

THE INTONATIONAL STRUCTURE OF CHICKASAW

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ABSTRACT

This paper describes the principal features of the intonational system of Chickasaw, a Muskogean language spoken in south-central Oklahoma. Results of the study are as follows. The Intonational Phrase (IP) consists of one or more Accentual Phrases (AP) which can be larger or smaller than a word. The underlying tonal pattern of the AP is [LHHL]. Chickasaw statements are characteristically marked by a H% final boundary tone, whereas both Wh and yes/no questions are realized with a L% final boundary tone. The nuclear pitch accent in an IP falls on the final syllable in statements. In questions, the conditions governing nuclear pitch accent placement involve sensitivity to syllable weight.

1. INTRODUCTION

This paper describes aspects of the intonational system of Chickasaw, using the intonation framework developed by Pierrehumbert and Beckman [1, 9, 10]. In section 2, the methodology of the study is briefly outlined. Section 3 discusses the results of the experiment.

2. METHODOLOGY

This study is based primarily on a corpus of speech uttered by four native speakers of Chickasaw (3 female, 1 male), three of whom (2 female, 1 male) were recorded during a trip to Oklahoma in September 1996. The fourth speaker was recorded in Los Angeles in October 1996. On subsequent occasions, this last speaker also provided additional data not collected from the other three consultants. Data from the four speakers were digitized and analyzed using XWAVES. Material from a further eight speakers was considered impressionistically but not instrumentally analyzed.

During each recording session, which involved a single Chickasaw speaker, the subject was read an English sentence and asked to supply the Chickasaw equivalent. The data set consisted of a number of sentences designed to investigate major intonational features of Chickasaw. The bulk of the data consisted of two word sentences consisting of a noun (either a subject or a direct object) followed by a verb. (The dominant word order in Chickasaw is SOV [5, 7].) The number of syllables of both the noun and the verb, as well as the internal syllable structure of the noun were varied systematically in the corpus. In addition, sentences with both a subject and an object were examined, as were sentences containing a possessive construction (e.g. 'X's dog'). The corpus also consisted of some questions, exclamations, negated sentences, and sentences containing focussed noun phrases. A total of approximately 100 different sentences were uttered by each speaker. Each sentence was repeated three times. The sentences in Table 1 illustrate the kinds of sentences elicited. (Note that the half-long symbol indicates a rhythmically lengthened vowel; see section 3.2.2.)

Structure	Chickasaw	English gloss
subject-verb	minka:t pisa. chief(subj) sees	The chief looks at her/him.
	minka:t pisa'tok. chief(subj) sees(past)	The chief looked at her/him
	ofõ:loat pisa. owl(subj) sees	The owl looks at her/him.
object-verb	minko? pisa. chief(obj) sees	She/he looks at the chief.
	minko? pisa'tok. chief(obj) sees(past)	She/he looked at the chief
	ofõ:lo pisa. owl(obj) sees	She/he looks at the owl.
subj.-obj.-verb	minka:t ofõ:lo pisa.	The chief looks at the owl.

Table 1. Sample sentences recorded

3. RESULTS

3.1. Hierarchical Intonational Structure. A Chickasaw sentence typically consists of a single IP which in turn is composed of one or more intonational units, which may be termed Accentual Phrases (AP), each of which is canonically made up of the tonal melody [LHHL] (for more discussion, see section 3.3). An IP has a nuclear pitch accent which is characteristically realized in the last word of the IP. An IP ends in a boundary tone which is associated with the phonetically highest or lowest pitch, depending on the type of boundary tone, in the IP.

An exception to the generalization that a sentence consists of a single IP is provided by sentences in which the canonical Chickasaw SOV word order is substituted with either SVO or OVS order. In such utterances, the verb is in IP-final position and the postposed noun phrase forms a separate IP (see section 3.2.1).

3.2. Structure of IP

3.2.1. Boundary Tones. An IP ends in a boundary tone, a H% in the case of statements and a L% in Wh and yes/no questions. The high boundary tone in statements is presumably responsible for the impression that final syllables are stressed in Chickasaw [4]. This boundary tone is often upstepped resulting in the phonetically highest pitch peak falling at the very end of the IP. Interestingly, two of the four speakers (1 male and 1 female) frequently end their statements in a slight pitch fall in the final syllable following the H% pitch peak which also occurs in the final syllable. This pitch fall is often imperceptible and, in many cases, can be regarded as a by-product of non-modal phonation associated with utterance final position. However, in other tokens, the fall commences relatively early in the final syllable and is quite perceptible. Interestingly, a third speaker employs the slight IP final fall, but almost exclusively in imperatives and emphatic conditions.

Given its predominance, I will assume that the primary boundary tone in statement IPs is H%, with a complex HL% being an option for some speakers, though the semantic circumstances which give rise to this complex boundary tone are not completely understood. The canonical IP-final H% boundary tone in statements is illustrated in Figures 1 and 2.

Wh and yes/no questions end in a long pitch fall commencing immediately after the nuclear pitch accent (see section 3.2.2) and persisting through the end of the IP. The lowest pitch in a question is found at the end of IP, a fact which is captured by assuming a L% boundary. It is also employed in exclamations expressing surprise or disbelief. A question IP is illustrated in Figure 3.

Postposed noun phrases following a verb in IP-final position form an independent IP characterized by different intonational properties than the preceding IP. Thus, for example, in the utterance *pisa oŋ:loat looks owl(subj)* ‘The owl looks at her’, the verb and the postposed object each form an IP. The first IP is realized with a H% (or HL%) final boundary tone, as the description thus far would predict. The pitch range of the second IP consisting of the postposed noun, however, is quite reduced relative to that of the preceding IP. A high tone in the second IP is phonetically equivalent to a low tone in the first IP. Furthermore, an IP consisting of a postposed noun phrase culminates in a final L% boundary tone rather *even in statements*. The intonation associated with a postverbal noun is illustrated in Figure 4.

3.2.2. Nuclear Pitch Accent. An IP contains one syllable, the nuclear pitch accented one, which stands out from others by virtue of possessing the highest pitch and greatest amplitude in the IP. The nuclear pitch accent is a H* in both questions and statements; it is phonetically most transparent in question IPs where the final boundary tone is L%. The point at which the pitch fall to the final low boundary tone in questions originates is the syllable carrying the nuclear pitch accent. This syllable also has the greatest amplitude in the IP. The rules which govern the placement of the nuclear pitch accent in questions are rather complex and are sensitive to morphological factors as well as to syllable weight.

If the final syllable in the question IP contains a long vowel (CVV), it attracts the nuclear pitch accent. The result is a pitch peak on the final syllable followed by a steep pitch fall to the end of the IP. The vowel is phonetically lengthened to accommodate both the H* and the L%.

If the final syllable does not contain a long vowel, the nuclear pitch accent falls on the penultimate syllable if it either contains a long vowel (CVV) or is closed by a consonant (CVC). Long vowels include underlying long vowels (including nasalized vowels, which are always long) and phonetically lengthened vowels which arise through a process of rhythmic lengthening which affects the second in a sequence of two phonemically short vowels occurring in open syllables [3, 4, 5, 6, 7, 8]. (Note that rhythmic lengthening does not affect final vowels, even if other conditions for lengthening are met; thus, the only long vowels in final syllables are underlyingly long.)

If the final syllable does not contain a long vowel and the penultimate syllable is neither closed nor contains a long vowel, the nuclear pitch accent falls on the antepenultimate syllable. Because the rhythmic lengthening process ensures that there are never more than two consecutive syllables which

are neither CVV or CVC, an antepenultimate syllable carrying the nuclear pitch accent will always either be closed or contain a long vowel (with one morphological exception discussed in the next paragraph). Thus, any syllable carrying the nuclear pitch accent will be either CVV or CVC, syllables which attract some level of stress in Chickasaw [2, 4]. The ability of CVV but not CVC to attract the nuclear pitch accent in final position accords with the preferential attraction of word-level primary stress by CVV over CVC in Chickasaw [2].

Interestingly, the nuclear pitch accent in verbs does not retract further to the left than the first syllable of the root. The nuclear pitch accent is restricted from falling on prefixes, even if syllable weight conditions would predict that these prefixes would carry the nuclear pitch accent. For example, in the verb *hapo:pisa* ‘She looks at us’, which consists of the object prefix *hapo:* plus the root *pisa*, the nuclear pitch accent falls on the penultimate syllable, *pi*, the first of the root, even though purely phonological conditions predict that the antepenultimate syllable should take the nuclear pitch accent. The nuclear pitch accent is not restricted from falling on suffixes.

In statements, the phonetic evidence for the nuclear pitch accent, which is H* as in questions, is less robust due to the final H% which independently raises the pitch of the final syllable. However, in the absence of any evidence to the contrary, we may assume that, regardless of syllable weight, the final syllable receives the nuclear pitch accent in statements. In support of this analysis, the final syllable also characteristically carries not only the highest pitch but also the greatest amplitude in a statement IP.

3.3. Structure of the Accentual Phrase. Most IPs in Chickasaw of sufficient length can be broken down into smaller units each of which is characterized by a recursive tonal pattern independent of the nuclear pitch accent and the final boundary tone of the IP. We may term this small intonational unit the Accentual Phrase (AP). Each morphological word characteristically forms its own AP, although there is a possibility (rarely exercised in the data analyzed) for contiguous short words (shorter than two syllables) to form a single AP. The tonal properties of the AP are most evident in words which are not in final position of the IP. The realization of tones in an IP-final AP is obscured by the nuclear pitch accent and the final boundary tone of IP-final position.

In describing the tonal realization of the AP, it is useful to invoke the notion of the sonorant mora, where a short vowel or a sonorant coda consonant receive one mora each and a long vowel receives two moras. The fullest realization of the AP pattern is as [LHHL], a pattern which is typical of APs containing at least three syllables, and two syllable APs consisting of at least three sonorant moras. The [LHHL] pattern is also a marked option in shorter words, where the likelihood of all tones being realized decreases as the duration of the word shortens. The realization of the AP in short words is discussed below.

In APs in which all four tones are realized, the initial low is associated with the left edge of the AP. The first high tone occurs fairly early in the AP; it is generally realized on the second sonorant mora. Thus, if the first syllable of a word contains a long vowel or is closed by a sonorant consonant, the first high tone is usually realized on the first syllable. If,

however, the first syllable contains only one mora, the high is delayed until the second syllable. The actual timing of the first high tone is only loosely linked to the number of sonorant moras. If, for example, a long vowel in the first syllable is phonetically shortened, as at a faster speech rate, the high tone may actually fall on the second syllable rather than the first one.

The second high tone is loosely associated with the very beginning of the final syllable of the AP. Syllables intervening between the two high tones receive phonetically high tone by interpolation. The final high tone is usually followed by a sharp fall in pitch to the final low tone which is associated with the right edge of the AP. An AP with a canonical tonal realization is illustrated in Figure 1.

However, the final pitch fall is not an invariant property of the AP. If the final syllable contains a long vowel, the pitch fall on the final syllable may optionally be absent, a pattern which is plausibly attributed to the greater stress of long vowels relative to short vowels in the Chickasaw stress system, both at the level of the word and at the level of the IP (see discussion in section 3.2.2) [2]. An AP in which the final L tone is eliminated by the presence of a long vowel is depicted in Figure 2. This contrasts with Figure 1 in which the final L tone is realized.

The AP tonal pattern is often truncated in an AP which contains fewer than three sonorant moras. The most common tonal pattern in a short AP is [HL] with the H realized at the beginning of the AP and the L on the right edge of the AP. This [HL] intonation pattern is consistent with the observation that disyllabic words may be realized with prominence on the first rather than the final syllable [4]. The result is a steady fall in pitch throughout the AP. Parallel to the realization of the nuclear pitch accent in the IP, the tonal realization of the AP is sensitive to the morphological structure of words. For purposes of determining the ability of a word to manifest the full tonal realization of the AP, suffixes are typically ignored. Thus, the word *kata:t* in Figure 3 is a short AP consisting of a bimoraic root *kata* plus a suffix.

Another more marked option in a short AP is to not realize either of the high tones; the result is a level low toned AP with a L linked to the beginning of the AP and a L associated with the end of the AP.

In a word consisting of at least three syllables and in a two syllable word in which the root contains at least one syllable with two sonorant timing positions in the rime (i.e. CVR where R is either a sonorant consonant or the second half of a long vowel), both the initial pitch rise and the final pitch fall are usually realized.

Interestingly, there is a strong preference for the AP to coincide with morphological word boundaries. Thus, each morphological word characteristically is a single AP and each AP typically consists of a single morphological word. A by-product of this strong tendency toward alignment of AP and morphological word boundaries is that a sequence of two CVCV words is characteristically treated as two separate APs rather than one. The likelihood of two morphological words being produced as a single AP is greater for words which are constituents. For example, a sequence of object followed by a verb is more likely to be realized as a single AP than a sequence of subject plus verb. Crucially, though, the likelihood of any sequence of two morphological words being uttered as a single AP is quite small.

Conversely, longer morphological words, of which there are many in Chickasaw, may consist of more than one AP. Words consisting of more than seven syllables are typically broken into multiple APs each consisting of a roughly equal number of syllables. The division of longer morphological words into multiple APs appears to be sensitive to the morphological make-up of a word, though the details of this influence of morphology on the intonational parse require further investigation.

The tonal realizations of the AP is illustrated in Figure 5.

H	L	L	L	
				AP < 3 moras
[μ	μ] _{AP}	[μ	μ] _{AP}	
L	H	HL		
				AP 3 moras
[μ	μ ...] _{AP}		

Figure 5. Realizations of the Chickasaw Accentual Phrase

4. CONCLUSIONS

In summary, Chickasaw utterances consist of at least two hierarchically arranged intonational units, an Accentual Phrase (AP) and an Intonational Phrase (IP). An IP consists of one or more APs each of which contains between one and seven syllables. There is a strong preference for aligning morphological word boundaries with AP boundaries, even if this results in two short APs characterized by tonal omission. Statement IPs are typically realized with a H% final boundary tone, though a HL% boundary tone is also an option, particularly in imperatives. Question IPs carry a final L% boundary tone. The nuclear pitch accent in statement IPs falls on the final syllable, while the algorithm for positioning the pitch accent in question IPs is sensitive to syllable weight.

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