A First Glimpse of Kanakanavu Word Prominence

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Abstract

This study investigated the word prominence pattern of Kanakanavu, a critically endangered Austronesian language spoken in Taiwan. Previous studies on the phonetic correlates of Piwan and Saisiyat agreed that pitch is the only consistent cue, indicating that Formosan languages are more like pitch-accent languages. However, given that word accents are in a fixed position for those two languages, it remains an open question whether the same phenomenon would be observed for Kanakanavu, a language with more flexibility in the position of word prominence. A list of 2-, 3-, and 4-syllable words was recorded from three native speakers of this language. The words differ in their word prominence position: Disyllabic words receive their prominence either in the penultimate or the final syllable, while 3- and 4-syllable words are read with their prominence in either the penultimate or the ante-penultimate syllable. Word prominence type and corresponding acoustic correlates were labeled and analyzed. Results showed that only 3-syllable words with prominence in antepenultimate position were realized with different prominence types. Moreover, Kanakanavu word prominence is realized via both pitch and duration: Maximal pitch values were consistently higher for vowels in the syllables receiving word prominence, and duration of these vowels was also longer.

Index Terms: Kanakanavu, word prominence, pitch-accent language, phonetic correlates, phonological typology

1. Introduction

Phonological typology has been focused on classifying a given language into the tone-stress continuum. Languages with word-level pitch features are likely to be categorized as tone languages, whereas those with word-level metrical structure classified as stress languages. Given the same phone combination, tone languages such as Mandarin, are noted for their multiple pitch shapes standing for various meanings. Stress languages, e.g., English, on the other hand, are known for their structural distinction based on multiple cues, such as pitch height, duration, and intensity. In addition to these two prototypes (the two extremes of the continuum), based on this widely accepted classification system, pitch-accent languages seem to occupy a bizarre status. They are considered as "defective" tone languages in that although pitch serves as a crucial cue, they do not form a coherent prototype due to diverse combination of phonetic cues [1].

Despite that different terms were used (stress *vs.* accent), in general, previous phonetic studies have proposed that Austronesian languages in Taiwan belong to pitch-accent languages, as pitch was the only cue that is consistently used to indicate word-level prominence. Duration and other cues,

on the other hand, were only occasionally used. Examples included [2] and [3].

In this study, we would like to explore whether the same situation would occur in Kanakanavu. Originated from Kaohsiung City in southern Taiwan, this language is now spoken by no more than 1,000 people (with fluent speakers less than 20). Thus, in accordance with the standard of UNESCO, it belongs to "critically endangered languages," which is in serious danger of disappearing.

Politically, Kanakanavu has been classified as southern Tsou with Hla'alua until recently[1]. However, the distinction of these three as separate languages can be traced back to the Japanese Colonial Era (1895-1945). Investigation of the Tsou language started quite early. The default word "stress" position was believed to be on the penultimate syllable, and suffixation does not cause stress shift [4]. The word "stress" of Hla'alua, on the other hand, is more complicated. For words made up with two syllables, it is the penultimate syllable that bears the primary stress, whereas for words composed of three or more syllables, primary stress may fall on the penultimate or the antepenultimate syllable [5].

To the best of our knowledge, Kanakanavu has not yet been thoroughly studied phonologically. Sound inventory of this language is believed to be similar to that of Hla'alua, and preliminary analysis has shown that the distribution of word prominence in this language is also diverse [6].

In contrast to the traditional classification system as aforementioned, a new property-driven approach has been proposed based on a database analysis [1]. Specifically, pitch-accent languages are believed to freely "picked" and "chose" properties from the tone and stress prototypes. In this study, we aimed to examine whether the traditional view or the new approach may better explicate the word prominence system of Kanakanavu via the analysis of the phonological/phonetic properties commonly used to differentiate tone and stress languages. A list of Kanakanavu words consisting of different number of syllables and contrasting in their position of word prominence position was investigated.

Prominence type is included as the tone languages usually have multiple fixed types whereas pitch-accent languages just few. In terms of phonetic correlates, the perception of word prominence is believed to be multidimensional. The four most common psychological dimensions, or acoustic correlates, include: segmental length, loudness (intensity), fundamental frequency, and vowel quality, as in [7] and [8]. Among them, intensity is severely influenced by heterogeneous recording conditions. As none of the recordings of this study was conducted in a sound attenuated booth (rather, they were done in the tribe), intensity would not be included for analysis.

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[1] Hla'alua and Kanakanavu was certificated as the fifteenth and the sixteenth aboriginal peoples in Taiwan in June, 2014.

Vowel quality was not included in the analysis, either, since there is no vowel reduction in Kanakanavu.

Upon the two remaining correlates, previous studies on the phonetic realization of stress showed that compared with their unstressed counterparts, stressed syllables usually have higher F0 and longer duration and longer duration [8]. In the same vein, we also expect for a higher maximal pitch value for the vowels in the syllable receiving word prominence. As for duration, if it is not consistently lengthened for target vowels (those in the syllable assigned with prominence), Kanakanavu would be conforming to the traditional definition of a pitch-accent language, as the cases of Saisiyat and Paiwan [2][3]. On the other hand, if duration of the target vowels is consistently lengthened, then the property-driven approach seem to better explicate the situation, as different combinations of multiple properties serve as the principle to describe this new language in the pitch-accent system.

2. Method

2.1. Informants

Six native speakers of the Kanakanavu language (three for each gender) were recorded in their homes in Namasia District, Kaohsiung, Taiwan. The informants were in their 60s (N=4), 70s(N=1), and 80s (N=1).

2.2. Materials

A list of 2-, 3-, and 4-syllable Kanakanavu words were collected from a pilot fieldwork. Disyllabic words include those those who receive the word prominence in either syllable. For 3- and 4-syllable words, word prominence may reside in either the penultimate or antepenultimate position. Examples are as shown in Table 1.

Table 1. *Example of target words.*

	Ante-penult		Penult		Final	
4-syll	sa<u>pa</u>niri	*(shoes)*	taru<u>ku</u>ka	*(chicken)*		
3-syll	<u>so</u>ravu	*(typhoon)*	ta<u>na</u>sa	*(house)*		
2-syll			<u>man</u>man	*(chili pepper)*	man<u>man</u>	*(to like)*

2.3. Data labelling and analysis

The Praat software [9] was used for data labelling and collection. For each sound file, six layers were labelled in the corresponding TextGrid file. As illustrated in Figure 1, the layers included the code, orthography, tone type, prominence position and individual syllables/vowels of each target word. The assignment of the tone type followed the tradition of Tone and Break Indices. Details can be found in [10] and [11].
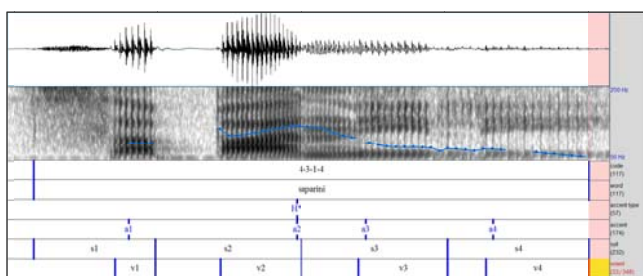

Figure 1: *Illustration of data labeling of this study.*

A Praat script was written to extract the information of the phonological and phonetic labels in the TextGrid. Data of tone types and their corresponding duration and pitch information were analyzed as follows.

3. Results and discussion

3.1. Prominence types

Given the fact that during the process of data collection, different prominence types seemed to be heard based on the author's impressionistic observation, the relation between prominence position and the maximal pitch value was firstly plotted. As shown in Figure 4, though most of the word prominence seemed to occur between 20% and 80% of the target vowel, there was a subgroup of late prominence, of which the pitch peak usually appeared after 80% of the target vowels was pronounced. The situation was consistent for both male and female informants.
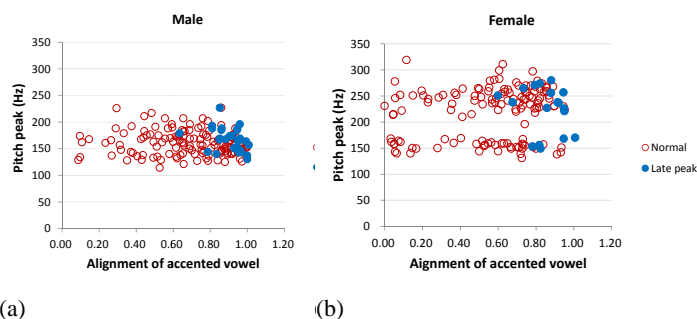

(a)   (b)

Figure 2: *Relation between temporal alignment and maximal pitch value of the vowels receiving word prominence ((a): male; (b); female).*

If we look into the words with different syllable numbers, we could see that for 4-syll words (Figure 3 (a) and (b)), almost all accents were pronounced with the high target in normal positon. That is, for words assigned with either the penultimate prominence (more common) or the ante-penultimate prominence (less common), they were read with the same contour shape. The occasional late peaks observed in male informants were contributed by the same informant, and thus could be considered as idiosyncratic representations. Similar phenomenon was also observed for disyllabic words. Late peaks seldom occurred and were contributed by the same informant (Figure 3 (c) and (d)). It was true for both male and female informants. As for the case of 3-syll words, the prominence type of late peaks only appeared in the condition of antepenultimate prominence. About 60% of words of this condition were pronounced with a late peak for the male informants, and 50% for their female counterparts, as can be seen in Figure 3 (e) and (f).
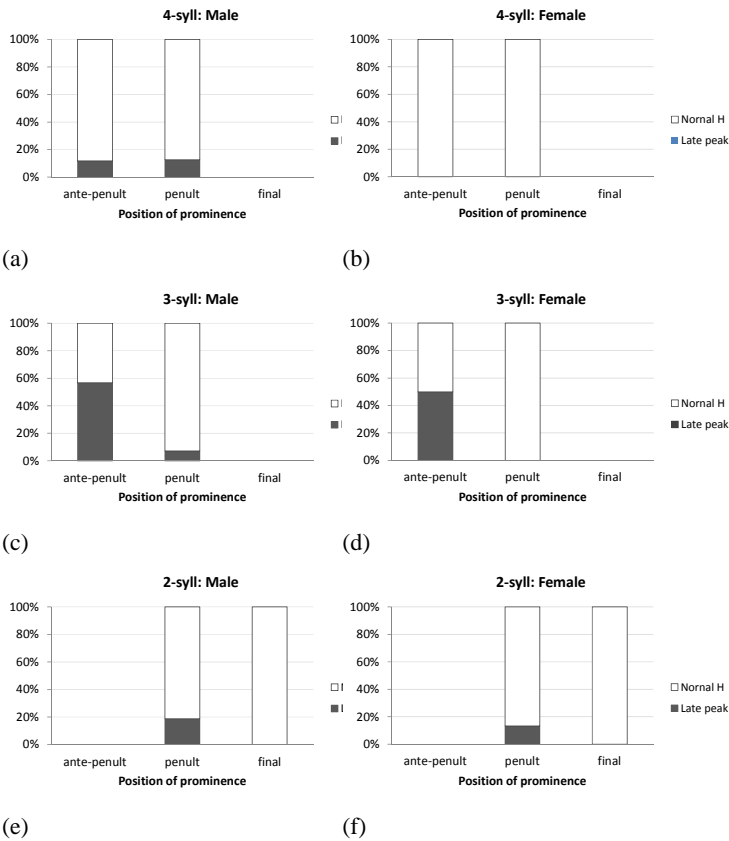
Figure 3: *Distribution of prominence types vs. number of syllables (left column: males; right: females).*

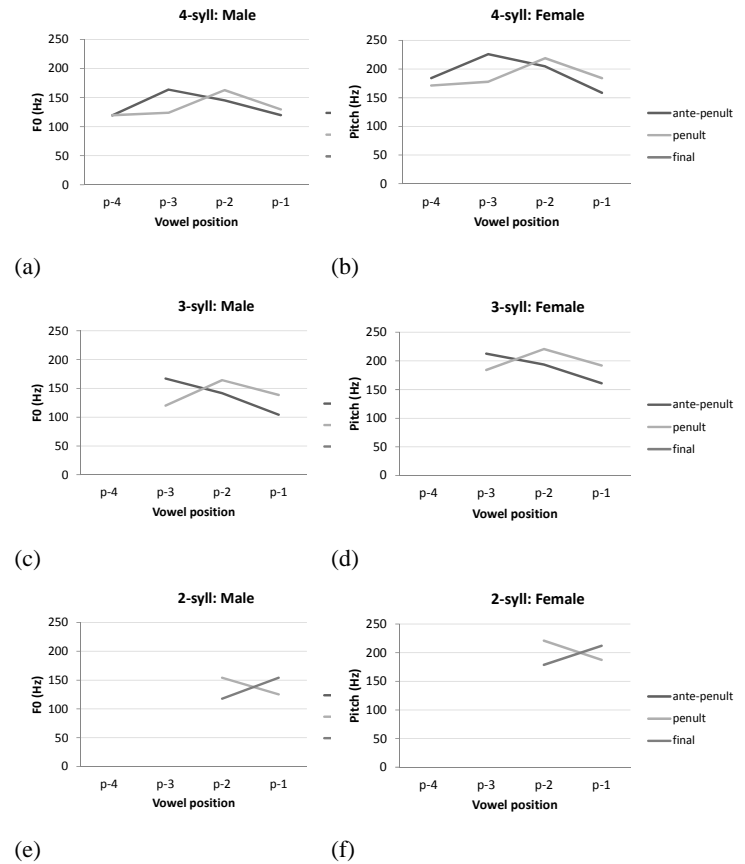receiving word prominence and its preceding counterpart also remained constant (at about 50Hz).

Figure 4: *Maximal pitch value of individual vowels in the target words (left column: males; right: females).*

3.2. Phonetic correlates

Data of the maximal pitch value and the duration of the vowel receiving word prominence were extracted from the TextGrid files and plotted separately for the two genders, as shown in the following analysis.

3.2.1. Maximal pitch value

Figure 4 shows the maximal pitch value of each vowel in the syllable receiving word prominence. Vowel position was counted from the position of word boundary, i.e., p-1 stands for the vowel in the final syllable, p-2 that in the penultimate syllable, and so forth.

As can be seen from the figure, native speakers of Kanakanavu consistently used pitch as a crucial cue to indicate word prominence, as higher F0 was always observed for the vowel of the syllable receiving word prominence. This was not surprising, since pitch serves a crucial role for pitch accent languages.

For words made of the same number of syllables, a comparable value of maximal pitch was always observed, regardless of prominence position or informant gender (Figure 4 (a) vs. (b), (c) vs. (d), and (e) vs. (f)). Moreover, as shown in the figure, the difference of maximal pitch between the vowel

3.2.2. Duration

As difference in the relative durations of vowels in a two-syllable word may change the perceived stress pattern for the word [7], lengthening or reducing of vowel duration has been believed to be a crucial perceptual cue for stressed or unstressed vowels in a stress language. Finally, the duration of the target vowels and their reference counterparts were measured and compared. As previous studies have found that duration did not serve as a consistent cue for Saisiyat and Paiwan [2] [3], if the contrast of vowel duration between accented and reference vowels is not significant, Kanakanavu would be more like those languages (as F0 change is the only prominent cue for the traditionally defined pitch-accent languages); on the contrary, if duration between the accented and reference vowels exhibits differences, then Kanakanavu would be different from those two languages that had been examined, as duration was traditionally defined as one of the features of stress languages.

Results were as illustrated in Figure 5. As can be seen in the figure, vowels in the prominent syllable were consistently longer than their counterparts, except for the final one. It was not surprising, though, as these final syllables served as the prosodic boundary, of which the feature of final lengthening is just natural. For 4-syll words, the duration difference between

the target vowel and its preceding counterpart was comparable. For 3-syll words, the absolute duration of the target vowels was comparable. As for disyllabic words, the difference was relatively small for the condition of penult prominence. This could possibly be attributed to the confounding effect of final lengthening.

In general, the final lengthening effect was slightly larger in female informants, at least in the 3-syll and 4-syll conditions.

Thus, different from what has been found for Saisiyat and Paiwan, duration served as a robust cue to indicate word prominence in Kanakanavu. This imposed a question that whether Kanakanavu conforms to the traditional definition of a pitch-accent language, as only pitch contrast should be included in that sense. On the other hand, the new property-based approach seemed to offer a more flexible account for describing Kanakanavu—it is a pitch-accent language showing both pitch and durational properties.
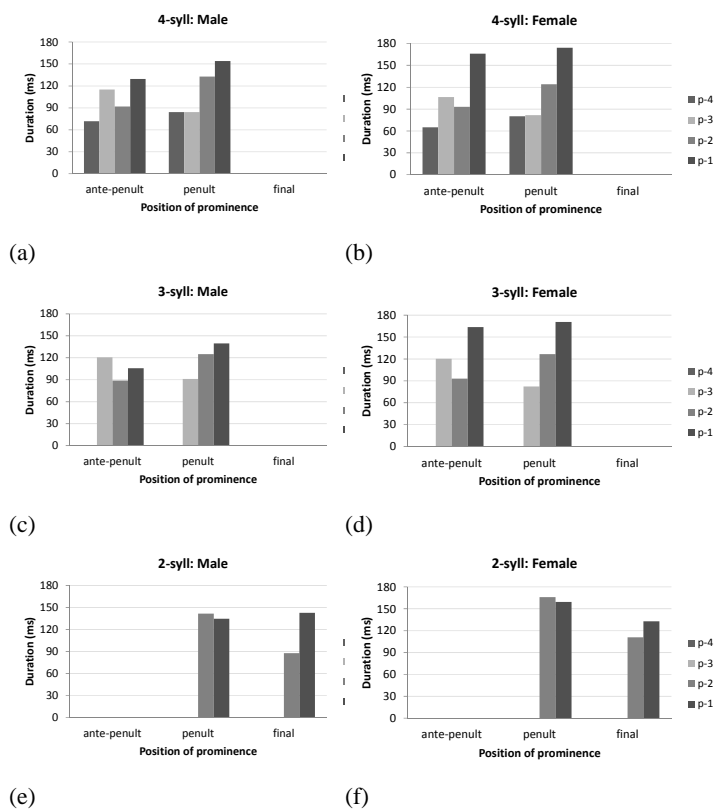

Figure 5: *Duration of individual vowels in the target words (left column: males; right: females).*

4. Conclusions

In this study, the word prominence pattern of Kanakanavu was investigated for the first time. An analysis on the 2-, 3- and 4-syll words of this language showed that different from what have been found for other Formosan languages, in addition to maximal pitch value, durational cues are also used consistently to indicate word prominence in this language. Contradictory to the traditional definition of a pitch-accent language, this important finding could be accounted for by a broader pitch-accent system using a property-based approach.

6. References

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