ 'money'
mɔ̀kɪ́kà 'mat' (from Swahili mkeka)
pàkɪ́ 'parcel' (from French *paquet*)
lɪ̋pùmbʊ̋ 'flower'
kʊ̋mbʊ̋sʊ̋ 'gorilla' (cf. Lingala mòkómbósó 'chimpanzee')
rɔ̋pɔ̀ 'dress' (from French *robe*)
pʊ̋ndà 'donkey' (from Lingala mpúndà)

Another difference is that in the older layer very few simplex nouns have high tone on the [-ATR] vowels ɪ , a , and ʊ , whereas these combinations are frequent in the newer layer. Finally, in the older layer the frequency of extra high tone on final ɛ and ɔ in simplex nouns is considerably lower than the frequency of high tone in the same environment.

4.3. Other word classes. In words belonging to other classes, i.e. adverbs, ideophones, particles, and interjections, there are no restrictions on the distribution of tones in terms of position within the word or in terms of vowel quality, apart from a general absence of high tone on [+ATR] vowels. For instance, extra high tone often occurs on [-ATR] vowels (cf. the ideophones in (12)):

(12) kɔ̋kɔ̋kɔ̋ 'forcefully'
trɑ̋kɑ̄trɑ̋́ɑ̋ 'being on the point of falling'

Thus, words belonging to these classes behave tonally like the newer level of nouns, and in fact few of them can be proved to be part of proto-Moru-Madi.

5. Tone Split and Vowel Merger

5.1. Tone split. The non-occurrence of H on [+ATR] vowels (except in inflected verb forms to be treated below) could be explained as the result of a merger of H with E on such vowels. This hypothesis would imply that all the other Moru-Madi languages have uniformly merged E and H in all environments. A priori, it seems unlikely that the other Moru-Madi languages have developed tonally in the same way, as they constitute the periphery of the Moru-Madi area and have developed divergently with respect to vowels and consonants. More importantly, however, the hypothesis fails to explain (a) why no verb stems have E on [-ATR] vowels, (b) why there are (almost) no old simplex nouns with E on ɪ , ʊ , and a , and (c) why there are relatively few old simplex nouns with E on ɛ and ɔ .

A priori, a more likely explanation for the distribution of H and E would be that Western Lugbara originally had three tones like the other Moru-Madi languages and that E arose as a result of pitch raising of H on [+ATR] vowels. In order for this hypothesis to work, a further assumption is needed, viz. that at an earlier stage Lugbara had a 9-vowel system including *e and *o in addition to the present 7 vowel phonemes and that later *e and *o merged with ɛ and ɔ . A result of this merger would be that the allophonic variation between H and E had been phonemicized, and loanwords borrowed after that point would not need to conform to the prior distribution of E.

5.2. Vowel merger. The vowel merger hypothesized to explain the occurrence of extra high tone on [-ATR] vowels in Western Lugbara is confirmed by comparative evidence from other languages of the Moru-Madi group.

Like Lugbara, all the other languages of the Moru-Madi group have vowel systems with vowel harmony based on the ATR feature. What it commonly considered the prototype of such vowel systems is found in Moru, which has a completely

symmetric 10-vowel system as shown in Table 2, although the phonemic status of e , ʌ , and o is somewhat marginal. Madi and Lulubo have a 9-vowel system, lacking the phoneme ʌ . Avokaya and Logo have 7 vowel phonemes like Lugbara (cf. Callinan [1981] and Goyvaerts [1983] respectively).[6] But whereas Lugbara has a "full" [-ATR] set with five vowels in addition to two [+ATR] vowels, Avokaya and Logo have only four [-ATR] vowels and on the other hand three [+ATR] vowels.[7]

Table 2. Vowel systems of Moru-Madi languages

	[+ATR]					[-ATR]				
Moru Miza	i	e	ʌ	o	u	ɪ	ɛ	a	ɔ	ɷ
Avokaya	i		ʌ		u	ɪ	ɛ	a	ɔ	
Logo	i		ʌ		u	ɪ	ɛ	a	ɔ	
Lugbara	i				u	ɪ	ɛ	a	ɔ	ɷ
Madi	i	e		o	u	ɪ	ɛ	a	ɔ	ɷ
Lulubo	i	e		o	u	ɪ	ɛ	a	ɔ	ɷ

Both ɛ and e in Madi and Lulubo regularly correspond to ɛ in Lugbara in root final position (cf. the examples of cognate sets shown in Table 3). As nothing indicates that ɛ has split into ɛ and e in Madi and Lulubo, it can be concluded that the proto-language had an opposition between *ɛ and *e , which merged in Lugbara. In Moru the same merger took place, but only under certain conditions not yet fully understood.

Similarly, both ɔ and o in Madi and Lulubo normally correspond to ɔ in Lugbara in root final position (cf. the examples in Table 3). It should be noted, however, that there is not always agreement among Southern Madi, Northern Madi, and Lulubo as to the choice between ɔ and o . But even the occurrence of o

[6]Although Goyvaerts [1983] does not analyze the Logo vowel system in terms of vowel harmony, the data he presents are compatible with an analysis using vowel harmony.

[7]In Avokaya and Logo *ɷ has merged with ɔ , cf. Logo _fɔ̀ , Eastern Lugbara fɷ̀ 'to go out', and Avokaya a|ɔ , Eastern Lugbara à|ɷ 'one'.

*ɛ	'neck'	ɔ̄mbɛ̄	ɔ̄mbɛ̄	ɛ̄mbɛ̄	ɛ̄mbɛ̄	ɛ̄mbɛ̄	cɛ̄mbɛ̄	*(k-)ɔ̄mbɛ̄
	'to give'	fɛ̀	fɛ̀	hwɛ̀	kɛ̀	kwɛ̀	-	*kwɛ̀
	'arrow'	ʼjɛ́	ʔɛ́	ɛ́ʔɛʼ	ɛ́ʔɛ́	ɛ́ʔɛ́†	-	*ɛ́ʔɛ́
	'white'	ɛ̄mvɛ̄	ɪ̄mvɛ̄	ɪ̄ŋgwɛ̄	ɪ̄ŋgwɛ̄	àŋgwɛ̄	ɔ̀ndʒɛ́	*-ŋgwɛ
*e	'to wait'	tɛ̀	tɛ̀	tè	tè	ṯè	kɔ̄tɛ̀	*tè
	'to buy'	dzɛ̄	dzɛ̄	dzē	gē	gē	jɛ̄	*gē
	'to burn'	vɛ̄	vɛ̄	gwē	gwē	gwē	dʒē	*gwē
	'to call'	ɔ̄mvɛ̄	ɔ̄mvɛ̄	ūŋgwē	lūŋgwē	ūŋgwē	-	*lō-ŋgwē
*ɔ	'to pierce'	sɔ̀	sɔ̀	sɔ̀	sɔ̀	sɔ̀	sɔ̀	*sɔ̀
	'to chase'	drɔ̄	drɔ̄	drɔ̄	dɔ̄	ɖɔ̄	-	*drɔ̄
	'eight'	àrɔ̀	àrɔ̀	àrɔ̀	àrɔ̀	àrɔ̀	-	*àrɔ̀
	'hoe (blade)'	-	àtsɔ́	àtsɔ́	àsɔ́	àsɔ̄	-	*àtsɔ́
*o	'to say'	ʼjɔ̄	dzɔ̄	ʼjō	ʼjō	ʼjō	-	*ʼjō
	'to sing'	ŋgɔ̄	ŋgɔ̄	ŋgɔ̄	ŋgō	ŋgō	ŋgɑ̄	*ŋgō

Table 4. Regular and irregular reflexes in Western Lugbara of high tone in proto-Moru-Madi

		W.Lugbara	E.Lugbara	S.Madi	N.Madi	Lulubo	Moru Miza	proto-Moru-Madi
i	'house'	dzɔ̋	dzɔ́	dzɔ́	zó	dzó	zɔ́	*dzó
ii	'urine'	ɔ́drɛ̋	ɷ̄drɛ́	ūdré	ūdwé	íɖwé	kūdré	*(k-)ōdrwé
iii	'grass'	ásɛ̋	āyísɛ́	āyísé	āyísé	āyí	kʌ̄yí	*(k-)ʌ̄yí(-sé)
iv	'dog'	ɔ̀tsɛ̋	ɷ̀tsɔ́-ɔ́	ɔ̀tsɛ́	ɔ̀kɛ́	ɔ̀kɛ́	kɔ̀cɛ́	*(k-)ɔ̀kɛ́
v	'yesterday'	ádzɛ̋̄	ádzɛ́̄	ádzɩ́nɩ̄	ágɩ́nɩ̄	ágɩ́nɩ̄	-	*ágɛ́nɩ̄
vi	'granary'	ɛ̀rɔ̋	ɛ̀rá	ɛ̀rɔ́	ɛ̀rɔ́	ɛ̀rɔ́	cɩ̀rɔ́	*(k-)ɛ̀rɔ́
vii	'hare'	ɛ̀tɔ́-ɔ́	ɷ̀tɔ́-ɔ́	ìtó	ìtó	ìt̪ó	cɩ̀tɔ́-ŋwà	*(k-)ìtó
viii	'witch-doctor'	ɔ́dzɔ́-ɔ́	ɷ́dzɔ́-ɔ́	ɔ́dzɔ́	ózó	ɔ́zɔ́	kɔ́zɔ́	*(k-)ódzó
ix	'bird'	àrɩ̋-ắ	ɩ̀rɩ́-á	àrɩ́-áŋgwá	àrɩ́-áŋgwá	àrɩ̄	àrɩ́	*àrɩ
x	'rope'	bắ(-kắ)	ˋbá(-ká)	ɩ̀bá	ɩ̀bá	ɩ̀bā	ɩ̀bā	*ɩ̀ba
xi	'basket'	ɛ̀vɷ̋	ɔ̀vɷ́	ɛ̀vɷ́	ɛ̀vɔ́	ɛ̀bɔ́	-	*ɛ̀bV́

in only one of these languages is evidence that the word had *o in the proto-language and, accordingly, that *o has merged with ɔ in Lugbara.

The frequency of *e and *o seems to have been much lower than the frequency of *ɛ and *ɔ in the proto-language. This explains why extra high tone is less frequent than high tone on ɛ and ɔ in final position in old simplex nouns in Western Lugbara.

5.3. Reduction or loss of segments. The sound change *e , *o > ɛ , ɔ in Lugbara immediately accounts for some cases of extra high tone on ɛ and ɔ in Western Lugbara (cf. examples (i-iii) in Table 4). However, it appears that the vowel change is neither a sufficient nor a necessary condition for the presence of extra high tone on [-ATR] vowels in old nouns. Firstly, there are some words with ɛ̋ and ɔ̋ for which there is no independent evidence of a change from [+ATR] to [-ATR], (cf. (iv-vi) in Table 4). Secondly, some words have é and ó , although cognates in the other languages have the corresponding [+ATR] vowels (cf. (vii-viii) in Table 4). Thirdly, some words have extra high tone on the other [-ATR] vowels ɪ , a , and ʊ (cf. (ix-xi) in Table 4).

Although the specific mechanisms are not yet understood, it seems likely that these irregularities in the tonal correspondences have resulted from influence from the tone of reduced, assimilated, or elided suffixes. Note for instance that ètó-ó 'hare' in (vii) has a suffix which in Moru exists with a less reduced form -ŋwá (< *ŋgwá 'child').

That loss of tone bearing segments has had an effect on the distribution of the tones in Western Lugbara is shown clearly by the development of verbal inflexion. From a synchronic point of view, one class of non-finite verb forms is characterized by addition of H to the tone of the final stem vowel, whatever the quality of that vowel. Similarly, E is added as a plural marker, if the subject is third person plural. If the tone of the final stem vowel is M, the resulting compound tones MH and ME are simplified to H and E respectively. The contrast between H and E is shown by forms like the following:

(13)

Stem	Non-finite	3rd plural	
nɛ̀	nɛ́	nɛ̋	'see'
zì	zí	zĩ	'open'
sā	sá	sā̋	'bury'
ʃ̄u	ʃ́u	ʃ̋u	'take'

In Eastern Lugbara a third person plural subject is indicated by a suffix -kɪ́ added to the verb stem. It seems reasonable to assume that this suffix is what has developed into the non-segmental extra high tone plural suffix in Western Lugbara. The non-finite form with a non-segmental high tone suffix is used in a number of syntactic constructions, but in one of them, viz. relative clauses in which the relativized element is the object, the tonal suffix alternates freely with -lɛ́ . This -lɛ́ is probably the origin of the tonal suffix, an assumption which is further evidenced by the fact that in Southern Madi -lɛ́ is used in all the syntactic constructions where Western Lugbara has the tonal suffix. Why -kɪ́ has developed into an extra high tone while -lɛ́ has kept its high tone is still a mystery, however.

6. Conclusion

It has been shown above that in Western Lugbara the vowel quality feature [+ATR] has had the effect of raising the pitch of high tones in stem-final position. Furthermore, evidence has been presented that the tonal allophony resulting from this pitch raising was later phonemicized by a merger of non-high [+ATR] vowels with the corresponding [-ATR] vowels and by elision or reduction of segments. It is still an open question, however, what could be a phonetic explanation for the pitch raising.

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