LEXICAL AND POST-LEXICAL TONE IN CHOGUITA RARÁMURI

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ABSTRACT

This study proposes a model of the intonation of Choguita Rarámuri (Tarahumara), a Uto-Aztecan language spoken in Chihuahua, Mexico. Tonal patterns of utterances were examined by varying the length of a word and a phrase, the location of lexical stress-tone, and sentence types. The only attested prosodic unit above the prosodic word is the Intonational Phrase (IP), which is usually marked by a high boundary tone. Additionally, there are optional tonal targets before lexical tones, which we term "lead tones". These do not seem to be demarcative tones, as they are variable in their location. Interestingly, the lead tones are either high or low, depending on the following lexical tone. Thus, we suggest that lead tones occur optionally for rhythmic purposes and/or to enhance the targets of lexical tones.

Keywords: intonation, tone, rhythm, Uto-Aztecan

1. INTRODUCTION

In this paper we analyze the intonation of declarative sentences in Choguita Rarámuri (henceforth, CR) produced in neutral focus. CR intonation is analyzed within the Autosegmental-Metrical (AM) framework of intonational phonology [11, 9]. Rarámuri (Tarahumara) is a Uto-Aztecan language of the Taracahitan branch. The CR variety studied here is part of the Highland dialect continuum, and is spoken by roughly 1000 speakers in Chihuahua, Mexico. There are almost no intonational studies of Uto-Aztecan languages in general (cf. [10]), and the current study is the first analysis of the intonation of a Uto-Aztecan language with lexical tones.

In terms of its word-level prosody, CR has lexical stress with complex morphological conditioning [3, 4], and which is correlated primarily with changes in syllable intensity and duration [5]. In contrast to many other toneless Uto-Aztecan languages, in CR lexically-stressed syllables obligatorily bear one of three lexical tones: low (L), high (H), and falling (HL). Stressless syllables are lexically toneless [5].

In this paper, we show that CR uses fundamental frequency (f0) to mark both lexical tones and post-lexical intonation. Lexical tonal targets are realized on the stressed syllables of each word, and (in the case of the falling tone) also on the post-tonic syllable. High tones often extend to the post-tonic syllable. The ends of Intonation Phrases (IPs) are usually characterized by an optional high boundary tone (H%). Both pitch expansion and raising are associated with H% boundary tones. In addition to boundary tones, CR shows evidence of additional tonal targets that cannot be attributed to stressed syllables or prosodic word edges. We will argue that these tones are inserted for rhythmic reasons and/or to enhance the f0 targets of lexical tones.

In order to observe various tonal patterns and to better understand the timing and sequencing of tones, we systematically varied the length of words and phrases, the location of lexical stress, as well as the syntactic structure of phrases. The data in this study come from two native speakers of the language (one female, age 26; one male, age 42). The participants read the sentences from a list and repeated each sentence three times. Recordings were done in a quiet room in the field using a Marantz recorder with a lapel microphone.

2. INTONATIONAL CONTOURS OF DECLARATIVE SENTENCES

2.1. Declaratives with lexical high tones

Figure 1 shows the pitch track of a 3-word sentence uttered by the male speaker. All words bear a lexical high tone on the stressed syllable. Tones associated with lexically-stressed syllables are indicated with asterisks (e.g. H*) on the 1st tier. When the high f0 peak for a H* is delayed with respect to the stressed syllable, a left angle bracket "⟨" is indicated to mark where the actual peak occurs. Peak delay tends to occur when the high-toned syllable is followed by a sonorant, as found in other languages [6, 12]. All other post-lexical tones are marked on the second tier. The third and fourth tiers provide the words in CR and English, respectively. (Lexical high tones are not marked orthographically in CR; low tones have a grave accent on the stressed vowel; falling tones have an acute accent on the stressed vowel). The stressed syllable is marked by 'S' on the fourth

tier. The same format is used for all subsequent pitch tracks.

As shown in Figure 1, the typical intonational contour of a CR declarative sentence with only lexical high tones consists of rising [(L) H*] sequences. The H* is due to the lexical high tone; the (L) tone is an optional lead tone preceding the lexical tone, which we discuss in more detail in Section 2.4. A H% boundary tone occurs at the end of the Intonation Phrase (see Section 2.5). Thus, in Figure 1, the pitch continues to rise from the final lexical high tone until the end of the utterance. No declination is observed; in fact, Figure 1 shows a higher f0 target for the second and third high tones compared with the first high tone.

Figure 1: Sample pitch track of a 3-word sentence 'The dancers ate zucchini' uttered by the male speaker. Each word bears a lexical high tone on the stressed syllable, whose interval is marked by 'S' on the fourth tier.

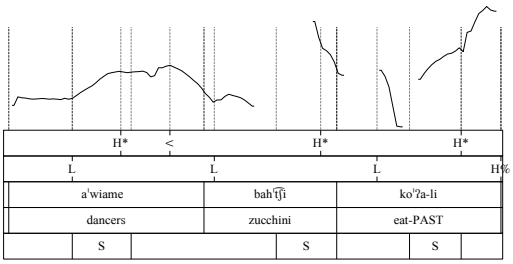


Figure 2 shows the pitch track of the same 4-word sentence shown in Figure 1, but uttered by the female speaker. Again, no declination is seen.

2.2. Declaratives with lexical low tones

As shown in Figure 3, the typical intonational contour of a CR declarative sentence with only lexical low tones consists of [(H) L*] sequences and ending in a H% boundary tone. The optional (H) tones before the lexical tones are lead tones, discussed in more detail in Section 2.4. The H% boundary tone is usually upstepped, such that it is as high or higher in F0 than any preceding H lead tone. The H% boundary tone often results in an upstepped phrase-final lexical low tone (as seen in Figure 3), such that the final low-toned syllable of the phrase is slightly higher in f0 than the preceding ones.

2.3. Declaratives with HL lexical tones

The typical intonational contour of a CR declarative sentence with only lexical falling tones consists

Figure 2: Sample pitch track of a 3-word sentence 'The dancers ate zucchini' uttered by the female speaker. Every word bears a lexical high tone on the stressed syllable, whose interval is marked by 'S' on the fourth tier.

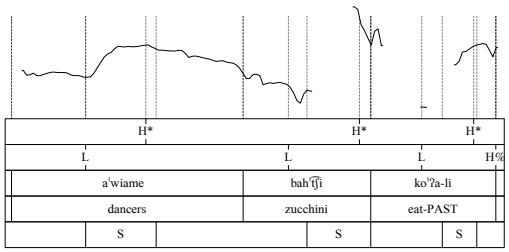
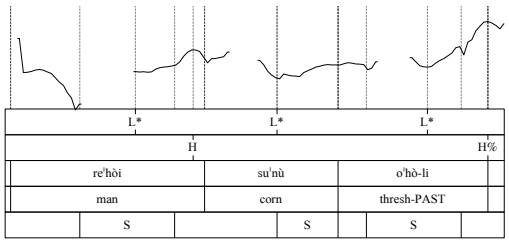


Figure 3: Sample pitch track of a 3-word sentence 'The man threshed corn' uttered by the male speaker. Every word bears a lexical low tone on the stressed syllable, whose interval is marked by 'S' on the fourth tier.



of [(L) H*L] sequences with no boundary tone (see Figure 4). The lead (L) tones are optional, as with lead tones found before other lexical tones. The fall of the lexical tone is realized with the high target on the tonic, followed by an f0 fall on the tonic or post-tonic syllable. Even though the phrase ends with a low f0 target (due to the phrase-final lexical falling tone), no declination of the high f0 targets on the falling tones is observed.

Therefore, sentences with only lexical high tones and sentences with only lexical falling tones can both be characterized by a sequence of rises aligned with stressed syllables (as in Figures 1 and 4). However, they differ in several respects. First, sentences with high tones end with a high pitch level, which can be attributed either to the final lexical high tone and/or to the presence of a H% boundary tone. On the other hand, sentences with falling tones end with a low pitch level. Second, the lead L tones before lexical high and falling tones are optional, whereas the lexical falling tones always have a low pitch tar-

Figure 4: Sample pitch track of a 4-word sentence 'Manuel bit two peppers' uttered by the female speaker. Every word bears a lexical falling tone on the stressed syllable, whose interval is marked by 'S' on the fourth tier.

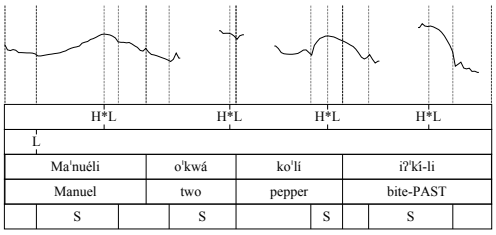
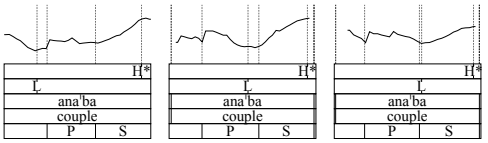


Figure 5: Sample pitch tracks of the word 'couple' excised from 3 different sentences uttered by the male speaker. The first two tokens are Utterance-final; the last token is Utterance-initial. The stressed syllable's interval is marked by 'S' on the fourth tier; the pretonic syllabic is marked with a 'P.' Notice the variable alignment of the lead L tones across tokens.



get (hence their representation as H*L). Therefore, sequences of lexical high tones are often characterized by a high plateau, rather than a sequence of rises. This is not possible for a sequence of falling tones, where the lag low target of H*L is always realized. Third, the falling tones on word-final open syllables may also be rearticulated (especially utterance-finally), such that a word-final vowel with a falling tone is realized as [V?V] [1]. However, rearticulation does not occur with high tones.

2.4. The lead tones

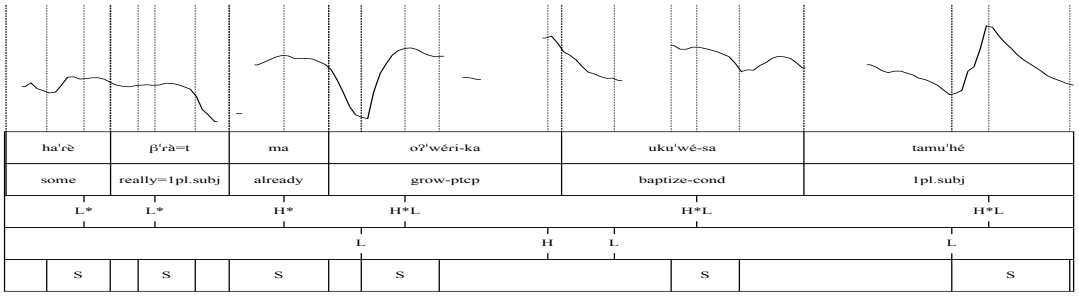
As discussed in the previous section, all lexical tones may be preceded by an optional lead tone. In the case of the high and falling tones, the lead tone is always a low target; before low tones, the lead tone is always high. Thus, it is possible to represent the high, falling, and low tones as L+H*, L+H*L (or L+H*+L), and H+L*, respectively. However, we prefer a minimal representation of the lexical tones as H*, H*L, and L*, for the following reasons. First, lead tones are optional, as seen in Figures 3, and 4. In contrast, the high (H*), low (L*), and falling (H*L) targets for the lexical tones are obligatory. Second, lead tones are variable in their alignment: they tend to occur in the pretonic syllable, but they can also align with the syllable preceding the pretonic or the beginning of the tonic (see Figure 5). In contrast, the lag low target for H*L, which is part of the lexical tonal phonology, always occurs in the post-tonic. Thus, despite the fact that variable alignment of pitch accents is found in languages like Cypriot Greek [14], CR lexical tones are consistently aligned with the stressed syllables (and, in the case of falling tones, with the post-tonic syllables). Instead, only the lead tones are variably aligned.

Given that the lead tones are variable in their alignment and tend to occur word-internally, it is also inappropriate to consider them as edge tones that mark the onset of a prosodic constituent (e.g., the onset of a prosodic word). Ongoing work will determine what governs the variable alignment of lead tones in CR. Preliminary findings suggest tone crowding [13, 2] is not the primary factor involved. In Figure 5, the third panel shows the closest alignment of the lead L tone to the H*, yet this token occurred Utterance-initially, which is not marked by an edge tone. Thus, there was no prior tone before the lead L to cause it to be pushed forward. Of course, speech rate may influence how many lead tones are realized. Future work will examine the role of speech rhythm in predicting the occurrence of lead tones in CR.

Typically, only one lead tone precedes a lexical tone. However, two lead tones sometimes occur in cases where there is (1) a sequence of unstressed syllables between two lexical tones, and (2) a mismatch in f0 height between one lexical tone's target and the target of a following tone (e.g. H*L ... H*L). For example, in Figure 6, there are four unstressed syllables between the lexical H*L tones of *o?'wérika uku'wésa*. If no lead tones were present, we would expect f0 to begin to rise between the low target of the first H*L and the high target of the second H*L (as in Figure 4). Instead, we see see a rising-falling contour between the two H*L targets.

Thus, we analyze lead tones as optional pitch targets. Because their f0 height varies as a function of the following lexical tone (L before H* and H*L; H before L*) and their alignment is usually pretonic, the lead tones can be considered post-lexical head-prominence tones [7]. That is, the lead tones in CR serve to enhance the prominence of prosodic heads– the lexical tones that occur only on stressed syllables. However, these lead tones are typologically

Figure 6: Sample pitch track of sentence 'Some of us are baptized once we are grown' uttered by the male speaker. Both H and L lead tones are found between two H*L lexical tones with several unstressed syllables.



rare: they are optional post-lexical head-marking tones that vary in f0 based on adjacent lexical tone.

2.5. Boundary tones

Declarative sentences normally end in a high f0 when the final lexical tone is high or low (see Figures 1, 2, and 3). When the final lexical tone is falling, the end of the utterance is typically low-pitched (e.g. Figures 4 and 6). Thus, we posit a H% boundary tone in declarative sentences. H% boundary tones are not found in sentences with lexical falling tones, presumably because the lexical falling tone's low target (H*L) precludes the insertion of a high boundary tone. Future work will investigate phrase-final words with H*L tones that occur at least two syllables before the phrase boundary. This will enable us to determine whether H% boundary tones are indeed found in sentences ending in lexical falling tones when the latter are far removed from the phrase edge. Why do phrase-final words with lexical low tones allow for H% boundary tones to follow, whereas those with lexical falling tones do not? We propose two possible answers. First, lexical low tones are longer in duration than the high or falling tones [1]. The longer duration of low tones may allow for both lexical low targets and a following high boundary tone to be realized. Second, the absence of a boundary tone after lexical falling tones may serve to enhance the tonal distinction between lexical low and falling tones that occur phrase-finally.

3. DISCUSSION AND CONCLUSION

In this paper, we propose a preliminary model of the intonation of declarative sentences in Choguita Rarámuri (CR), within the Autosegmental-Metrical framework. In CR, three lexical tones are found on stressed syllables. However, tonal targets are also found on unstressed syllables: H% boundary tones are found phrase-finally, and lexical tones are optionally preceded by "lead tones". Interestingly, the lexical tones constrain the intonation of declarative sentences: optional lead tones preceding lexical tones depend on the height of the lexical tone, and boundary tones are not found for phrase-final falling tones because the occurrence of a H% would override the lexical tone's low f0 target ([8]). This behavior of both the lead tones and boundary tones suggests that lexical tone preservation and enhancement are important constraints in the tonal grammar of the language. In future research we will analyze non-declarative sentences, and study longer declarative sentences to determine whether there are prosodic constituents that are larger than the prosodic word but smaller than the Intonational Phrase.

Overall, this work has important implications for prosodic typology. It is one of the only intonational analyses of a Uto-Aztecan language (cf. [10]), and to our knowledge the first intonational study of a Uto-Aztecan language with lexical tone. Additionally, our findings show that H% may be the default boundary tone for declarative sentences in some languages, though it is typologically rare [7], and that declination is not observed in declarative sentences in CR. Our analysis of post-lexical lead tones as being optional and dependent on lexical tone for their f0 height has implications for studies of prosodic typology more generally; CR is a head-marking prominence language [7] with both lexical tone and stress. Unlike many languages with lexical tone, CR makes use of both micro-rhythmic features (stress, lexical tone) and macro-rhythmic ones (lead tones), such that declarative sentences have regular alternations of high and low pitch targets.

4. ACKNOWLEDGEMENTS

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