

# Tone and Pitch Accent in Cherokee Nouns

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Abstract. Tone in Cherokee nouns is described in this paper as a hybrid system of metrical pitch accent and lexical tone. Four speakers of Oklahoma Cherokee spoke nouns in a frame dialog that put each of thirty-seven nouns in citation form, in a declarative sentence, a question, and with contrastive focus. In addition to an optional L\*H pitch accent that may occur on the penultimate or antepenultimate syllable only, and three distinctive tones (L fall, H, and H fall) that are restricted to occur only on non final, unaccented syllables, the study also identifies some aspects of Cherokee intonation contours.

## 1. Introduction.

This paper has two aims. First, the paper presents acoustic phonetic pitch traces of Cherokee nouns spoken in citation forms, and in three types of sentential context. These phonetic data supplement a literature on Cherokee tone that contains very limited phonetic data and even more limited data on Cherokee intonation (Lindsey, 1985; Wright, 1996). Second, the paper presents an analysis of the surface phonology of Cherokee tone. This analysis is inspired by, and largely compatible with previous phonological analyses of Cherokee tone (Lindsey & Scancarelli, 1985; Lindsey, 1985; Lindsey, 1987; Wright, 1996) broadly situated within the autosegmental/metrical approach to tone and intonation (Bruce, 1977; Pierrehumbert, 1980; Beckman, 1986).

Lindsey (1987) treated Cherokee as a kind of pitch-accent language with accents filled by either [+High] tone or [+slack] vocal folds depending on which mora of a long vowel is considered to be accented (H on the first mora, [+slack] on the second). Wright (1996) on the other hand treated Cherokee as a hybrid tone/accent language with pitch accent marking some syllables and lexically specified tone on others. The analysis presented here builds on Wright's insight that lexical tone

coexists with pitch accent in Cherokee.

The suggestion that languages may exhibit hybrid prosodic organization may seem surprising or a little overly complex, so it is useful to bear in mind that several languages have been given this kind of “hybrid” analysis, including Beijing Mandarin Chinese (Chao, 1968; Peng et al., 2005), the Bantu languages Tonga (Goldsmith, 1984) and Kizigua (Kenstowicz, 1989), the English-based Creole Saramaccan (Good, 2004), and Stockholm Swedish and Venlo Dutch (Gussenhoven & Bruce, 1999). In fact, when it comes to the cross-linguistic typology of prosodic systems it is probably better to situate a language along several scales rather than try to categorize it as one of only two or three possible types (Hyman, 2001; Beckman, 1986). Hyman’s (2001, 2005) typological oppositions for tone systems are particularly useful in characterizing Cherokee. Therefore a brief summary, with some liberty of interpretation, is given here.

*Opposition 1: Free versus culminative.* Tone is said to be free when “multiple tones may occur within the same word. Lexical tone, in the canonical case, requires specification of pitch for every syllable in every word. In some languages (usually found in Africa) lexical tones may be drawn from a relatively small inventory of stationary pitch targets (H or L). In other tone languages (usually found in Asia), lexical tones are drawn from a larger inventory, usually with distinctive pitch contours as well as level tones. Cantonese (Wong et al. 2005) is an example. In this language, tone is paradigmatically contrastive (e.g. Hashimoto (1972) identified lexical tones [55], [35], [33], [23], [22], and [11]) and every syllable, except a few minor grammatical particles, must have a tonal specification. Prominence marking tonal events are *culminative* if every word has at most one syllable marked for the highest degree of prominence. As this culminative function is realized in discourse it may be used to bring pragmatically important words into the foreground. This is seen in English, where one syllable in most words can be identified as bearing primary stress, and pitch accent may be placed on stressed syllables to mark focus.

*Opposition 2: Optional vs. Obligatory.* It is sometimes said that in English every word has at least one syllable marked for primary stress. This for Hyman (2005) is a definitional property of stress accent systems. Clearly some caveats need to be mentioned if we think of closed-class function words as essentially stressless, but English is also very different from languages that

have unaccented nouns and verbs (Tokyo Japanese, for example). When accent is optional word order or overall pitch range may be used to mark discourse prominence.

*Opposition 3: Distinctive vs. Demarcative.* In syntagmatic structure, tone may be used in word segmentation as a cue for the location of word boundaries in running speech. For example, if stress or pitch accent is restricted to occur on particular syllables (such as the initial, penult, or final) then the presence of pitch accent on a syllable indicates the location of the word boundary. Freely occurring tone, on the other hand is not a cue for word segmentation because tone plays a more paradigmatic role. Words are distinguished from each other by their pitch patterns. This opposition, like the others listed by Hyman is rarely absolute within a language. So, in addition to its syntagmatic functions, prominence-marking in English may also play a limited paradigmatic role, analogous to the role played by tone in a lexical tone language (for example, *conTRAST* versus *CONtrast*).

*Opposition 4. Multi-valued vs. Privative.* If tone must take one of two values (H or L) the word prosody can be described as privative. Many Bantu languages fit this description. Prominence marking in English is non-privative because we mark prominent syllables with any one of an inventory of possible pitch accents (\*H, \*L, \*L+H, etc.). Tokyo Japanese on the other hand uses a more privative system, marking prominence with a HL fall to the exclusion of any other pitch pattern.

*Opposition 5. Equal vs. Subordinative.* Within a word, if more than one syllable is prosodically marked, the system is described as subordinative if the relative strength or prominence of the marking is unequal. We see this in the distinction between primary and secondary stress in English.

*Opposition 6. Pitch vs. Complex phonetic correlates.* The phonetic dimensions used to mark prosody vary from language to language. In Cantonese pitch is the main correlate of tone, while in stress accent languages, a combination of suprasegmental properties (pitch, duration, loudness) is commonly used to mark prominence. Segmental properties may also mark prominence. For example, one common way that prominence is marked with segmental, rather than

suprasegmental features is by the inventory of segmental contrasts that exists in certain syllables. Thus, is it not rare at all to find that a language has one set of contrasts in open-class words, and another smaller set of contrasts in closed-set words. For example, we find a tendency toward this in English with coronals used in most closed-class words and in affixes. Navajo has the same pattern - coronals in grammatical particles and larger set of contrasts in stems. Laryngeal contrasts show similar restriction to stems or open-class words in some languages. An expanded set of contrasts lends a type of prominence to syllables by giving those positions in words greater phonetic richness relative to a neutral or mono-phonetic pronunciation.

These oppositions we could add one more. If tone is specified on all or most syllables we can consider the language to have a *dense* tone specification, while if only one or few syllables are marked the language has *sparse* tone specification.

As table 1 shows, the difference between a prototypical “lexical stress” language like Cantonese and a prototypical “stress accent” language like English shows up in differences in all seven of the prosodic typology oppositions. However, in addition to providing a description of prototypical cases, this system of classification provides a nice characterization of the prosodic typology of a language like Somali, in which a high tone maybe optionally assigned to final or penultimate syllables (Hyman, 1981).

Table 1. Characterizing the prosodic typology of Cantonese, English, and Somali.

Opposition	Cantonese	English	Somali
1	free	culminative	culminative
2	obligatory	obligatory	optional
3	distinctive	demarcative	demarcative
4	multi-valued	privative	privative
5	equal	subordinative	??
6	pitch	complex	pitch
7	dense	sparse	sparse

The main claim of this paper is that prosody in Cherokee nouns is best described as a hybrid system mixing two types of prosody. One prominence-marking pitch accent per word may occur on the penultimate or antepenultimate syllable, while lexical tone may co-occur before the pitch accented syllable, and in longer words there may be more than one lexical tone. This suggests that in Hyman's oppositions Cherokee word prosody is culminative, optional, and demarcative; uses multi-valued, pitch, cues without subordination within words; and tone is marked more densely than English and Somali, but less densely than Cantonese. Evidence supporting this analysis will be drawn from pitch contours calculated from recordings of four speakers of Oklahoma Cherokee.

Section 2 gives some general background on the Cherokee language, and surveys very briefly prior descriptions of Cherokee tone. The recording and analysis method of the present study are given in section 3. Section 4 presents evidence suggesting that some Cherokee nouns have a L\*H pitch accent on the penult or antepenult syllable. This section also gives some very preliminary suggestions regarding phrasal intonation patterns observed in declarative sentences, questions, and focus constructions. In section 5, the three lexical tones (H, L, and HL) are introduced. Pitch traces in this section show their typical pitch patterns and how they interact with pitch accent and phrasal intonation.

## 2. Cherokee.

Cherokee is an Iroquoian language (related to Oneida, Seneca, Mohawk, and Onondaga, see Michelson, 1988) spoken in N. Carolina, and Oklahoma. In one of the most important modern reference works on Cherokee, Feeling & Pulte's (1975) *Cherokee-English Dictionary*, phonetic tone is written with pitch numbers so that [1] represents the low end of the speaker's pitch range and [4] represents the high end. Feeling and Pulte identified six tones in Cherokee [1], [2], [3], [4], [23], and [32] and wrote tone on every syllable in the dictionary, except the last syllable of the word. They described nouns as having a falling tone on the final syllable and also noted that

the final syllable (which is said to be nasalized) is often deleted in connected speech.

In order to make this paper as accessible as possible to Cherokee language specialists and speakers the examples shown in this paper will be written in the romanization used in Feeling and Pulte (1975). This alphabet is a variant of the Americanist phonetic alphabet (Pulum & Ladusaw, 1986), with the following exceptions. The letter “v” is used to write schwa [ə], and sequences “hl”, “hn”, and “hw” represent voiceless [l], [n] and [w]. For typographical convenience, long vowels are written with two vowel letters [aa] and short vowels with one letter [a].

As is found in many other native American languages, Cherokee has complex morphology, particularly with verbs. This is illustrated very briefly in (1).

(1) A few of the forms of the verb “to speak”

ga <sup>2</sup> wo <sup>3</sup> ni <sup>2</sup> ha	“he is speaking”
da <sup>2</sup> ga <sup>2</sup> wo <sup>3</sup> ni <sup>2</sup> ha	“he will speak”
da <sup>2</sup> ga <sup>2</sup> wo <sup>32</sup> ni <sup>2</sup> hi <sup>2</sup> se <sup>23</sup> li	“he will speak for him”
da <sup>2</sup> ga <sup>2</sup> wo <sup>32</sup> ni <sup>2</sup> si <sup>23</sup> hli	“he will come to speak”

Derived nouns (usually from verbs) often have a tone [4] in the penultimate syllable (2). And this common tone pattern may on rare occasions serve to mark a noun even without a deverbal suffix.

(2)	u <sup>1</sup> dlv <sup>3</sup> ga	“he’s sick”
	ju <sup>2</sup> ni <sup>2</sup> dlv <sup>1</sup> gi <sup>4</sup> ʔi	“hospital”
(3)	gay <sup>2</sup> go <sup>1</sup> gi	“lie”
	gay <sup>2</sup> go <sup>4</sup> gi	“liar”

After Feeling and Pulte's description, several other researchers have studied Cherokee tone. Lindsey (& Scancarelli, 1985; 1985; & 1987) broke from the "tonal" analysis given by Feeling and Pulte (1975) suggesting that tonal specification in Cherokee is much more sparsely specified than the tonal analysis implies (see also Cook, 1979). In particular, he took tone [2] - the most frequently occurring tone mark in the dictionary to be a default pitch specification that is added to the phonological representation near the end of the phonological derivation. He also made the important observation that syllables transcribed as tone [23] in the dictionary have two realizations. Some syllables written [23] in Feeling and Pulte show quite significant pitch rise, while others do not. The phonetic results reported here support this observation. Lindsey also used the glottal feature [+slack] to account for the falling pitch patterns in the tones identified in this paper as low and high-fall. Finally, Lindsey (1985) concluded that final vowels in Cherokee phonological phrases (usually individual lexical items?) are associated with a H% boundary tone.

Wright (1996), building on Lindsey's autosegmental/metrical analysis, proposed that Cherokee is a hybrid system making use of pitch accent and lexical tone. This contrasts with Lindsey's attempt to characterize all pitch contrasts in Cherokee using a system of rather dense accent marking (often with two accents per vowel - one per mora), and realization rules in which accents on the first mora of a vowel are realized as [+High] tone and accents on the second mora of the vowel is realized as [+slack] vocal folds. Wright's analysis recognized distinct lexical tones that play a paradigmatic role in the prosodic system as well as pitch accents that play more of a syntagmatic (culminative, demarcative) role.

The present study builds on these prior analyses with more detailed phonetic results that support Wright's (1996) conclusion that Cherokee is a hybrid system.

### 3. Method.

#### *3.1 Speakers.*

*UC Berkeley Phonology Lab Annual Report (2005)*

Four speakers (2 men, 2 women) of Oklahoma Cherokee participated in this study. One speaker (DF) was the lead consultant on this project and participated in each of the recording sessions. The pitch traces shown in this paper are drawn from the speech of the male speakers. These are representative of the women's patterns, but with better pitch tracking.

*3.2 Materials.*

Word list recorded for this study was composed of examples of the most frequent noun tone patterns found in Feeling and Pulte (1975). The full list of words is given in Appendix 1. The list was composed of six two syllable tone patterns, twelve three syllable patterns, thirteen four syllable patterns, and six examples of tone patterns on five syllable words.

These were produced in a script that elicited a citation, declarative, question, and contrastive focus forms, as illustrated in (4). Each word appeared in each context.

(4) Part of the script for [jolani] and [kawonu].

<u>jolani</u>	“window”
<u>jolani</u> jigowahta.	“I saw a window”
<u>jolani</u> -s digowahta?	“Did you see a window?”
hla <u>kawonu-dv</u> jigowahta.	“No I saw a duck”

*3.3 Recordings.*

A Shure SM58 hand held dynamic microphone was used to record each speaker on a Sony DM1 digital audio tape recorder. Speaker AH was recorded at a picnic table in Honor Heights Park in Muskogee, Oklahoma. Speaker DM was recorded in the community room at the Tahlequah, Oklahoma public library. Speaker EW was recorded in her home near Tahlequah. Speaker DF (Durbin Feeling) was the lead speaker and linguistic consultant for this project. He recorded the script with each one of the other speakers. We used the first of these recordings; the one made in the park.



DM, AH, and EW repeated each item in the script after the English gloss was read and after DF read the scripted utterance. That is, three people spoke each phrase of the script, one after the other like this: “window” (linguist), “jolani” (DF), “jolani” (DM, AH, or EW), “I saw a window”, “jolani jigowahta” (DF), “jolani jigowahta” (DM, AH, or EW).

### *3.4 Analysis.*

The recordings were transferred to digital audio files and down-sampled to 22.05 kHz samples per second. A research assistant (Tsan Huang - now assistant professor of Linguistics at SUNY Buffalo) marked all of the vowel onsets and offsets in the test words. F0 was calculated at 10 msec intervals in the test words using the algorithm implemented in Entropics XWaves “get\_f0” program. F0 was then extracted (using a perl script) into a large data file taking five equally spaced points during each vowel of each test word. Occasionally (less than 5% of the points), the F0 tracking algorithm failed to report an F0 value at one of the five time points. In these cases, the value was estimated by interpolation from neighboring points.

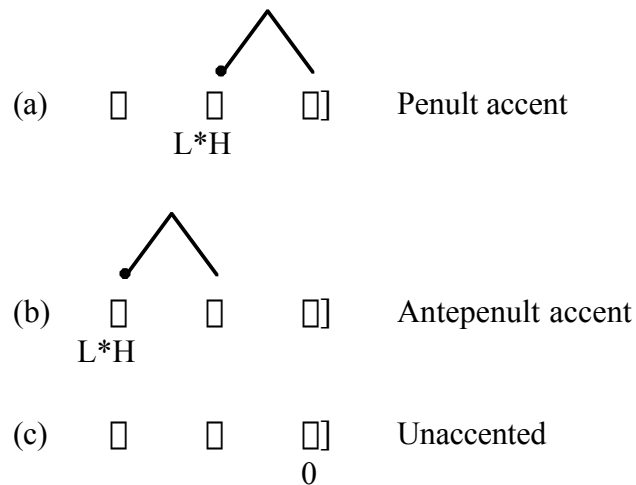
Finally, to produce the figures shown in this paper an R script ([www.r-project.org](http://www.r-project.org)) took an average F0 trace for the two male speakers. The average F0 trace was made by taking the average time value and F0 value of each point in the vowels of the test word being plotted.

### 4. Pitch accent.

The analysis of pitch accent here assumes that there are three kinds of nouns in Cherokee. Two kinds have a pitch accent either on the penultimate syllable (5a) or on the antepenultimate syllable (5b). The pitch accent is hypothesized to be the first syllable of a strong-weak (trochaic) foot because, especially in antepenultimate syllables, where the effects of intonation do not obscure it, the pitch pattern of the second syllable of the foot is dependent on the pitch accent. Penultimate accent is written in Feeling and Pulte (1975) as [4], while antepenultimate accent is written [23]. However, as Lindsey (1987) noted, not all syllables given [23] in the

dictionary are realized with the L\*H pitch accent. The third basic pattern (5c) is the most common pattern, especially in underived nouns, and has no pitch accent.

(5) Pitch accent patterns in Cherokee nouns.



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**Figures 1, 2 and 3 about here**

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Figure 1 shows pitch accents in three syllable words on the penultimate syllable of [a2 wee4 na] “young man” and antepenultimate pitch accent on the antepenultimate syllable of [joo23 la2 ni] “window”. The L\*H pitch accent rises in both words from below 100 Hz to above 120 Hz over the course of one vowel. Note also that pitch falls dramatically on the vowel following L\*H. Evidence from question intonation and with the focus clitic (shown below) suggests that the fall is an expendable part of the pattern while the rise is more reliably present. Another indication that the rising portion of pitch pattern is the key component is that the location of the rise is constrained. Antepenultimate accent is only found if the penultimate syllable has a short vowel and the antepenultimate syllable has a long vowel. The metrical constraint implied by this observation is that L\*H must appear on a long vowel. There is not comparable constraint on the fall that comes after L\*H.

Figures 2 and 3 show essentially the same patterns that we saw in figure 1, but with low-high pitch accent (L\*H) on the penult or antepenult syllable in words of four syllables (Figure 2), or five syllables (Figure 3).

Interestingly, the pitch accent shown in these figures (L\*H) is the only pitch accent pattern found in Cherokee. This is similar to the limitation of accent in Tokyo Japanese to the HL fall pattern (Pierrehumbert & Beckman, 1988). In addition to being limited in shape, pitch accent in Cherokee is limited to the penultimate or antepenultimate syllable of the stem as seen in figures 1-3.

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**Figures 4-6 about here**

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Unaccented nouns are shown in figures 4 through 6. These pitch traces of three, four, and five syllable unaccented nouns illustrate that unaccented nouns do not show the large pitch rise that we saw in accented nouns. Unaccented words in citation form show a pitch rise fall pattern on the last syllable which is being interpreted here as a high-low boundary tone (HL%). This boundary tone is also apparent in the antepenult accented forms [joo(L\*H) la ni] in figure 1, [juu gvv(L\*H) wahl di] in figure 2, and [uu gee yuu(L\*H) hna ?i] in figure 3. Later we will see pitch traces that show that HL% is a boundary tone by showing that this rise fall pattern is not present in other intonations - suggesting that HL% is a feature of citation intonation and not a lexically specified pattern. This is also suggested by the presence of HL% on the final syllable of accented forms.

#### 5. Intonation patterns.

Figure 7 shows the noun *ganee(L\*H)li* “person living in the house” in citation form and with the focus clitic [-də]. There are two points of interest in these traces (which are representative of all words in the test set that have penultimate accent). First, the location of the accent is not shifted

by addition of the [-də] focus marking clitic. This indicates that the location of accent is a property of the lexical stem, rather than being metrically determined at the phrasal level. Second, where the citation form (and the forms in declarative sentences) has a fall on the final syllable following the accent, the focus form does not have a fall on this syllable. This indicates that the key element of the accent in the citation form is the penultimate rise, not the final fall.

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**Figure 7 about here**

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The realization of focus is somewhat different with antepenultimate accent. For example, Figure 8 shows the noun *joo(L\*H)lani* “window” in citation form and with the focus clitic. In these forms, which are typical of other forms with antepenultimate pitch accent, the fall on the syllable after L\*H is fully realized and the focus clitic is produced on a higher pitch than is the final syllable of the stem. As indicated in the figure, this might be described with a low phrase accent (L-) on the final syllable of the stem and a high boundary tone (H%) on the clitic. If this analysis is correct we could also assert that in items with penultimate accent (Figure 7), the H% of the focus construction replaces a low phrase accent, high-low boundary tone sequence (L-HL%) normally seen in citation forms.

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**Figures 8 and 9 about here**

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The intonational pattern associated with contrastive focus with the [-də] particle can also be seen in unaccented forms (Figure 9). As with the antepenultimate accented form in figure 8, this form and all other unaccented forms in the recordings, shows a big pitch jump from the relatively monotone and low final syllable of the stem to a much higher pitch on the focus particle. This jump up to the pitch of the focus particle is an indication that stem final syllables in the forms in figures 8 and 9 should be marked for low tone - perhaps as a low phrase accent.

The intonation of questions can also be briefly described from these data. While it might be best to describe the tune for focus construction as L-H%, the evidence suggests that question intonation involves a global pitch range adjustment.

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**Figures 10 and 11 about here**

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Figures 10 and 11 show unaccented nouns in citation form and question form. The question form in both cases, and in unaccented nouns generally, has a higher overall pitch range. One way to analyze the pitch contours in Figures 10 and 11 is to posit that a phrase tone (H-) is responsible for the overall higher pitch range on the question forms. Interestingly this phrase tone, if indeed it makes sense to call it that, behaves differently from other phrase tone phenomena in other languages (as well as differently from the low phrase tone posited for the focus construction. The difference can be seen in figures 12 and 13. The words illustrated in these figures have accent on either the penultimate or antepenultimate syllable. (Figure 12 also shows a two-syllable non-derived noun that has an accent on it - something we haven't seen before in this presentation.) Interestingly, question intonation in these accented stems also shows an overall pitch height increase in the questioned form and this includes the pitch height achieved by the accented syllable.

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**Figures 12, 13 and 14 about here**

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Figure 14 helps fix the analysis. This form, a five syllable word with accent on the penultimate syllable, shows overall pitch height increase from the second syllable through to the end of the word. What is significant about the second syllable is that this is the first long vowel of the word. The pitch upstep in the unaccented forms in figures 10 and 11 also occurs on the first long vowel of the noun. So, although it is tempting to account for "question intonation" in Cherokee in terms of a phrase tone, it seems perhaps more accurate (given the normal implementation of phrasal tones in other languages) to describe Cherokee question intonation as process - increase the pitch range beginning with the first long vowel of the questioned word (or phrase?).

6. Lexical Tone.

So far we have seen that Cherokee nouns may be accented on their antepenult or penult syllables and that there is only one pitch accent shape in Cherokee, a L\*H rising pattern (section 4). Some details of the pitch patterns of words in citation forms, questions, and focus construction were attributed to intonational tones (what Gussenhoven and Bruce, 1999 called “post-lexical” tones). We saw that citation forms have a HL% boundary tone, and that questions and focussed statements have H% boundary tone. We also noted a typologically interesting pattern of pitch range upstepping in question intonation, that might be attributed to a phrasal tone pattern even though this Cherokee pattern is somewhat unique in being sensitive to vowel length and not sensitive to the presence of an accented syllable.

Perhaps this should be enough. The Cherokee prosodic system as described so far is fairly rich and it wouldn’t be hard to imagine a language with this prosody and none else. However, the examples to this point have been carefully chosen to avoid words that have lexically specified tone. The pitch traces shown in this section illustrate three distinctive tones in Cherokee nouns. These differ from the L\*H pitch accent in that they are not limited to the penultimate or antepenultimate syllable - and hence are nondemarcative, they may co-occur with accent and (rarely) with each other.

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**Figures 15 and 16 about here**

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Figures 15 and 16 the low tone (phonetically low-falling) in words that are either accentless or have accent on the penultimate syllable. These pitch traces illustrate the prototypical pitch shape of the low tone, and illustrate that it may co-occur with accent. A survey of Feeling and Pulte (1975), where this tone is written [1], indicates that low tones in nouns occur in any non-final syllable and may be preceded or followed by any other tone. L almost never occurs on a short vowel - only two instances like [uuh na(L) sdee dla] “root” were found.

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**Figures 17 and 18 about here**

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Figures 17 and 18 illustrate the distinctive High tone, contrasting it with a toneless/accentless pitch contour in figure 17 and with an accented syllable in figure 18. (Figure 18 also illustrates a high tone on a short vowel.) There are details of phonetic realization, including the higher starting pitch in the HL% tone, that go beyond the scope of this paper, but the main points are clear. H has higher pitch than a corresponding toneless syllable (figure 17) and has a level pitch contour that differs markedly from the rising pitch contour of L\*H (figures 17 and 18). As with low tone, a survey of Feeling and Pulte (1975) reveals that H may appear on any non-final syllable in nouns and does occasionally occur on short vowels. The only tonal co-occurrence restriction found in this survey is that H on long vowels was never found immediately preceding a vowel marked [23]. Lindsey (1987) suggested that Feeling and Pulte used [23] sometimes to mark the L\*H pitch accent. I suspect that many other instances of [23] in the dictionary may be cases of tonal assimilation to a following high or rising tone.

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**Figure 19 about here**

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For example, figure 19 shows pitch contours for [gaa<sup>2</sup> duu<sup>3</sup> hvv<sup>4</sup> ?i] “town” and [ii<sup>23</sup> na<sup>3</sup> gee<sup>4</sup> ?i] “forest, wilderness”. The two pitch patterns are obviously very similar to each other if not identical. The only difference is that H is on a short vowel in [ii na(H) gee(L\*H) ?i] and on a long vowel in [gaa duu(H) hvv(L\*H) ?i]. The pitch of [ii] seems therefore to be anticipating the H tone in [na] more than the pitch of [gaa] anticipates the high of [duu]. This was also observed in [gaa<sup>23</sup> ga<sup>3</sup> ma] “cucumber” and several other words. So one finding of this study is that the syllables written [23] in Feeling and Pulte (1975) need to be reconsidered because [23] is not a coherent category in the dictionary.

Figure 19 also illustrates a case of tonal interaction. In a sequence of H followed by L\*H, the accent is realized as a slightly rising high tone, rather than as the characteristic low-high rising pattern. Rather than introduce a second accent shape H\* that is restricted to appear only after H

toned syllables, the analysis here is that the rise of the L\*H accent is simply not produced after H. Figure 20 illustrates that this constraint on the realization of L\*H requires strict adjacency - when H is removed by one syllable from L\*H the characteristic rising pattern can be seen.

Incidentally, reinforcing the point about the need for a reevaluation of [23] in Feeling and Pulte (1975). One of the two words in figure 20 is said to have [23] on the initial vowel while the other is written with [2]. I leave it to the reader to determine which one has [23].

Finally, there is a tone written in Feeling and Pulte (1975) as [32]. This tone like almost everything else about the dictionary (despite the carping about [23]) is phonetically exactly as they described it. This is illustrated in Figure 21, where the tone is labeled HL. As with L and H, a survey of the nouns in Feeling and Pulte indicates that though HL is relatively rare, occurring in only 32 nouns, its distribution is like that of H and L in that it may appear in any non final syllable.

## 7. Conclusion.

*Summary.* This acoustic phonetic study of Cherokee prosody has found that the system is a hybrid of pitch accent and lexical tone. There is an optional L\*H pitch accent that is restricted to occur on the penultimate, or if the penult contains a short vowel, on the antepenultimate syllable. Three freely occurring distinctive lexical tones have been documented - Low (which is phonetically low falling), High, and a somewhat rarer High-Low fall. In a cursory look at intonation two kinds of boundary tone were identified - HL% in citation forms and H% in focus construction and questions. The declarative utterances recorded in the study were not discussed here but displayed contours almost identical to those of the citation forms except that the HL% boundary tone was often truncated or missing. Also in considering the intonational patterns, I proposed that focus and citation forms may have a L- phrase tone while questions involve an upstepping process that raises the pitch range of question phrases starting at the first long vowel of the phrase or questioned word.



*Lexical specification of prosody.* Though accent in Cherokee nouns is often associated with the morphological derivation of nouns, so that nonderived, monomorphemic nouns generally do not have accent, while deverbal nouns do, there seem to be enough exceptions to this rule in Feeling and Pulte (1975) to suggest that the presence or absence of accent may be a lexical property of nouns rather than a predictable consequence of synchronic word formation processes. When a noun is accented the location of the accent seems to follow a metrical rule. Accent belongs on the penultimate syllable, but if that syllable is short the accent goes on the antepenultimate syllable.

Regarding the non-predictability of lexical tone in Cherokee, given the historical origin of the distinctive low tone from consonant tone interaction, it might be possible (following Lindsey, 1987) to analyze the lexical low tone in terms of a segmental property such as [+slack] and perhaps take a step toward avoiding characterizing Cherokee as a prosodic hybrid. However, nothing is to be gained by this level of abstraction. In many words the only evidence that there was a glottal stop at some earlier stage of the language is the fact that now the word bears the low falling tone. It is, thus, not plausible to suggest that speakers posit a segmental property to code the low-falling tonal contour. Additionally, the presence of H and HL cannot be predicted from segmental properties either.

*From pitch accent to tone.* Most hybrid systems that have been reported in the literature seem to be former lexical tone languages that have developed properties of an accent system (culminativity, demarcativeness, perhaps even obligatoriness). This seems to be true of Beijing Mandarin Chinese (Chao, 1968; Peng et al., 2005) and the Bantu languages Tonga (Goldsmith, 1984) and Kizigua (Kenstowicz, 1989). However, Saramaccan (Good, 2004), and Stockholm Swedish and Venlo Dutch (Gussenhoven & Bruce, 1999) may have gone, historically, in the opposite direction (from accent to tone). What about Cherokee?

Michelson (1988) reconstructs the prosody of proto-Iroquoian with penultimate accent. She notes that penultimate accent remains in most of the Lake-Iroquoian languages with some also developing antepenultimate accent in certain word formation processes, vowel lengthening in accented syllables, and pitch falls before glottal stop. This reconstruction suggests that Cherokee developed lexical tone from a system that at some earlier stage had pitch accent with some local

segmentally-induced pitch perturbations. We could speculate then that the segmental conditioning environment was deleted and that the pitch shape was then reinterpreted as a distinctive lexical property. In fact, the loss of this environment seems to be one characteristic difference between N. Carolina Cherokee and Oklahoma Cherokee. Where “rock” is [nv?ya] in N. Carolina, it is [nvv1ya] in Oklahoma. So it is possible that lexical tone in Oklahoma Cherokee developed within the last 200 years. With falling pitch patterns derived in glottal stop environments leading the way and making it possible to reinterpret some accents in compound words or other derived environments as lexical high tones.

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**Appendix 1.** Cherokee nouns word list for the August, 2001 recordings. The words are given in pairs as they were presented to talkers. The number in parentheses next to each noun gives the number of nouns in Feeling & Pulte (1975) that show this tone pattern. Each pair was put into contexts as in this example for the first pair.

I saw water. Did you see water?  
No, I saw beans instead.

I saw beans. Did you see beans?  
No, I saw water instead.

- |     |                                      |                   |
|-----|--------------------------------------|-------------------|
| 1a. | a <sup>2</sup> ma                    | ‘water’ (55)      |
| 1b. | tuu <sup>23</sup> ya                 | ‘beans’ (17)      |
| 2a. | goo <sup>4</sup> la                  | ‘winter’ (6)      |
| 2b. | nvv <sup>1</sup> ya                  | ‘rock’ (9)        |
| 3a. | aa <sup>3</sup> ma                   | ‘salt’ (6)        |
| 3b. | u <sup>2</sup> sdi <sup>4</sup>      | ‘baby’ (1)        |
| 4a. | ka <sup>2</sup> nuu <sup>2</sup> na  | ‘bullfrog’ (60)   |
| 4b. | a <sup>2</sup> wii <sup>4</sup> na   | ‘young man’ (23)  |
| 5a. | ka <sup>2</sup> woo <sup>23</sup> nu | ‘duck’ (27)       |
| 5b. | waa <sup>3</sup> lee <sup>2</sup> la | ‘hummingbird’ (6) |
| 6a. | ga <sup>2</sup> noo <sup>1</sup> ji  | ‘leather’ (13)    |

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- 6b. da<sup>2</sup>woo<sup>3</sup>li ‘mushroom’ (9)
- 7a. gaa<sup>23</sup>ga<sup>3</sup>ma ‘cucumber’ (11)
- 7b. aa<sup>1</sup>suu<sup>2</sup>lo ‘pants’ (8)
- 8a. sgwaa<sup>1</sup>hlee<sup>4</sup>sdi ‘ball’
- 8b. too<sup>1</sup>juu<sup>23</sup>hwa ‘redbird’
- 9a. joo<sup>23</sup>la<sup>2</sup>ni ‘window’
- 9b. ga<sup>2</sup>nee<sup>4</sup>li ‘person living in the house’
- 10a. ki<sup>2</sup>yuu<sup>32</sup>ga ‘chipmonk’
- 10b. uu<sup>2</sup>naa<sup>2</sup>lii<sup>4</sup>?i ‘his friend’
- 11a. a<sup>2</sup>svv<sup>2</sup>noo<sup>23</sup>yi ‘Nighthawk’
- 11b. ga<sup>2</sup>nvv<sup>2</sup>noo<sup>2</sup>wa ‘pipe’
- 12a. juu<sup>2</sup>gvv<sup>23</sup>wahl<sup>2</sup>di ‘price’
- 12b. a<sup>2</sup>laa<sup>1</sup>suu<sup>23</sup>lo ‘shoe’
- 13a. gvv<sup>2</sup>noo<sup>2</sup>sa<sup>3</sup>sdi ‘broom’
- 13b. oo<sup>1</sup>da<sup>2</sup>lvv<sup>4</sup>?i ‘mountain’
- 14a. gaa<sup>2</sup>duu<sup>3</sup>hvv<sup>4</sup>?i ‘town’
- 14b. tsgwa<sup>2</sup>lee<sup>3</sup>gwa<sup>2</sup>la ‘whippoorwill’

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- 15a. uu<sup>2</sup>loo<sup>1</sup>gi<sup>3</sup>li 'cloud'  
15b. uu<sup>2</sup>noo<sup>1</sup>dee<sup>4</sup>na 'sheep'
- 16a. a<sup>2</sup>kuu<sup>23</sup>gii<sup>4</sup>sdi 'dipper'  
16b. ii<sup>23</sup>na<sup>3</sup>gee<sup>4</sup>?i 'forest, wilderness'
- 17a. a<sup>2</sup>yvv<sup>2</sup>wi<sup>2</sup>yaa<sup>4</sup>?i 'Indian'  
17b. uu<sup>2</sup>gee<sup>2</sup>yuu<sup>23</sup>hna<sup>2</sup>?i 'possessive, stingy person'
- 18a. juu<sup>2</sup>nii<sup>2</sup>dlvv<sup>1</sup>gii<sup>4</sup>?i 'hospital'  
18b. uu<sup>1</sup>waa<sup>3</sup>?i<sup>2</sup>hlvv<sup>4</sup>?i 'bush'
- 19a. ii<sup>23</sup>gvv<sup>3</sup>na<sup>2</sup>dee<sup>4</sup>na 'area'  
19b. a<sup>2</sup>li<sup>2</sup>gvv<sup>2</sup>duu<sup>2</sup>lo 'mask'

**Figure Captions.**

Figure 1. Pitch accent L\*H as it is seen in pitch traces of a three-syllable word that has accent on the penultimate syllable [a wii(L\*H) na] “young man” and a three-syllable word that has pitch accent on the antepenultimate syllable [joo(L\*H) la ni] “window”. The pitch traces are aligned on the L\*H.

Figure 2. Pitch accent on penultimate and antepenultimate syllables in words that are four syllables long. [uu naa lii(L\*H) ?i] “his friend”, and [juu gvɪ(\*HL) wahl di] “price”. The pitch traces are aligned on the L\*H.

Figure 3. Pitch accent on penultimate and antepenultimate syllables in words that are five syllables long. [a yvɪ wi yaa(L\*H) ?i] “Indian”, and [uu gee yuu(\*HL) hna ?i] “possessive person”. The pitch traces are aligned on the L\*H.

Figure 4. An unaccented three-syllable noun [ka nuu na] “bullfrog”.

Figure 5. An unaccented four-syllable noun [ga nvɪ noo wa] “pipe”.

Figure 6. An unaccented five-syllable noun [a li gvɪ duu lo] “mask”.

Figure 7. Comparison of citation and focus forms of [ga nee(L\*H) li] “person living in the house” which has accent on the penultimate syllable.

Figure 8. Comparison of citation and focus forms of [joo(L\*H) la ni] “window” which has accent on the antepenultimate syllable.

Figure 9. The unaccented noun [ka nuu na] “bullfrog” in citation form and with the focus particle [-də].



Figure 10. Question intonation (compared with the citation form) on an unaccented noun four syllables long - [ga nvv noo wa] “pipe”.

Figure 11. Question intonation (compared with the citation form) on a three-syllable long unaccented noun - [ka nuu na] “bullfrog”.

Figure 12. Question intonation (compared with the citation form) on a two-syllable accented noun - [goo(L\*H) la] “winter”.

Figure 13. Question intonation (compared with the citation form) on a four-syllable accented noun with antepenultimate accent - [juu gv(v)L\*(H) wahl di] “price”.

Figure 14. Question intonation (compared with the citation form) on [a yvv wi yaa(L\*H) ?i] “Indian”.

Figure 15. Low tone in an unaccented noun, contrasted with an unaccented noun that has no distinctive tone specifications. [a laa(L) suu lo] “shoe” vs. [ga nvv noo wa] “pipe”.

Figure 16. Low tone in a penultimate accented noun, contrasted with a penultimate accented noun that has no distinctive tone specification. [uu noo(L) dee(L\*H) na] “sheep” vs. [uu naa lii(L\*H) ?i] “his friend”.

Figure 17. High tone in an unaccented noun, contrasted with an unaccented noun that has no distinctive tone specifications. [tsgwa lee(H) gwa la] “whippoorwill” vs [ga nvv noo wa] “pipe”.

Figure 18. High tone in an unaccented noun, contrasted with a penultimate accented noun that has no distinctive tone specification. [uu naa lii(L\*H) ?i] “his friend” vs. [gvv noo sa(H) sdi] “broom”.

Figure 19. When H is adjacent to L\*H. [gaa duu(H) hvv(L\*H) ?i] “town” vs. [ii na(H) gee(L\*H)

?i] “forest, wilderness”.

Figure 20. When H is one syllable removed from L\*H. [a yvv wi yaa(L\*H) ?i] “Indian” vs. [ii gvv(H) na dee(L\*H) na] “area”.

Figure 21. Typical pitch shape of the HL tone. [ka nuu na] “bullfrog” vs. [ki yuu(HL) ga] “chipmonk”.

Figure 1

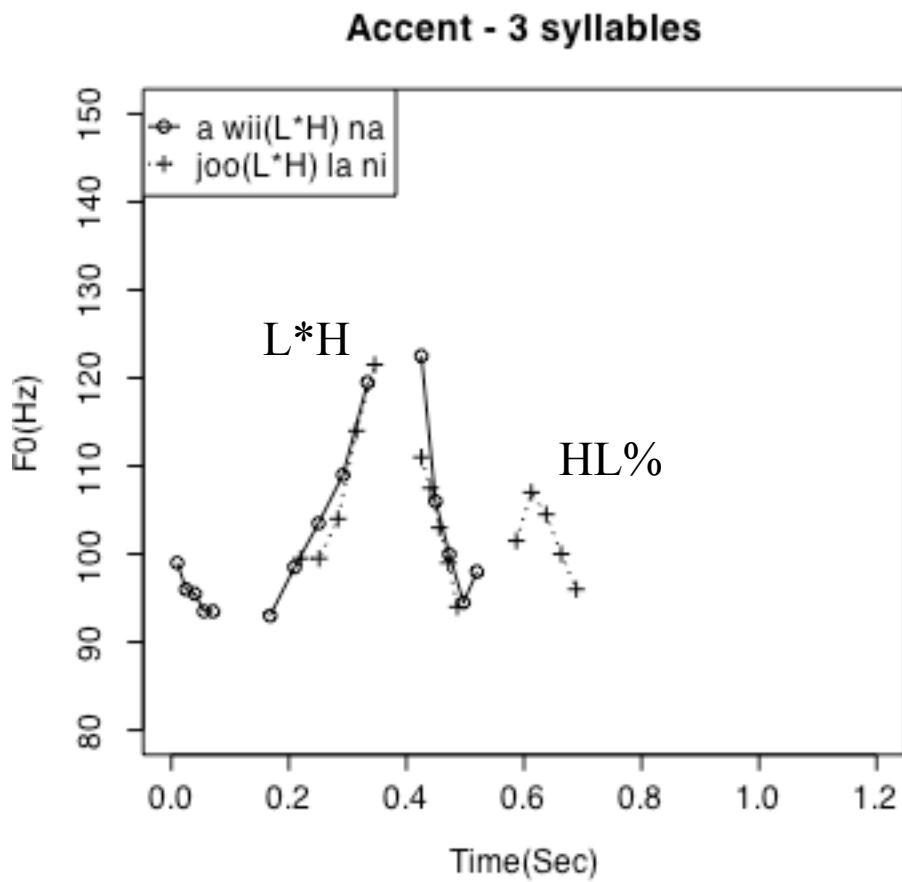


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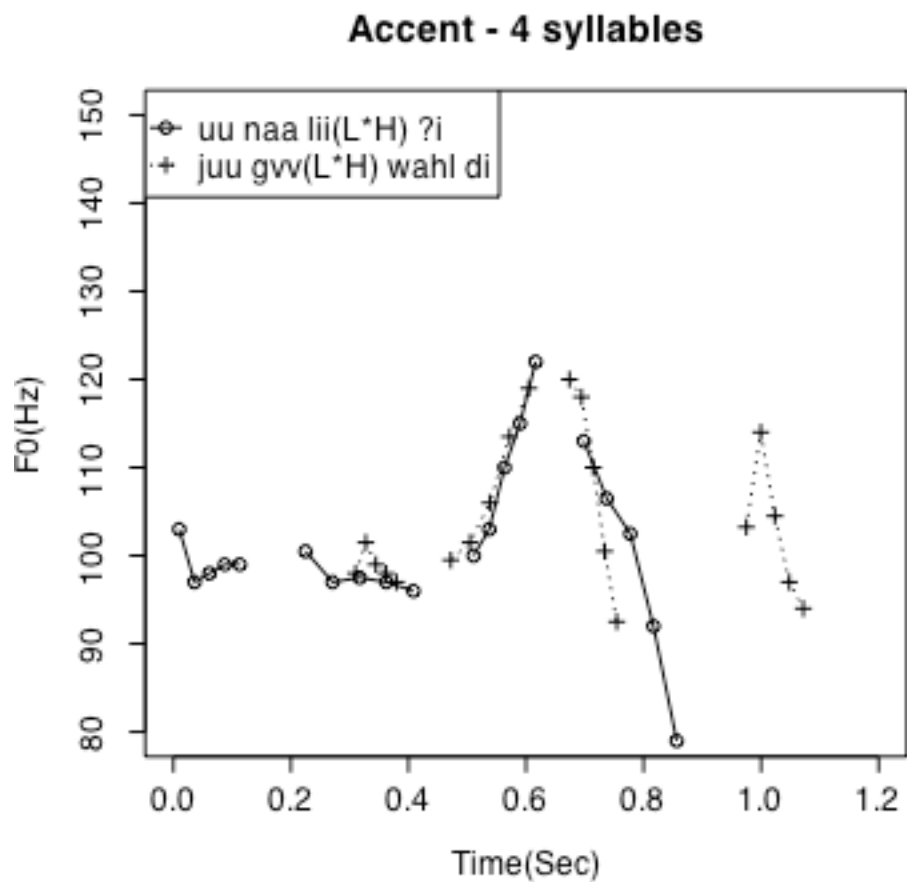


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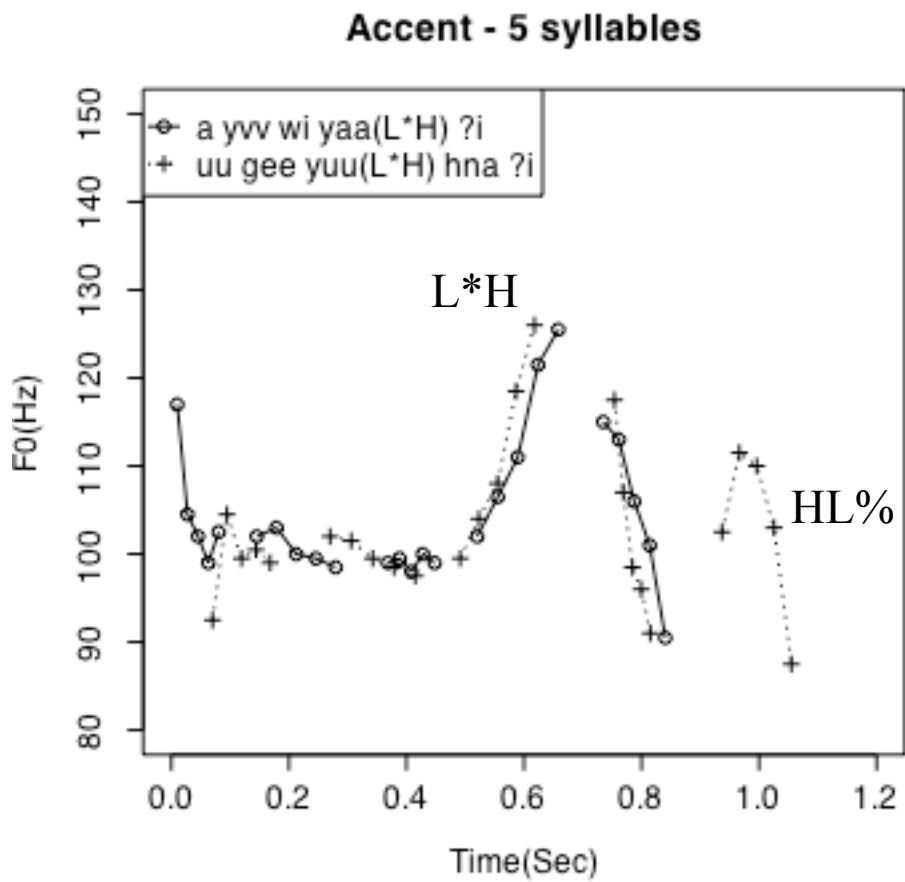


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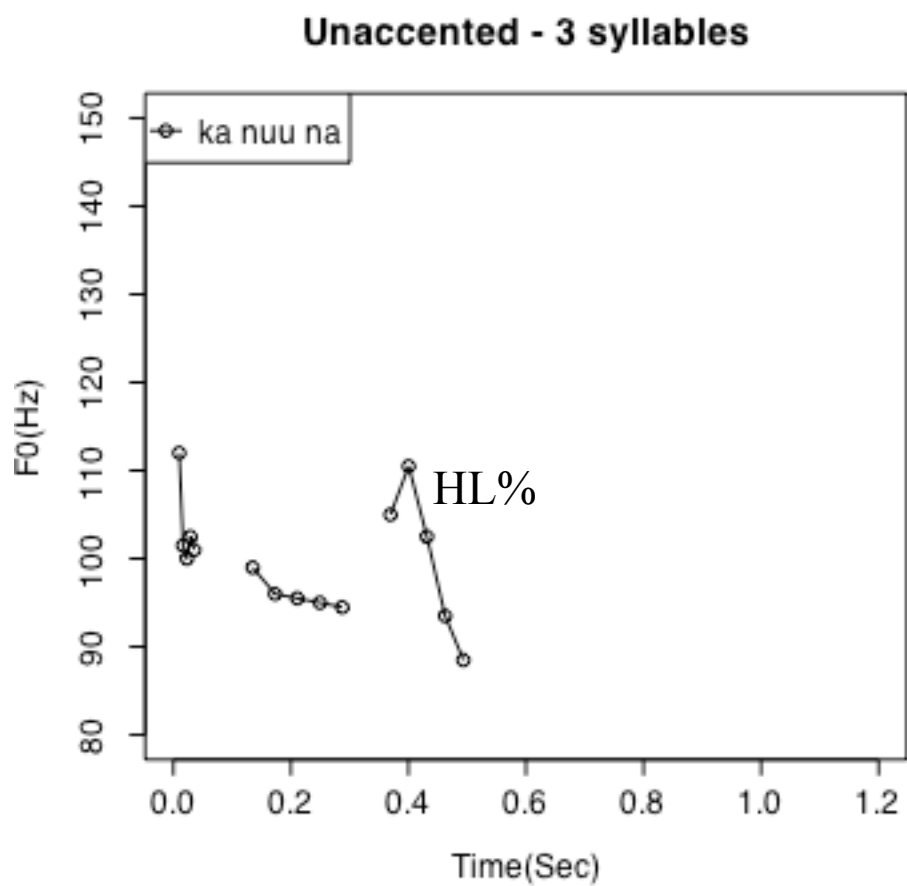


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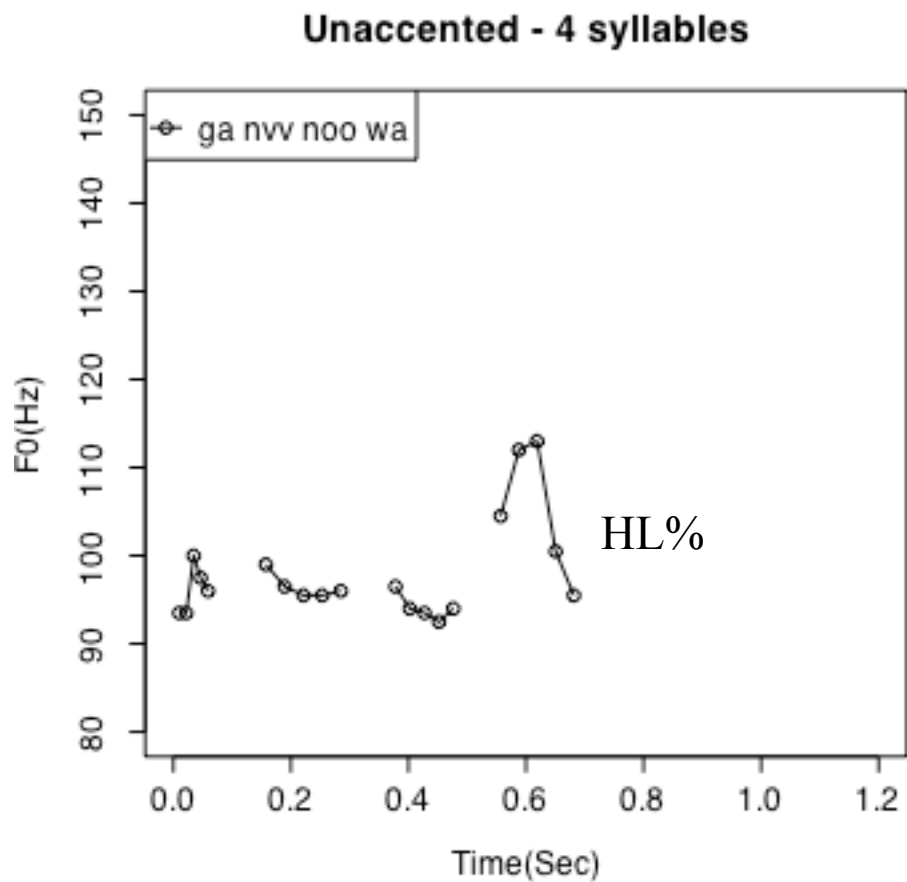


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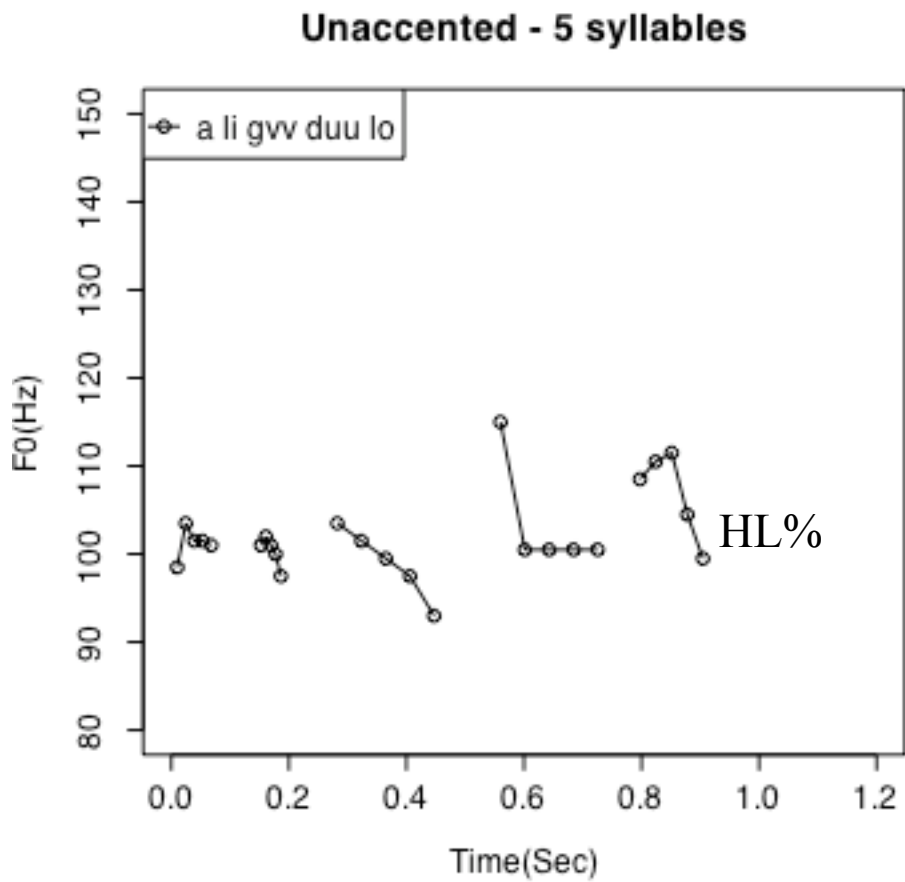




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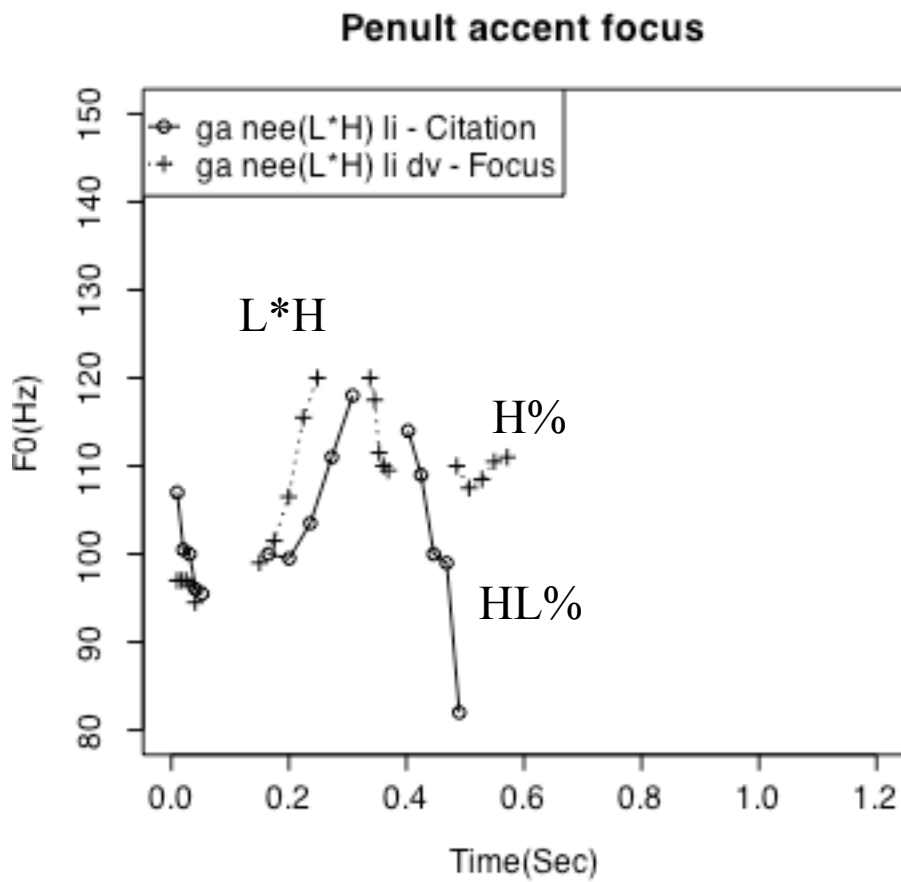


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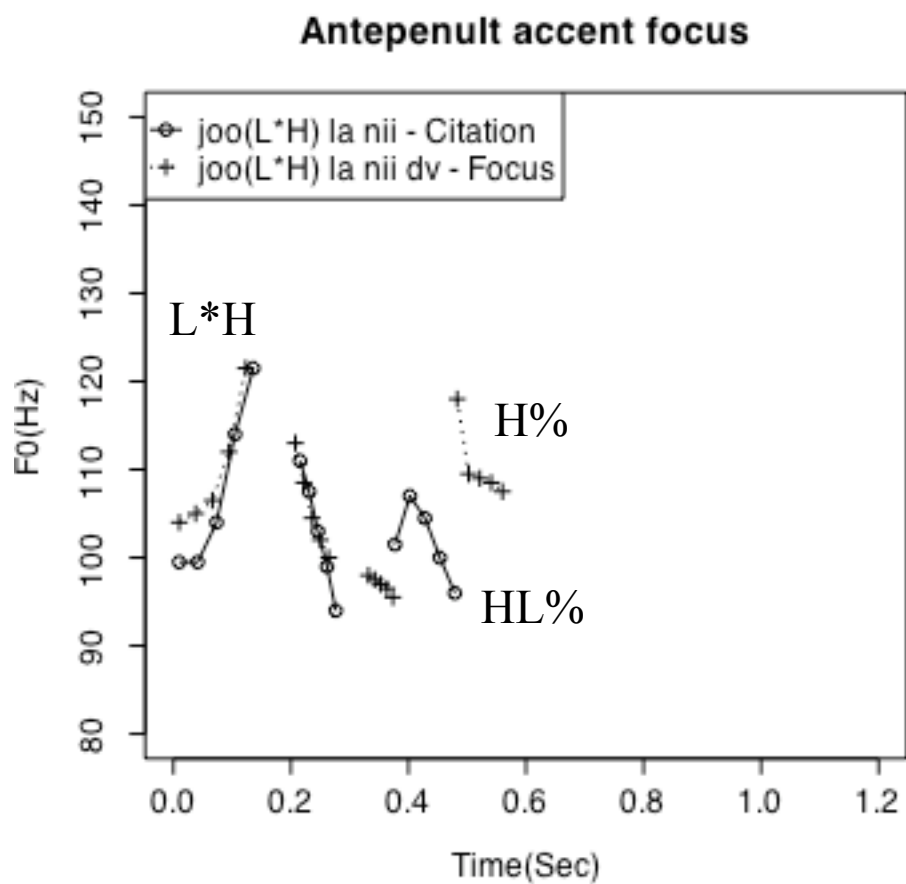


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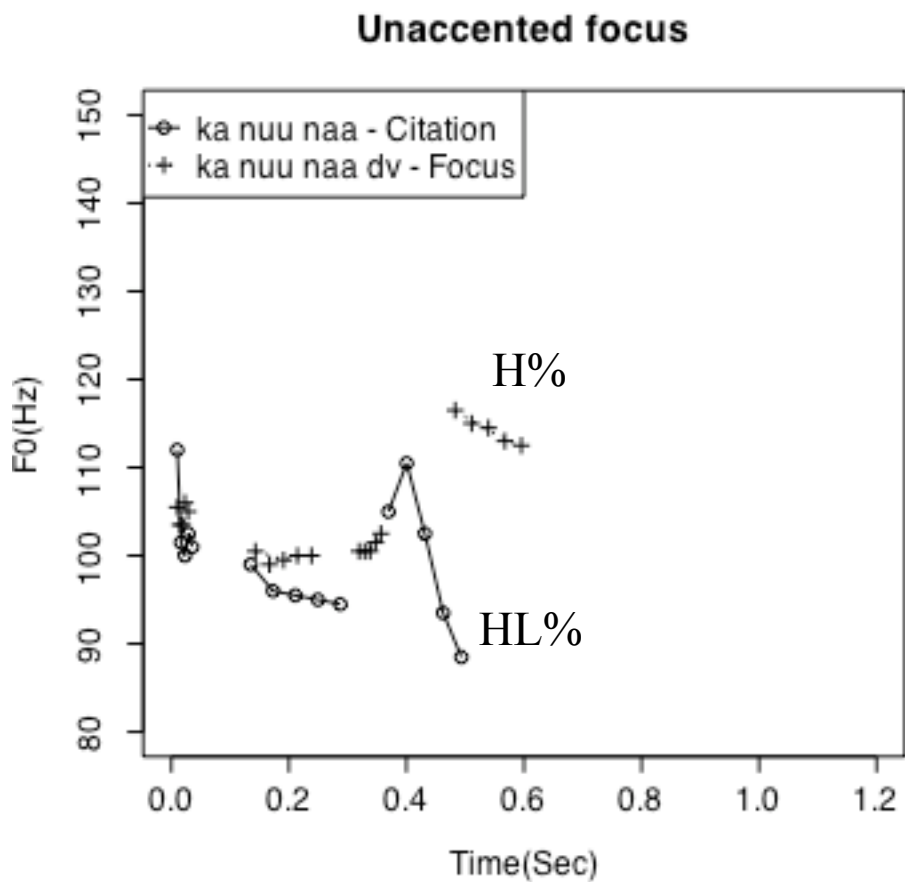


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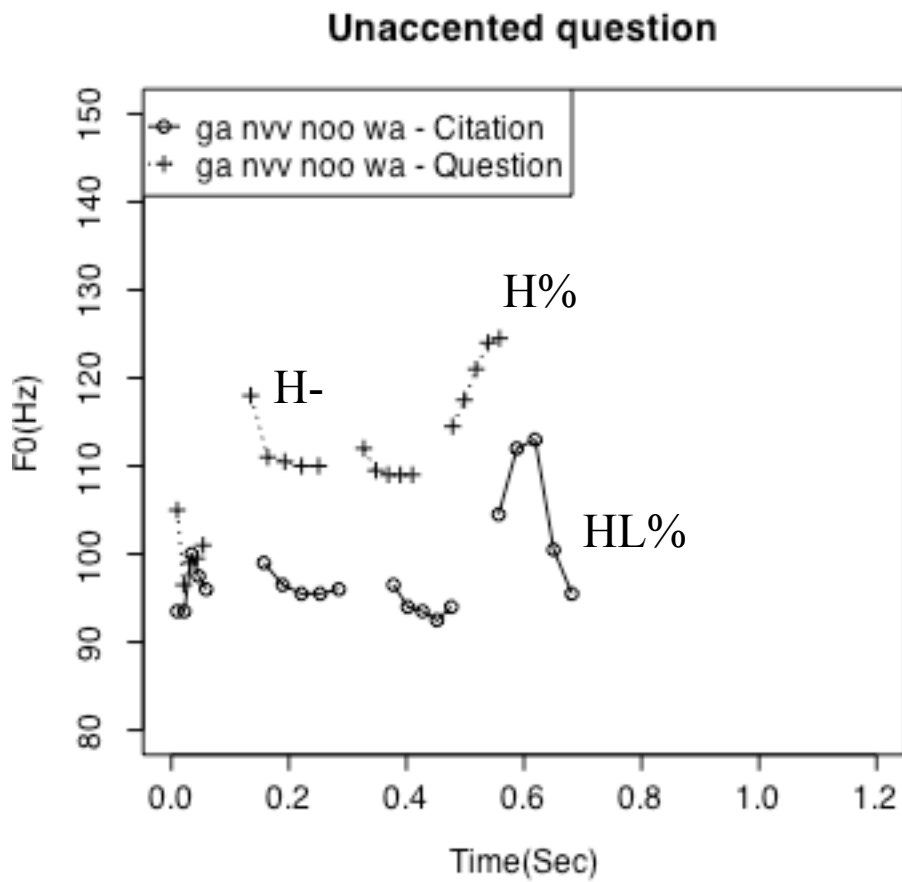


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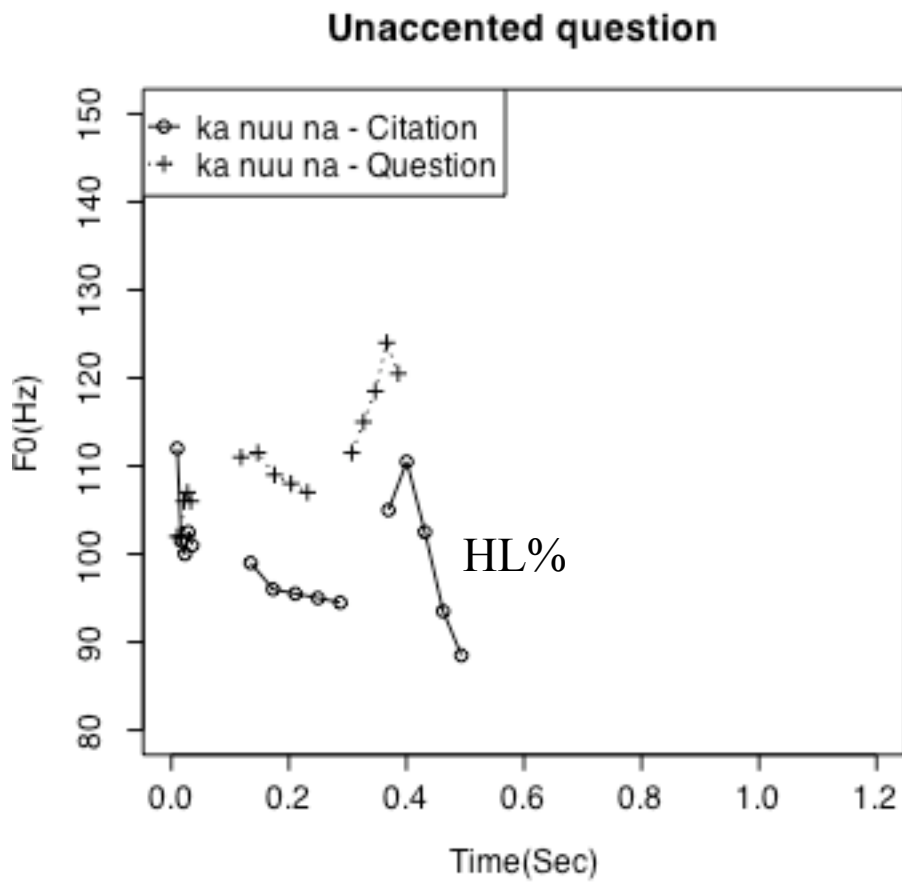


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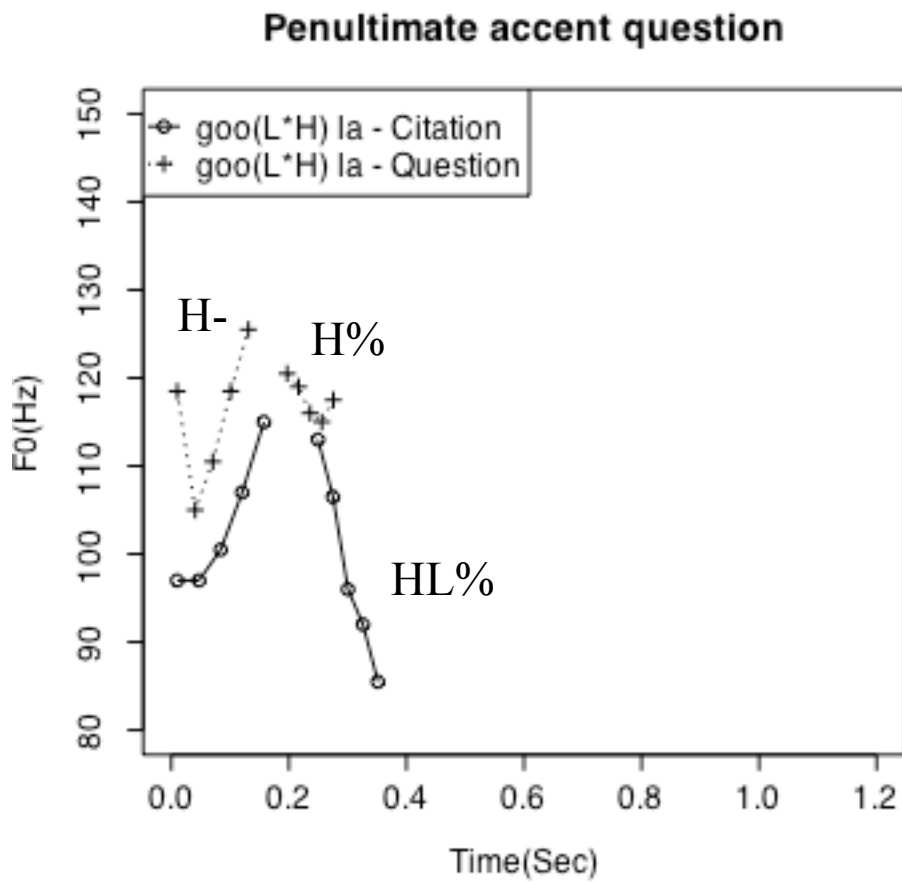


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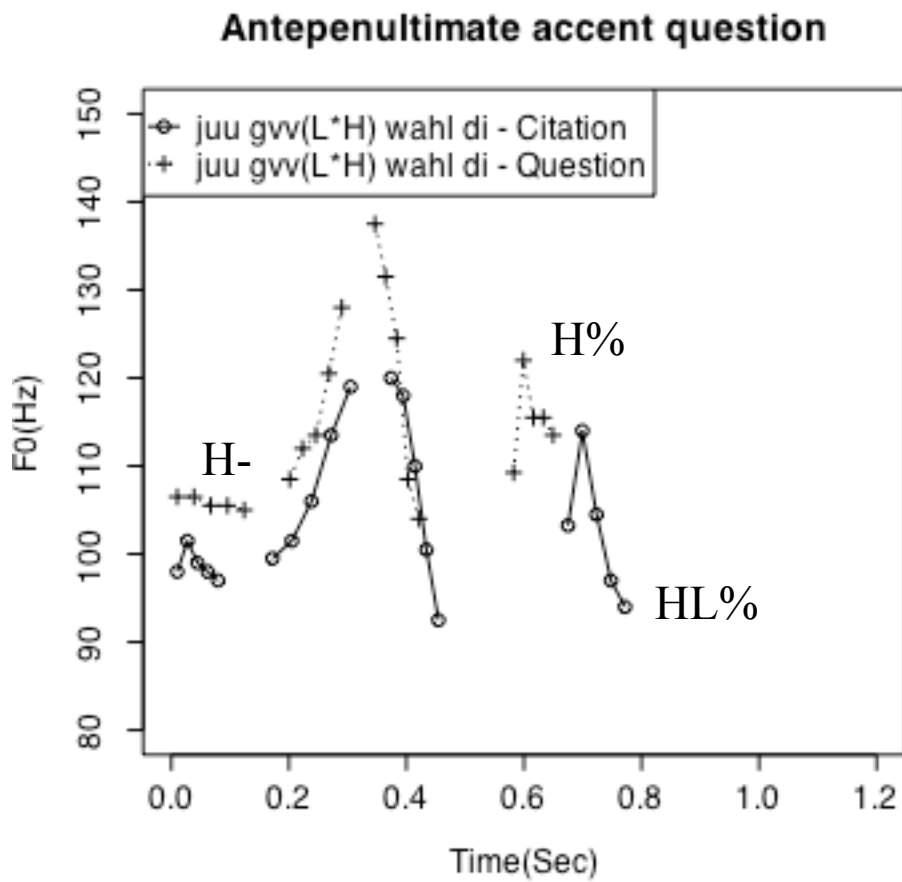


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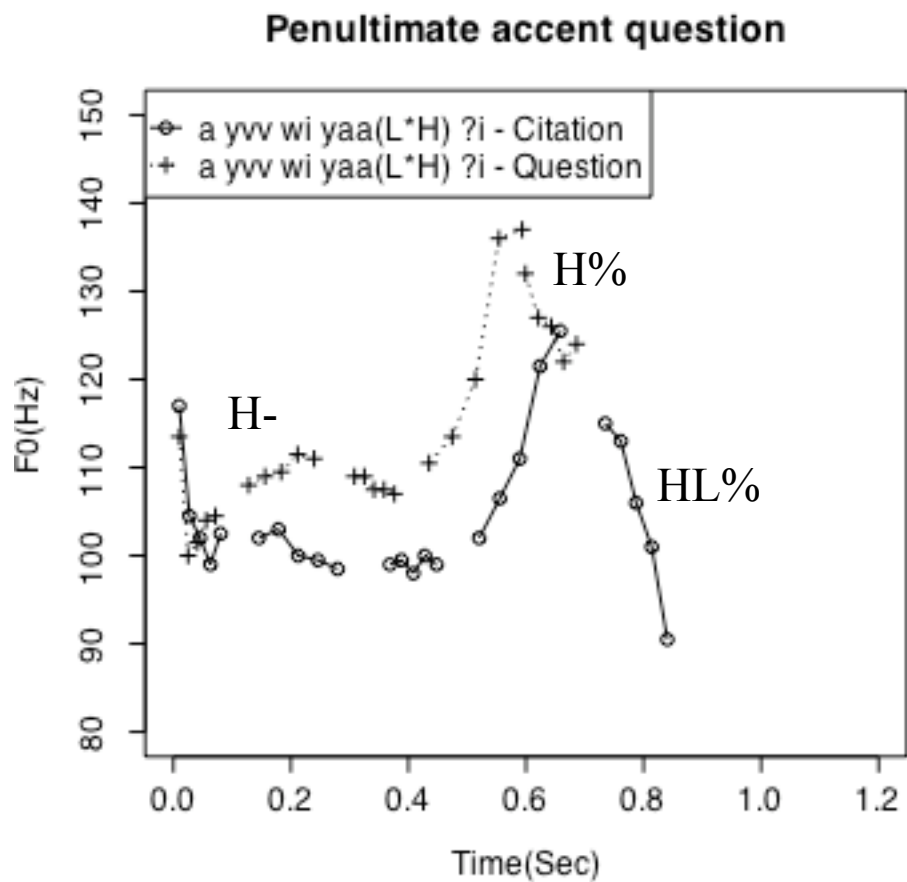




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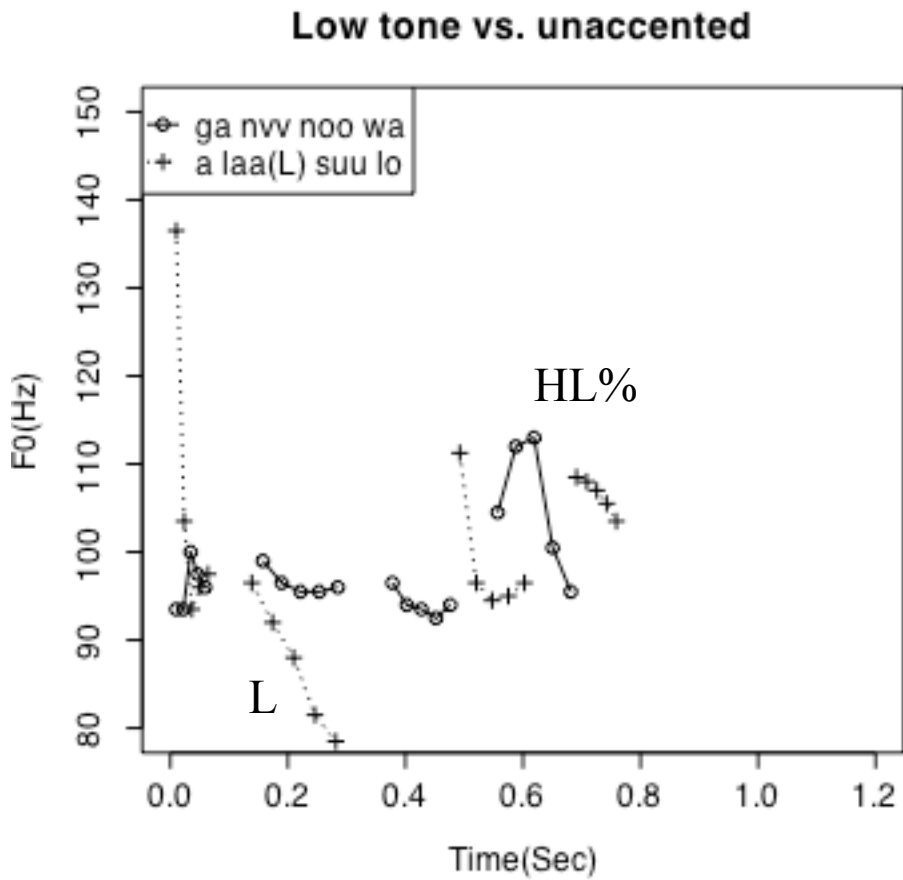


Figure 16.

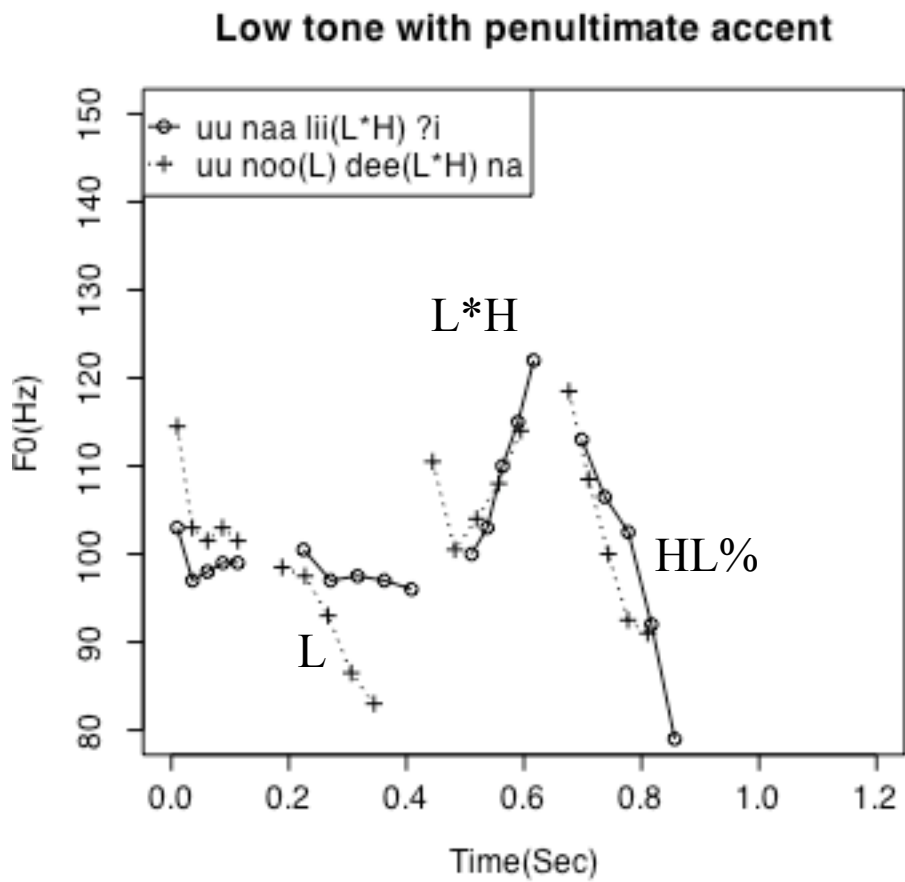


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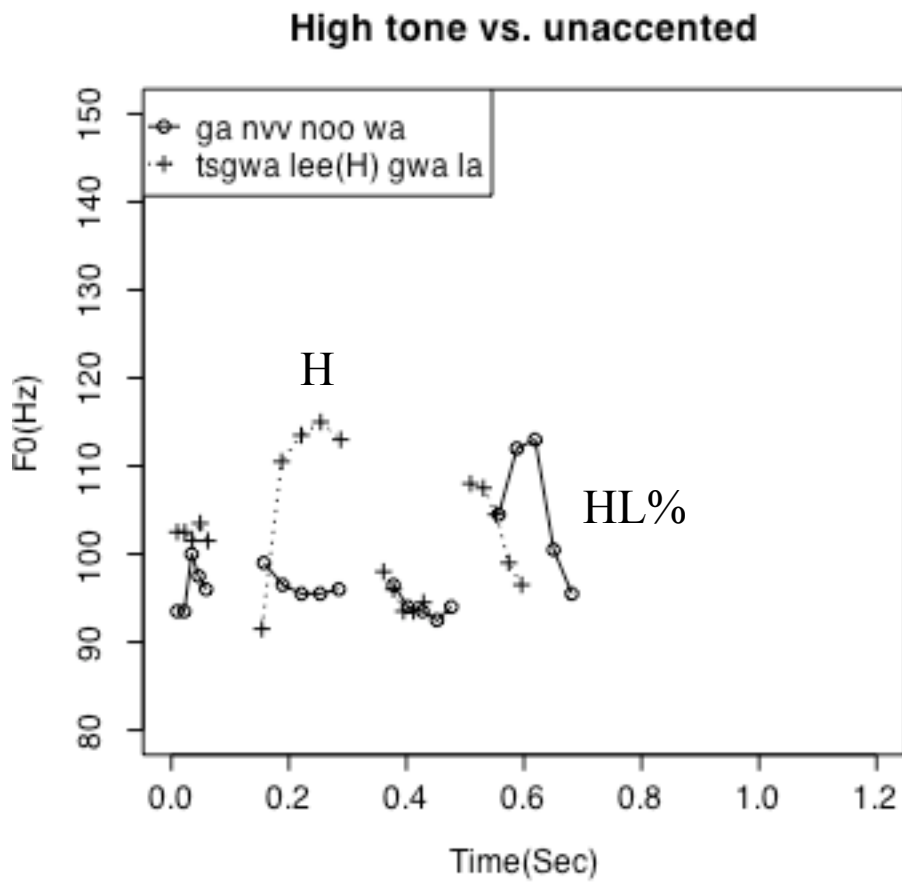


Figure 18.

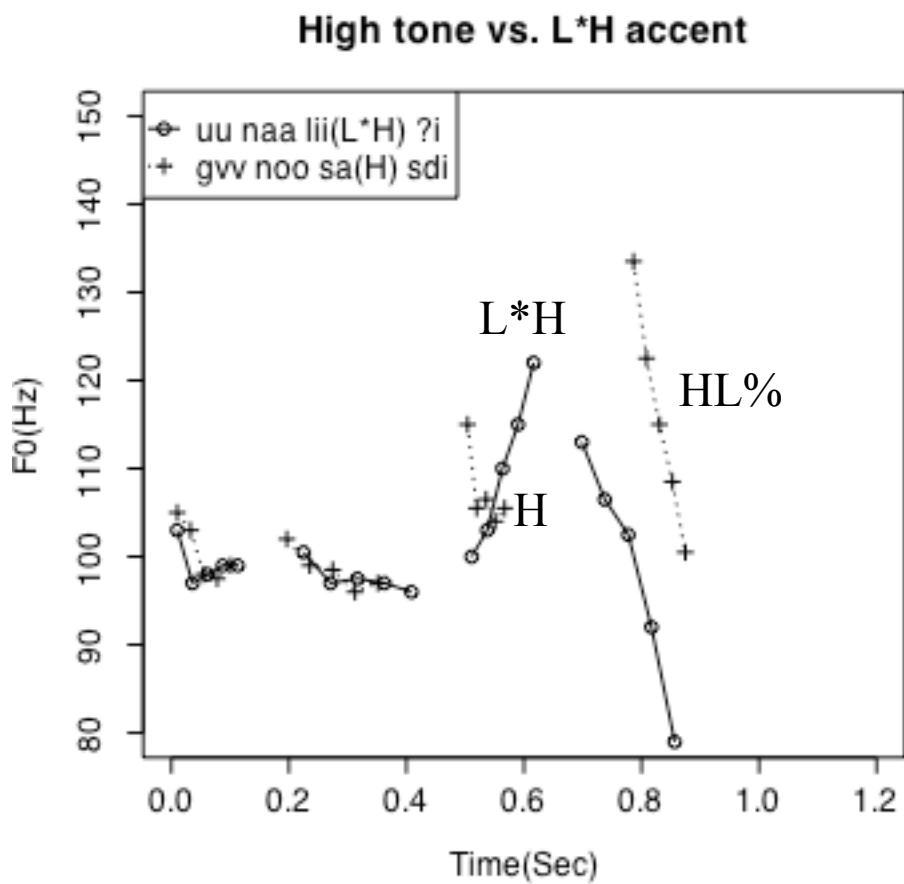
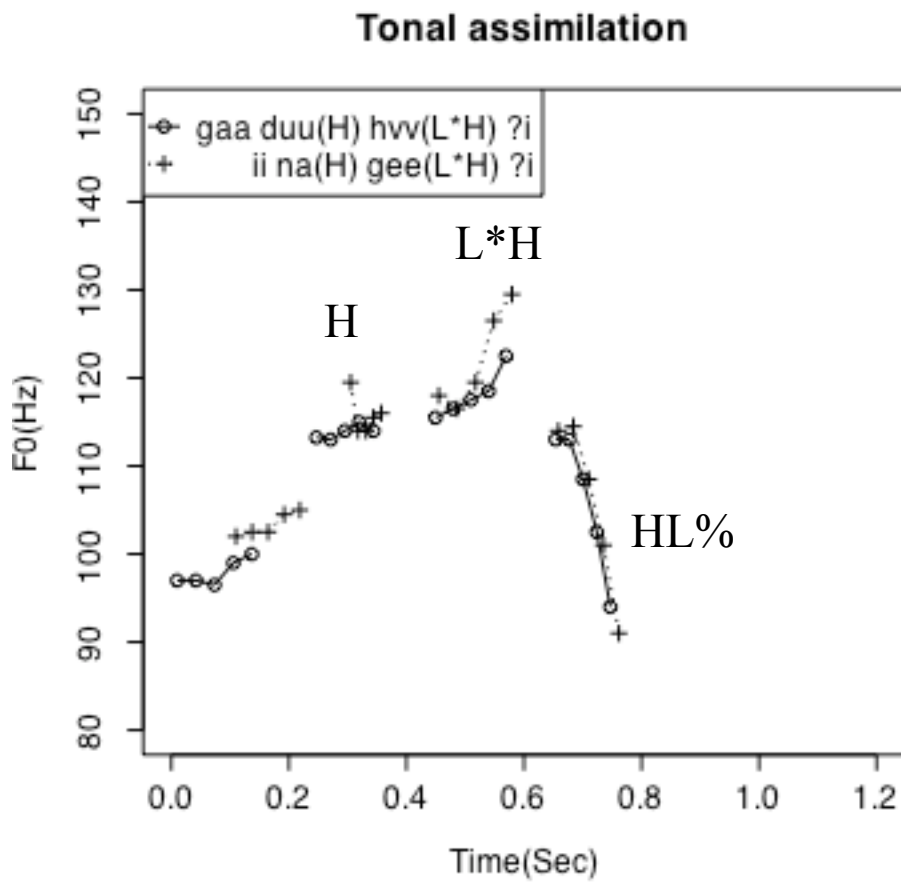


Figure 19.



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Figure 20

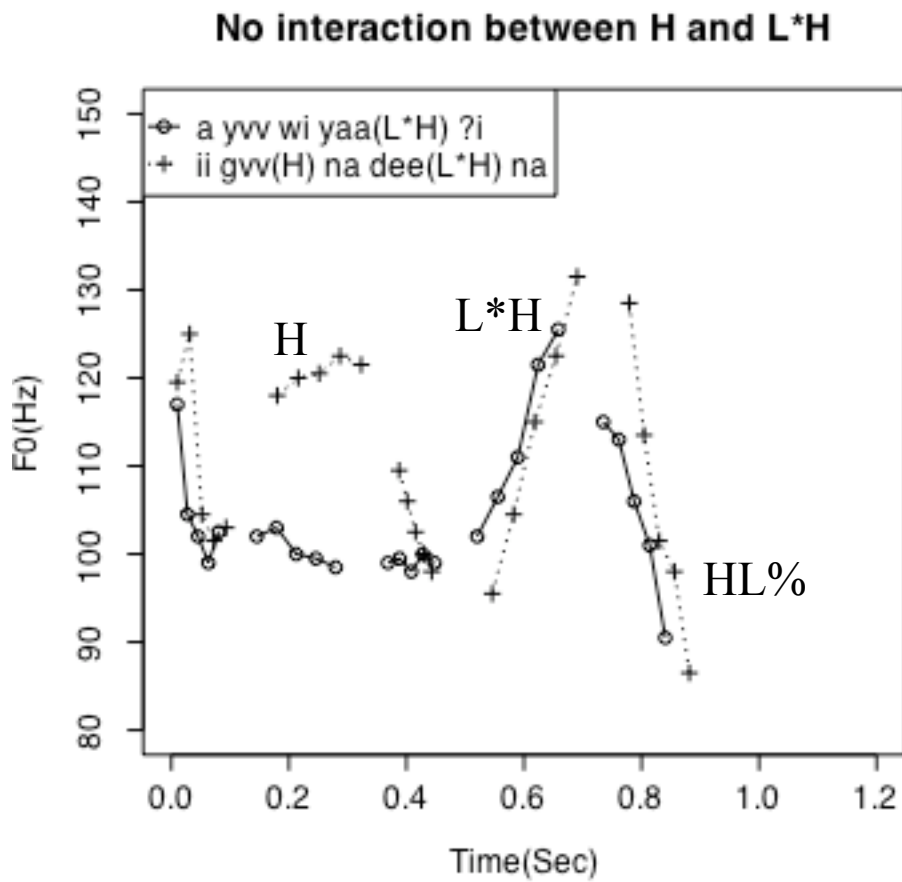


Figure 21.

