



Paraguayan Guarani: Tritonal pitch accent and Accentual Phrase

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Abstract

This paper investigates the intonation system of Paraguayan Guarani in the Autosegmental-metrical (AM) framework of intonational phonology. Previous work on Guarani intonation stated that Guarani has two types of pitch accent, rising (L*+H or LH) and falling (H+L* or HL), and there is no prosodic unit between a word and an Intonational Phrase. But these findings seem to have resulted from the limitation of the data examined. When longer words/sentences and various syntactic structures are examined, it was found that Guarani has one type of pitch accent, a tritonal HLH*, and has an Accentual Phrase (AP). The tonal pattern of AP is /H HLH* Ha/, i.e., it has one pitch accent and its edges are marked by a H tone. However, because the pitch accent is tritonal, AP edge tones are realized only when there are unstressed syllables before and after the syllables carrying the tritonal pitch accent, suggesting that the function of AP boundary tone is not marking word prominence as in other AP languages. Instead, an important function of Guarani AP seems to mark specific syntactic categories and groupings. These findings are compared with other AP languages and discussed in terms of the typology of word-prominence type.

Index Terms: intonation, Paraguayan Guarani, tritonal pitch accent, Accentual Phrase, prosodic typology

1. Introduction

This paper investigates the intonation system of Paraguayan Guarani in the Autosegmental-metrical (AM) framework of intonational phonology ([1, 2, 3]). Paraguayan Guarani (henceforth Guarani) is a Tupi-Guarani language, and together with Spanish, is an official language of Paraguay. Guarani is a highly agglutinative language, and the default word order is Subject-Verb-Object (SVO), though the location of arguments can vary depending on informational properties ([4, 5, 6]).

For word prosody, Guarani has lexical stress, typically located at the end of a lexical item. But when a word includes more than one morpheme that has stress, only the last stress is realized ([4, 7, 8]). For example, stress on the verb /hó/ remains the same when the unstressed prospective aspect/modal suffix /-ta/ is added as in [o-hó-ta], (3p-go-Prosp) ‘(S)he is going to go’. But, the stress shifts to the following suffix when the stressed, desiderative modal suffix /-sé/ is added as in [o-ho-sé] (3-go-desiderative) ‘(S)he wants to go’. Stress is not marked orthographically when stress is on the word-final vowel or on a nasalized vowel, which is marked by a tilde. Otherwise, stress is orthographically marked by an acute accent on the stressed vowel (e.g., ñandu ‘ostrich’ vs. ñandúre ‘ostrich-at’; porã ‘well’ vs. porãta ‘well-future’; mercádo ‘market’ vs. mercádope ‘market-Locative’). Acoustically, stressed syllables are longer and stronger in intensity than unstressed syllables.

1.1. Previous studies on Guarani Intonation

To date, descriptions of Guarani intonation are found in only a few studies. [4] describes pitch shape on a stressed syllable in short declarative sentences: a rising pitch movements on non-final stressed syllables and either rising or falling pitch movements on the right-most stressed syllable in a phrase (from [7], p.231). More recently, [7,8,9] examined Guarani intonation, related to the prosody of focus within the AM framework of intonational phonology. [7,9] examined intonation patterns of two-word utterances composed of a proper name subject and a verb, produced in three focus conditions (verb new focus, verb contrastive focus, subject contrastive focus). They varied the length of the verb root from one to three syllables and varied the location of stress in the verb by adding a different number of unstressed suffixes.

They found two most common contours: one is a sequence of a rising pitch accent (L*+H) on the subject and a falling pitch accent (H+L*) on the verb, which they called a *hat* contour, and the other is a sequence of two rising pitch accent on each word (L*+H L*+H), called *two peak* contour. The hat contour was found more often for the contrastive focus on the subject condition than the contrastive focus on the verb condition, but the two tonal contours were equally common in the verb new focus and contrastive focus conditions. They also found that the two contours had a high plateau between the two pitch accents. They suggested that the high plateau in the hat contour could be explained by interpolation between the H target of L*+H and the H target of the following H+L* pitch accent. However, since the interpolation account couldn’t explain the high plateau in the two peak contour where the second pitch accent starts with a L target (L*+H), the authors stated in [9] that “further exploration of the pitch accent categories of Guarani is needed to determine the full inventory of pitch accents and how phonetic interpolation between pitch accents is realized” ([9], p. 256). In [7], the authors also provided tone-segment alignment patterns; The Low target of L*+H was consistently aligned with the stressed syllable and the High target occurred on the following syllable for the subjects and verbs except when the verb had stress on the final syllable, in which case the High target occurred late in the syllable ([7], footnote 8). For prosodic units larger than a word, [7, 9] found a big prosodic break, called an Intonational Phrase (IP), which is characterized by pauses and final lengthening, between the subject and the verb.

Burdin and colleagues ([8]) further examined prosodic realizations of focus in Guarani (as one of the four languages they examined), based on focus marking within a noun phrase, Noun + Adjective (e.g., *yellow dog*), produced in a sentence (e.g., *Put the yellow dog in box one*). They confirmed the findings of [7, 9] with some revision in the tonal label. That is, they found two types of contours (a hat contour and two peak contours) and two pitch accents, but they changed the accent

labels to LH and HL (i.e., without ‘*’ or ‘+’) by pointing out that the tone-syllable alignment does not seem to be contrastive. They also found that nouns were sometimes deaccented but more likely so when the following adjective is focused, and claimed that there was no prosodic unit intermediate between a word and an Intonational Phrase (IP).

The findings from these recent studies need to be confirmed because they are based on short and syntactically simple declarative sentences, which were designed to study prosodic realizations of focus. It is also likely that the mystery of a high plateau between two pitch accents could be solved if we examine more data including morphologically and syntactically complex sentences and longer words and phrases. This is what we aim for the present study. The present study is also motivated by our on-going research on the syntax-prosody interface in Guarani [11, 12]. The paper is organized as follows. Sec. 2 describes the data and methods of analyzing intonation and Section 3 provides a new model of Guarani intonation, focusing on the pitch accent and an Accentual Phrase. Finally, Section 4 discusses the intonation model of Guarani from the view of the typology of word prominence marking [10].

2. Present Study

2.1. Methods and Procedures

For the present study, intonation contours of approximately 250 sentences were examined by varying sentence types, morpho-syntactic structures, and word orders (e.g., declaratives and interrogatives, SV, SVO, SOV, SV-LowAdverb, complex predicates, conjunction, subordinate structure), information structure (new, focused) as well as the length of a word and the location of stress. Sentences of target structures were embedded in a dialogue to improve natural conversational speech production, and each dialogue was produced two times by each speaker. We also used randomized list of sentences to complement the dialogue data. To investigate whether a tonal target is marking prominence, i.e., pitch accent, or a word boundary, the inter-stress interval was increased across a word boundary, as suggested in [13].

Data was collected from three speakers of Paraguayan Guarani. The bulk of our data comes from two speakers, a female in her 50s (our primary participant) and a male in his 20s (our secondary participant), and occasional recordings from a third speaker (a female in her 40s). The three participants are bilingual Spanish/Guarani speakers who acquired Guarani in early childhood and continue to use it actively in their daily lives. The recordings were made with *Audacity* via *Skype* (due to the pandemic) and segmented in *Praat*. Each utterance was labeled on five tiers: *tones*, *words*, *gloss* (of each word in English), *sentence* (the meaning of the sentence), and a *miscellaneous* tier. F0 contours were analyzed as a sequence of tonal targets by referring to the location of stress and syllable/word boundaries as well as spectrogram/waveform. Surface tonal targets were labeled following the conventions proposed in [13].

3. Results

We found that Guarani has only one type of pitch accent and its tonal pattern is HLH*, a tritonal pitch accent, instead of two bitonal pitch accents as proposed in [7, 8, 9]. We also found that Guarani has an Accentual Phrase (AP). (Our data also suggest that Guarani has an Intermediate Phrase (ip) as well as an IP,

but this paper will focus on the AP only). Section 3.1 provides evidence for a tritonal pitch accent and Section 3.2 provides evidence for an AP.

3.1. Pitch Accent

Most words in Guarani are typically realized with a pitch accent. Though the pitch accent is HLH* underlyingly, the surface tonal shape of the pitch accent varies depending on the number of syllables before and after the stressed syllable, the location of the word in a phrase, and the tonal context.

When stress is word-initial, the tonal shape of a pitch accent can be LH* or, less commonly, H*. But, the L of LH* is often not *fully* realized unless the syllable is lengthened or begins with a sonorant onset. When stress is on the second syllable of a word, the pitch accent can be LH* or HLH*. When the pre-tonic syllable is immediately preceded by a H tone of the preceding word (Fig.1), the falling f0 on the pre-tonic syllable can be interpreted as HL or L (i.e., falling f0 can be a transition between the preceding H tone and L). However, when there are two or more syllables before the stressed syllable, the pitch accent clearly shows three tonal targets, HLH*, forming a falling-rising tone (see Figs. 2 & 3). This suggests that the underlying tonal category of Guarani pitch accent is tritonal, /HLH*/, but it is allophonically realized as H*, LH*, or HLH* depending on the location of stress. Figures 1-3 illustrate pitch tracks of a sentence fragment, *He saw one ostrich/fox/cat* (this phrase is followed by *under the tree*, with a big break in between, which is not shown here). Here, the stressed syllable in the last word (contained in the red box) is preceded by one, two, and three syllables, respectively.

The realization of H* in the tritonal (HLH*) pitch accent can also vary depending on the location of the word in a large phrase (ip or IP) or whether the word is focused or not. When a word is phrase-initial (where the pitch range is largest in a phrase) or focused (where the pitch range is expanded), the H* is fully realized, but when a word is phrase-medial, H* is typically realized as a downstepped, H* (!H*), i.e., f0 is lower than that of the preceding H of HL. When a word with neutral focus is sentence-final, ending with a Low boundary tone (L%), H* can be realized either as !H* (see Fig.8) or L* (see Fig.4; this was categorized as H+L* in [7,9]), which may be still slightly higher than the following L%. Finally, H* can be substantially undershot (and can be categorized as L*) in the context of tonal crowding, e.g., when an accented syllable is right before another accented syllable (like stress clash) or when an accented syllable is short and AP-final (see ‘one’ in Fig.3; see Sec.3.2 for the definition of AP). Overall, undershoot is more common when a phrase is produced at fast rate or in casual speech style.

As for the syllable-tone alignment of the tritonal targets, no consistent pattern seems to exist except for the final H*. The H and L tonal targets of the HL falling tone can each be aligned with each of the two pre-tonic syllables (i.e., H.L.H*; a period refers to a syllable boundary) or aligned together on the pre-tonic syllable (i.e., HL.H*). Further, the L tone can sometimes be realized at the beginning of the stressed syllable, creating a late rising tone on the stressed syllable (i.e., H.LH*). This suggests that the tone-syllable alignment of the two tonal targets before H* is not distinctive, as hinted at [8]. Therefore, we did not add the ‘+’ symbol within the tritonal pitch accent, as in HL+H*. However, in labeling the f0 contour on the tones tier, we labeled HL and H* separately (i.e., HL at the f0 minimum before the stressed syllable and H* at the f0 peak during the

stressed syllable) because the middle L occurred more often with the preceding H (as HL) than with the following H*.

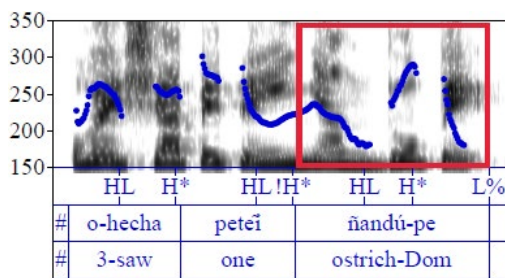


Figure 1: The last word has *one syllable before stress*: the 1st syllable of [ñandú] ‘ostrich’ shows a falling tone (HL), just before H* on the stressed syllable [dú].

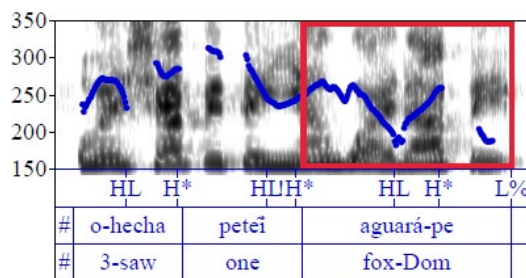


Figure 2: Two syllables before stress: the 1st syllable of [aguará] ‘fox’ shows a high tone, the 2nd syllable shows a falling tone, and the stressed syllable [rá] shows a H tone (H*).

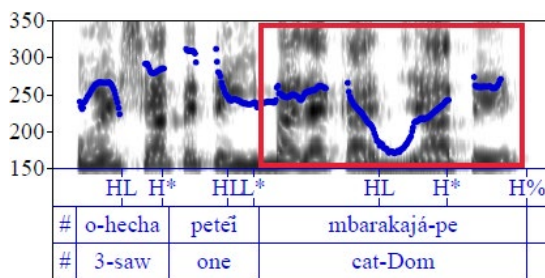


Figure 3: Three syllables before stress: the first two syllables of [mbarakajá] ‘cat’ show a high tone and the 3rd syllable shows a falling tone (HL), just before H* on the stressed syllable [já].

3.2. Accentual Phrase

An Accentual Phrase (AP) is a prosodic unit slightly larger than a word and smaller than an Intermediate Phrase (ip). The edges of an AP are tonally defined and can include at most one pitch accent, if the language has a pitch accent [2, 13, 14]. The left edge tone of an AP can be a pitch accent and the right edge tone can be a boundary tone as in Bengali or Georgian [L* Ha] (‘a’ is a diacritic, denoting an AP) [15, 16], or the other way around, i.e., an AP-initial boundary tone and an AP-final pitch accent as in French [L H*] [18, 19], or both AP-initial and AP-final can be marked by a boundary tone as in Japanese [H- (H*+L) L%] [17] and Korean [L Ha] [20, 21].

We found that, like other AP languages, an AP in Guarani includes one word most of the time, but can include more than one word when the words are closely related syntactically or semantically. When an AP includes more than one word, only the last stressed syllable of the AP-final word carries a pitch accent. That is, an AP is the domain of a pitch accent. We also

observed that an AP has an initial boundary tone (H) and a final boundary tone (Ha). Thus, the underlying tonal pattern of Guarani AP is /H HLH* Ha/.

Every AP in Guarani has a pitch accent, so the number of pitch accents in a phrase is equal to the number of APs in a phrase. However, the edge tones of AP are optionally realized. Since the pitch accent is tritonal, realized over up to three syllables, the edge tones are not realized if there is no TBU. The AP-final boundary tone (Ha) is realized only when there is at least one unstressed syllable after the accented syllable, and the AP-initial boundary tone (H) is realized only when there are at least three unstressed syllables before the accented syllable. Phonetically, the Ha tone is typically higher than H* (see Fig.4), but the AP-initial H is about the same f0 level as the first H of the HLH* pitch accent (see Figs.5-8). One might think that Ha being higher than the preceding H* might be due to a delayed peak of H* as proposed in [7, 9]. However, the f0 after the accented syllable stays high over multiple syllables up to the end of the word/AP, suggesting that there is a H tone target at the end of an AP. Fig.5 shows two APs, and a red box includes an accented syllable and three unstressed post-accented syllables in the first word/AP, where f0 is higher after the accented syllable [chá] and stays high till the end of the word/AP. In this figure, the boundary between APs does not seem to be clearly marked, though the second AP’s initial H is slightly lower than the first AP’s final H (AP-initial H is not labeled when it’s right after Ha). So, one may think we may only need one H tone, not both AP-final and AP-initial H boundary tones. But an AP-initial H tone is clearly visible in a focused AP because a focused AP’s initial H tone is slightly higher than the preceding AP’s final H, suggesting the presence of two separate H tones at AP edges. An AP-initial H tone is also visible when an ip-initial AP begins with at least three unstressed syllables. See Figure 6. Here, the second AP begins an ip (which is cued by slight lengthening of the preceding AP’s final syllable without changing the tonal shape, labeled H-), and the tonal target of the 2nd AP’s initial H is clearly reset and maintained until it falls at the HL on the pre-accentual syllable.

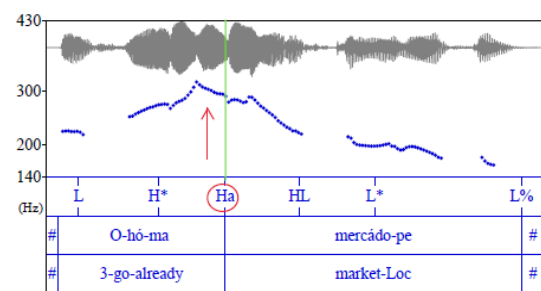


Figure 4: H* is followed by a higher f0, which is Ha, marking the end of an AP. (This sentence means “(S)he is already going/has gone to the market.”)

So far, we have shown an AP including only one word. But as in Figure 7 (bottom), an AP can include more than one word. Figure 7 shows pitch tracks of the same phrase, ‘the man with blond hair’, produced in two accentual phrasing. The top figure shows when a 4-syllable noun (‘hair’) and a 3-syllable adjective (‘blond’) each forms one AP, with a falling-rising pitch accent per word. But in the bottom figure, the two words together form one AP, showing only one pitch accent on the stressed syllable of the adjective and no pitch accent on the noun. The noun lost its pitch accent and created a long high plateau between the noun’s 1st syll and the pre-accentual syllable of the adjective.

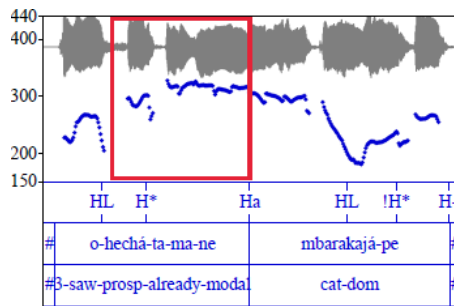


Figure 5: In the first AP, f_0 is higher after H^* and stays high till the end of AP, which is explained by an AP-final H tone (H_a). (“(S)he might already be seeing/have seen the cat”)

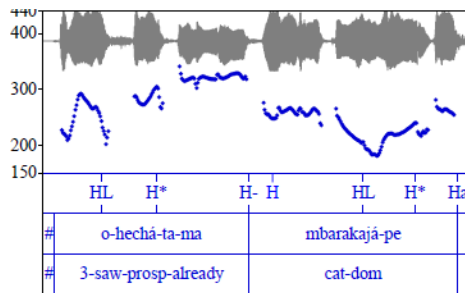


Figure 6: The break between the two words is bigger than an AP (i.e., an Intermediate Phrase, marked by $H-$ tone and final lengthening). The second word/AP begins an ip and the H tone starts in a reduced pitch range and stays high until it falls at the HL syllable. (“(S)he is already going/has gone to see the cat”)

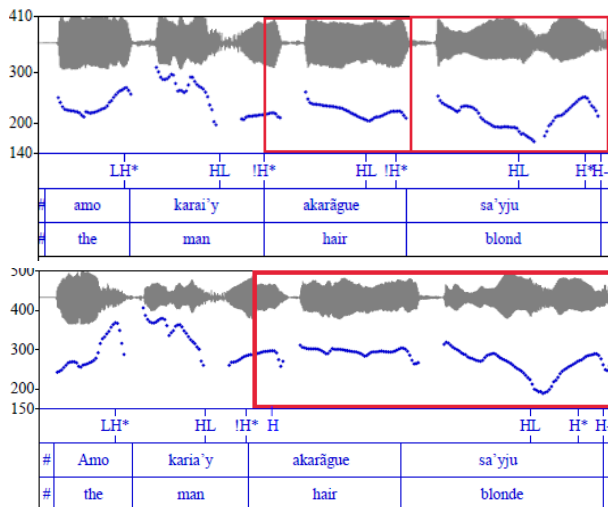


Figure 7: A 4syll-Noun and a 3syll-Adjective each forms one AP (the top panel) and together form one AP (the bottom).

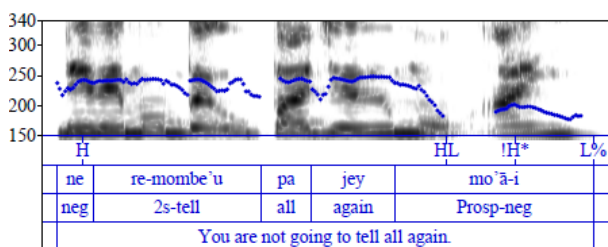


Figure 8: An AP containing a verb and a low adverb (total 11 syllables). Shows a long H plateau before HL on pre-tonic syll.

AP phrasing is optional, reflecting the syntactic/semantic/pragmatic relations among words as well as the length of the words/phrase. However, in Guarani, a certain syntactic grouping always forms one AP. A verb and a low-modifier, which form a Complex Predicate, always form one AP, not constrained by the length of the phrase as commonly found in other AP languages [15-22]. Low modifiers are stative predicates that specify a quality (e.g., ‘well’, ‘ugly’), the manner (e.g., ‘slowly’), or certain aspectual properties of the event (e.g., ‘again’) [23, 24]. Figure 8 shows an 11-syllable long VP, including a verb (‘tell’) and a low adverb (‘again’) and accompanying suffixes. The whole phrase forms one AP, with a pitch accent on the penultimate syllable of the phrase (realized as $HL!H^*$ before $L\%$) and a long high plateau starting from the 1st syll to the pre-accentual syll of the last word. This syntax-marking function of AP is very unique among AP languages.

4. Discussion and Conclusion

Our data show that Guarani intonation has a tritonal pitch accent, HLH^* , and an AP. A tritonal pitch accent is rare cross-linguistically and has been proposed for only a few languages, e.g., $L+H^*+L$ in Pisa Italian [25] and Argentinian Spanish [26]. However, the HL of the tritonal targets are not fully realized when there is not enough number of TBUs, creating variable surface tonal shapes. This is probably because there is only one pitch accent in the language. If there are multiple pitch accents that are contrastive in a language, maintaining the tonal shape of a pitch accent would be critical. Given that one or two syllable APs are often realized with a rising pitch accent, the LH^* part seems to be the core of the HLH^* pitch accent. This might be the reason why previous studies [7, 8, 9] did not recognize a high tone target before a rising tone and could not interpret the high plateau between pitch accents. This underscores the importance of examining a large dataset of morphologically and syntactically complex sentences and longer words and phrases in developing an intonation model.

Guarani is also unique in the prospect of prosodic typology, especially the typology of word prominence type. According to [10], languages that have lexical stress with strong acoustic correlates (e.g., English, belonging to “head”-prominence languages) are not expected to have an AP, tonally marking the edge of a word. Languages that have an AP typically have a fixed stress location and weak acoustic correlates (e.g., Bengali, Georgian; these languages belong to “head/edge”-prominence languages) or no lexical stress (e.g., Korean, Mongolian, W. Greenlandic; these languages belong to “edge”-prominence languages). Therefore, it was hypothesized that if the head (stress) of a word is not prominent, the edge of a word would be tonally marked (by edge tones of AP or Prosodic Word). Since Guarani has lexical stress and its acoustic correlates are strong, having an AP seems to be an exception to the typology. However, given that AP boundary tones in Guarani are only visible when the AP is long, mostly when it marks a syntactic group, the function of AP edge tones in Guarani may not be marking word prominence, but rather marking a syntactic grouping. That is, Guarani may still belong to ‘head’-prominence languages, and does not constitute an exception to the typology of prominence marking types.

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