

# Typology of Paiwan Interrogative Prosody

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## Abstract

This paper investigates the phonetic correlates of interrogative prosodic features in Paiwan, an Austronesian language spoken in Taiwan. An attempt has been made to capture the typology of the Paiwan interrogative prosody. The interrogative sentence in Paiwan consists of one or more prosodic words which are usually larger than a verb stem. Yes/no, tag and alternative questions are characteristically marked by a high final boundary tone, whereas WH-questions are realized with a low final boundary tone. It is concluded that the typology of interrogative prosody in Paiwan lies in the sentence-level intonation structure. Stress or word-level pragmatic accent does not affect the high tone alignment of the interrogative sentences in Paiwan.

## 1. Introduction

Paiwan is a minority Austronesian language spoken in the mountain and plain areas of Pingtung and Taitung Counties, Taiwan. The Paiwan language is notable for its large number of consonantal phonemes, compared with the other Formosan languages. The importance of Paiwan has been mentioned in Ferrell's [1] dictionary. Paiwan does not show extensive mergers and splits among Proto-Austronesian (PAN) stops. On the other hand, the study of prosody in Austronesian languages is rather scanty. The interaction between stress and vowel length in Austronesian languages has been discussed in Wolff's [2] comparative study. He argues that in Proto-Austronesian (PAN) the stress patterns fell on the penult of the root if it was long (or accented) and on the final syllable of the root if the penult was short (or unaccented). Yet, details about the prosodic patterns in the daughter languages and sentence-level prosody in Proto-Austronesian (PAN) are rarely examined in earlier studies.

The term 'accent' has been used to describe various aspects of prosody in Austronesian languages. Zorc [3] classifies Paiwan as an Austronesian language with accent falling regularly on the penult. Wolff's [2] work on PAN accent patterns does not distinguish accent from stress. It is rather vague, under Wolff's his reconstruction, whether accented syllables trigger stress and whether accented syllables are always long in PAN. The work on accentual contrasts and the feature of PAN stress is still in its infancy. On the other hand, variation of the accent patterns of Paiwan has been attested in recent empirical works [4, 5, 6]. Puma Paiwan, for instance, has a quality-sensitive stress in which peripheral vowels such as /i/, /u/, and /a/ are more optimal than the central schwa, and the primary stress falls on the most sonorant or the most optimal vowel. However, schwa nucleus can bear stress in the other Paiwan dialects. The Paiwan informants under the age of fifty tend to randomize prosodic patterns in their speech and lose the prosodic features of the ancestral tone. Younger generations of Paiwan are able to say

a Paiwan lexical word, as many second language learners can do, but the change of prosodic patterns in their speech could result in the misunderstanding of communication or the loss of verbal arts.

Chiang and Chiang [7] claim that Saisiyat, another Austronesian language spoken in Taiwan, is a pitch accent language. They measure various prosodic parameters of syllable rhymes, such as F0 height at onset, offset, peak and trough, pitch range, duration, and slope of content words in Saisiyat, and they suggest that accent in Saisiyat should be classified as pitch accent. Though no minimal pairs with distinctive features are found in their lexical accent patterns, their account has been an innovative view for the empirical analysis of prosody in Austronesian languages.

This study investigates phonetic correlates and prosodic effects in the formation of Paiwan interrogative sentences, which have never been examined in any earlier theoretical study or field report. Given that phonetic implementations of high and low tones are important indices for word-level pitch accent of Paiwan, empirical studies were conducted to verify the phonetic cues and variation in the sentence-level prosodic features of Paiwan.

## 2. Methodology

The present study is based on a corpus of speech uttered by twelve native speakers of Paiwan. Six male and six female native speakers of Paiwan aged 50-70 participated in the recordings in three Paiwan villages. The dialectal varieties included Stimul, Sinvaudjan, and Tjavuali. The participants were recommended by either the chieftains or the village heads, and they were considered the most typical in the Paiwan villages. The Paiwan language does not have its orthography, and the majority of the Paiwan speakers under the age of fifty are literate in Chinese characters. Most of the Paiwan aborigines under the age of 30 did not speak the Paiwan language in the villages, whereas the middle-aged aborigines were Paiwan and Mandarin bilinguals. The Paiwan aborigines over the age of 70 spoke Japanese as well.

Data from the twelve speakers were digitized and analyzed using PCquirer. The corpus consisted of a number of sentences designed to investigate the major interrogative features of the Paiwan language. The interrogative sentence in Paiwan consists of one or more prosodic words which are usually larger than a verb stem. The structure of the sentences consisted of at least two prosodic words, verbs plus subjects or nouns (subject or predicate). Wh-words can be placed sentence-initially, medially, and finally. Studies on Paiwan [4, 8] have indicated that intonation distinguishes a declarative from an interrogative. Sentences with both a verb and noun were examined, as were sentences containing WH-words and tags. Four types of Paiwan interrogative sentences were included in the corpus: yes/no questions, tag questions, alternative questions, and WH-questions. A total of 120 different sentences were uttered by each speaker. The speakers

were asked to read the sentences at their normal rate. Each sentence was repeated twice. The Paiwan sentences in Table 1 illustrate sample recorded sentences.

Table 1. *Sample Paiwan sentences recorded.*

Structure	Paiwan	Gloss
(manu, uri) Verb-Subject	manu tsiqau manu udoŋ a uri kan-in nimaju	Will he eat fish or noodles?
	uri vaik-ə-sun	Will you go?
	vaik-aŋa-sun	Did you go?
Verb-WH-Subject	muri k-əm-uda sun	What are you going to do?
Verb-Subject-WH	patsutsunə-sun tua nəma	What are you reading?
Subject-WH-Verb	tia ima-ima na- maŋcəz	Who ever came here?
WH-Verb-Subject	aku maitazuazua mun	Why are you doing that?
WH-Subject	t-ima-sun	Who are you?
Subject-Predicate	timaju mamazaŋiʎan	Is he the chieftain?
Predicate-Subject	ti paʎaŋ timaju	Is he Paʎaŋ?
Predicate-Subject, <i>pai/ajaw/ɕi</i>	ti paʎaŋ timaju, <i>pai</i>	He is Paʎaŋ, right?

### 3. Results

#### 3.1. Interrogative formation

Verb-initial constructions are common in the speech of the Paiwan aborigines. Ferrell's [1] dictionary has shown that about 75% of Paiwan verbs are susceptible to a passive inflection, form by the prefix-*ma*. A simple sentence in Paiwan can consist of a verb and its focus marker. The verb is obligatory with an affix to specify the semantic role categories in a sentence. Focus is not related to emphasis in the Paiwan language. Sentences in different foci differ in a much more fundamental way. Yes/no questions are free of focus. Yet, WH-questions can be phrased in different foci for change of emphasis. Focus in Austronesian language is a sentence-level. Focus in the Paiwan language does not perform the same functional role as WH-formation. The focus of semantic role is indicated by the verbs. Sentences in Table 2 illustrate a set of foci in Paiwan.

Table 2. *Focus in Paiwan sentences.*

Focus	Paiwan	Gloss
Agent	inu a <b>k-əm-an</b> a Paʎaŋ	Where is Paʎaŋ eating?
Object	inu a <b>kan-ən</b> nua Paʎaŋ	Where is Paʎaŋ's food?
Referent	inu a <b>kan-an</b> nua Paʎaŋ	Where is Paʎaŋ's eating place?
Instrument	inu a <b>si-kan</b> nua Paʎaŋ	Where is Paʎaŋ's dinning utensils?

At the intonational level, focus system in Paiwan does not affect the phonetic realization of the WH-questions. All the sentences shown in Table 2 were reported as ending with a low boundary tone. Pitch range of the elicited sentences did not show significant difference. Although focus is the basic organization for all sentences in the Paiwan language, it is not correlated with phonetic features of the interrogative sentences. On the other hand, f0 realization of WH-interrogative sentences is similar to that of declarative sentences or affirmative statements. A low boundary tone was attested at the right edge of Paiwan declarative sentences and WH-questions. Boundary tones in Paiwan do provide evidence for the independent level of intonational phrases, apart from the level of prosodic words. Due to the diverse syntactic structure and the different numbers of morphemes in different types of Paiwan interrogatives, the factor of duration was excluded in the measurements and comparisons.

#### 3.2. Boundary tones

An intonational phrase in Paiwan consists of at least one prosodic word. The most distinctive intonational feature in Paiwan is the boundary tones at the right edge of intonational phrases. Contrastive boundary tones were attested in declarative statements and yes/no questions [4]. Declarative sentences in Paiwan are aligned with a low boundary tone, whereas yes/no questions are marked by a high boundary tone. Identical forms of syntactic phrases *timaju mamazaŋiʎan* 'he is a chieftain/is he a chieftain' can be differentiated from each other at the intonational level, in terms of intonational boundary tones.

The f0 values of the pitch peaks are higher in yes/no questions than in declarative sentences. Pitch peaks are higher in yes/no questions than in WH-questions uttered by the same speakers. The high boundary tone at the right edge of an international phrase is illustrated in Figure 1.

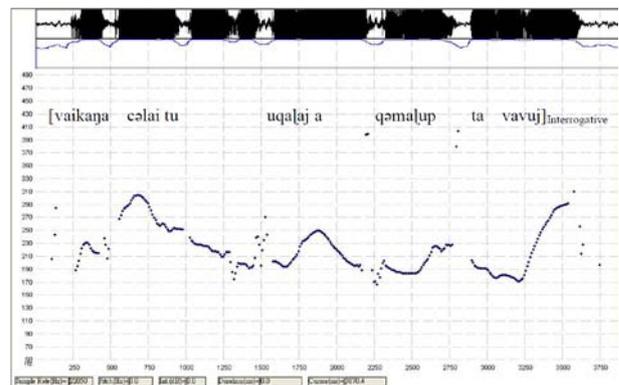


Figure 1: A pitch track of the yes/no question 'did the man go hunt wild pigs'

The pitch peak falls on the second prosodic word of the yes/no question 'did the man go hunt wild pigs', and the intonational phrase ends with a rising tone, as shown in Figure 1. On the other hand, WH-questions elicited by the same speaker did not show the same pattern of boundary tone. Figure 2 and Figure 3 illustrate the pitch tracks of two WH-questions in Paiwan.

Although the yes/no question reported in Figure 1 and the WH-questions 'who is the eighty-year-old woman' and 'where is the eighty-year-old woman' reported in Figure 2 and Figure 3 respectively were elicited by the same female speaker, boundary tones, pitch ranges, and peaks of the questions are different. The yes/no question is characterized by the high

rising boundary tone at the right edge of the intonational phrase, whereas both the WH-questions end with a falling tone. The pitch difference between the last two syllables at the rightmost prosodic word (*vavuj* ‘wild pig’) of the yes/no question is about 120Hz, whereas the pitch difference between the two syllables of the WH-words (*ima* ‘who’ and *inu* ‘where’) at the right edge of the WH-questions is 80-95Hz. On the other hand, pitch peaks were attested at the second prosodic words of the three intonational phrases, but the pitch peak of the yes/no question was as high as 310Hz, opposed to the peaks of the WH-questions as 250Hz and 290Hz.

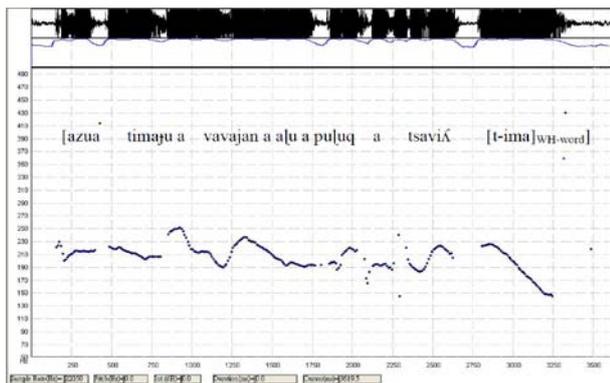


Figure 2: A pitch tract of the WH-question ‘who is the eighty-year-old woman?’

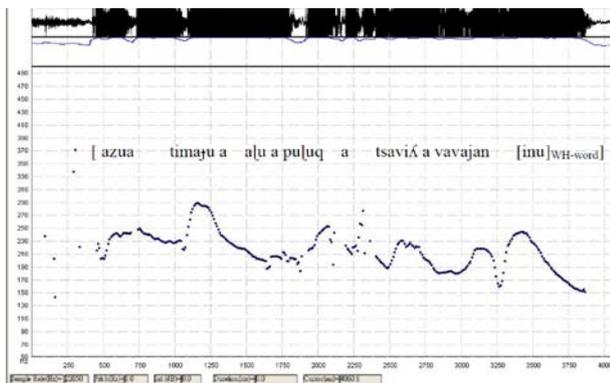


Figure 3: A pitch tract of the WH-question ‘where is the eighty-year-old woman?’

WH-words in Paiwan such as *ima* ‘who’, *nəma* ‘what’, *inu* ‘where/which’, *kəməda* ‘what, why’, *aku* (a zua) ‘why’, *pida* ‘how many/nuch’, *mapida* ‘how many people’, *nujida* / *kaŋida* ‘when’ were included in the corpus. All WH-words end with a low tone at the right edge of the intonational phrases. One question particle borrowed from Mandarin Chinese was attested in Paiwan yes/no questions, and the sentences also ended with a high rising tone.

It has been reported that f0 values are higher in questions than in statements (Hadding-Koch and Studert-Kennedy 1964; Inkelas and Leben 1990; Myers 1996). Yet, the corpus study of the Paiwan interrogative prosody indicates that not all questions in Paiwan end in a high boundary tone. The pitch range was overall higher in yes/no questions than in WH-questions. The result of a one-way ANOVA reveals that the difference in pitch range between yes/no questions and WH-questions is significant (F [1, 718] =165.786,  $p < 0.0001$ ).

Yes/no questions in Paiwan cannot be independent of prosodic properties. Based on the phonetic pitch tracks of the intonational phrases, the prosodic distinction between yes/no questions and WH-questions in Paiwan has been made.

Interrogative prosodic features in Paiwan are not associated with the phonetic implementations of word stress and accent. In the word *vavuj* ‘hog’, for instance, word stress falls on the first syllable *va*. When the well-formed prosodic word is placed at the right edge of the yes/no question, as shown in Figure 1, the word stress is overlaid by the high boundary tone.

Tag questions in Paiwan are also aligned with a high boundary tone, and a short pause immediately preceding the tag *pai/ajaw/di* ‘right’ was attested in 68% of the tag questions. Tags at the right edge of the intonational phrases are realized as a high rising tone with vowel lengthening, about 25% longer than the stressed syllables of the other prosodic words within the intonational phrases.

In alternative questions connected by *manu* ‘or’, high boundary tones were also attested. The most significant pitch peak was most frequently attested in the conjunction word *manu* ‘or’, which is one of the major features of the alternative interrogative construction. At least the last two prosodic words in the alternative sentences have a high rising boundary tone at the right edge of the intonational phrases. In about 50% of the elicited alternative interrogative sentences, all the prosodic words within the intonational phrases are affected by the alternative high boundary tone with a rising ending, and the intonational phrases end with a rising tone at the rightmost edge. The pattern of high tone alignment in the Paiwan alternative question [...*manu*... *udoj*]<sub>interrogative</sub> ‘...or...noodles’ is illustrated in Figure 4. The alternative word *manu* ‘or’ and the last prosodic word in the alternative question are both aligned with a high tone at the right edge of the intonational phrase. The most significant peak prominence in the alternative interrogative sentence is aligned with the right edge of the prosodic word *manu* ‘or’, and another high tone is aligned with the right edge of the prosodic word *udoj* ‘noodles’, also the boundary tone of the interrogative phrase.

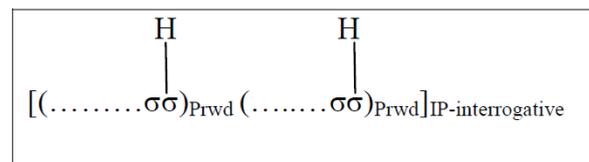


Figure 4: High tone alignment of the alternative question ‘...or...noodles’

Thus far, results from the investigation of the Paiwan corpus have shown that interrogative sentences in Paiwan are correlated with a rising tone, excluding WH-questions. In an intonational phrase, stressed syllables or accent patterns did not trigger a high tone. Typology of the interrogative prosody in Paiwan lies in the alignment of a high tone at the right edge of the intonational phrases or the difference of f0 values of the interrogative sentences.

### 3.3. Discussion

The following four types of Paiwan interrogative prosody have been investigated: yes/no questions, tag questions, alternative questions, and WH-questions. The WH-questions end with a low boundary tone. No matter how many pitch peaks occur in the WH-questions, the final syllable of the intonational phrase

is aligned with a falling tone at its right edge. Furthermore, primary prosodic envelope, prominence and modality of the Paiwan interrogative prosody are also retained in discourse data and everyday conversation of the Paiwan language. A high boundary tone at the right edge of an intonational phrase is never associated with WH-questions, opposed to the other types of interrogative sentences.

To sum up, boundary tones are the major distinctive features in Paiwan intonational phonology. Peak prominence at the right edge of each intonational phrase classifies the typology of Paiwan interrogative prosody. Word stress and other prosodic properties are overlaid by the peak prominences in the intonational phrases. Yes/no questions are marked by a high boundary tone. Tag questions in Paiwan are also aligned with a high boundary tone. High boundary tones were also attested in alternative questions, and the spreading of the high boundary tone could occur at the right edge of every prosodic word within the intonational phrases.

In the present study, four types of Paiwan interrogative prosody have been investigated. The phonetic description of the interrogative sentences in Paiwan is illustrated in Table 3.

Table 3. *Boundary tones at the right edge of the Paiwan interrogative sentences.*

Type	Contour features	Phonetic features
Yes/no questions	Rising ending	<b>High</b> tone
Tag questions	Rising ending	<b>High</b> tone; vowel lengthening of the tag may occur
Alternative questions	Rising ending	<b>High</b> tone; spreading of high tone may occur
WH-questions	Falling ending	<b>Low</b> tone

#### 4. Conclusions

In the present study, phonetic correlates of interrogative prosodic features in Paiwan were investigated. The interrogative sentence in Paiwan consists of one or more prosodic words which are usually larger than a verb stem. Yes/no, tag and alternative questions are characteristically marked by a high final boundary tone, whereas WH-questions are realized with a low final boundary tone.

How do we preserve the speech prosody of an unknown language? People may use digital recording facilities to collect the voice data in the field. But how do we present the digital recording in literal transcription? How can the dynamics of prosody be associated with segmental representation? There is no doubt that the prerequisite for documenting the prosody of the unknown language is to describe the word-level and sentence-level prosodic patterns of that language.

In the Paiwan language, word-level accents conveying various types of semantic and pragmatic information have been investigated [4, 6]. Yet, much more information about the traditional culture of Paiwan and the interaction between the speakers has been revealed in sentences, narrative or discourse pieces. Prosody must be an essential component in Paiwan speech. Prosody could be cohesive in Paiwan, as we have seen a number of contrastive and distinctive prosodic features in interrogative sentences. It has also been found that phonetic implementations of high and low tones are important indices for word-level pitch accent of Paiwan [5]. In elicitation, stress is the only parameter to determine the alignment of peak prominence in an isolated Paiwan prosodic word. When the

prosodic word is placed in different contexts, pitch accent may occur to change either the f0 timing or the peak alignment in the prosodic word.

As far as intonation is concerned, yes/no questions, tag questions, and alternative questions are aligned with a high boundary tone at the right edge of the intonational phrases. Interrogative phrases in Paiwan are generally aligned with a rising tone. Yet, the WH-questions end with a low boundary tone at the right edge of the intonational phrases.

Typology of interrogative prosody in Paiwan lies in the sentence-level intonation structure. Stress or word-level pragmatic accent does not affect the high tone alignment of the interrogative sentences in Paiwan. We need more elucidative description and empirical studies on the prosody of Austronesian languages, not only of the Paiwan language but also of other endangered languages. It is hoped that this paper provides a preliminary framework for the description of the intonational prosody of the other Austronesian languages.

#### 5. Acknowledgements

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