Intonation in Contact: Mandarin Influence in Yami

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Abstract

In an age of increasing mobility, language contact is unavoidable. Despite fruitful discussion in morpho-syntactic and phonological (segmental) variation, prosodic aspects of language contact have received far less attention. This paper thus intends to (1) describe key aspects of Yami intonation, an endangered Austronesian language spoken in Taiwan and (2) investigate Yami-Mandarin bilingual intonation patterns, given Yami-Mandarin contact. Three parameters are considered: final boundary tone, F_0 slope, and pitch height.

Yami-monolinguals produced falling contours in statements and neutral questions, but produced confirmation-seeking questions and default statement questions with a rising pattern. Bilingual speakers show evidence of Mandarin influence in two respects. First, they transfer the Mandarin-like (level) intonation to their Yami neutral questions; second, a non-Yami-native question type has also been "transplanted" into Yami by bilinguals. Interestingly, the newly-added question type is fused with pre-existing Yami intonation to form an innovative hybrid system. This seems to indicate a new direction in the evolution of the intonation system. If these variations continue and strengthen, present-day Yami intonation may evolve over time into a new-styled one.

Index Terms: language contact, Yami, bilingual intonation, prosodic innovation, evolution of intonation

1. Introduction

Language contact has often induced (reciprocal) changes in the speaker's native language. Contact-induced changes may result in loss, addition, modification, or replacement of pre-existing features, a restructuring process that affects the distribution of the recipient language (sub)system [1, 2]. *Borrowing* of structural features at all levels is amongst the most prevalent and obvious evidence of this. Due to intensity of contact, linguistic structures are argued to follow a borrowing hierarchy that begins with non-basic words and then followed by syntactic/phonological features. Under extremely intensive contact, lower level prosodic structure may be added into the recipient language [2, 3]. While these rubrics make no direct predictions for higher levels of prosody, there is a growing body of research showing that higher level prosody is in fact permeable under contact. Yami has revealed signs of contact-induced segmental [4, 5] and prosodic variation [6].

1.1. Contact-induced prosodic change

Contact literature as early as [7] recognized bilingualism as the "locus of language contact". More recent research shows that when distinct prosodic structures are in competition, bilingual speakers may produce fused (innovative) [8], bidirectional transfer [9], or L2 borrowing [10] patterns.

While transfer can take place in both directions, most reports are of L1-to-L2 transfer. More recent studies [11, 12, 13, 14, 15] have shown that transfer of melodic patterns from L2 to L1 is also possible. [12, 15] further added that L2 prosodic features can be *directly* transferred/borrowed via frequent contact with L2 speakers. Alternatively, the L2 features can be *indirectly* transferred through an intermediate L1 variety. For example, in intergroup interactions, non-native features from immigrants may be carried over to the host language over time.

There are also cases where prosodic features are mixed to create a new hybrid system. This is seen in some Caribbean creole languages like Papiamentu [16, 17], Saramaccan [18, 19, 20], and Palenquero [21], arguably due to contact between European languages and West African substrates [22].

1.2. Yami and Taiwan Mandarin Intonations: An Overview

In Taiwan Mandarin, neutral statements (ST) have a falling intonation [23, 24]. Questions on the other hand are of varying types. WH-questions (WHQ) are syntactically marked by WH-words and have a falling intonation pattern like in statements. YES/NO questions can be constructed by: (1) attaching the question particle *-ma* to the end of the statement (i.e., neutral question, NQ); (2) using a statement construction with a rising intonation to express incredulity/surprise (i.e., default statement question, SQ1), or (3) adding the *-ma* particle to the end of a statement question to express a *lighter* degree of incredulity (SQ2). [23, 24] further noted interaction between pragmatics, syntax, and prosody: statement questions (with or without *-ma*) are overall higher in pitch and have wider final pitch expansion than neutral questions. Within statement questions, those without *-ma* are higher in pitch than those with *-ma*.

Yami intonation and prosody have received scant attention thus far. [25] proposed three major findings. First, Yami speakers use final boundary tone to signal sentence type: statements and WH-questions take a L%, whereas confirmation-seeking statement questions take a H%. Second, speech rate in WH-questions is significantly faster than in confirmation-seeking questions produced by the same speaker. Third, the results suggest the independence of word- and sentence-level prosodies, with the former usually being overridden by the latter at the right edge of an intonation phrase (IP).

Our pilot study on Yami neutral questions indicated an association between speakers' language background and their neutral question intonation [26]. Yami-dominant bilinguals showed a L%, while Mandarin-dominant bilinguals showed a H%. No clear pattern was observed in balanced Yami-Mandarin bilinguals. We hypothesized that the default pattern of neutral

questions might be a falling one. With increasing use of and exposure to Mandarin, balanced bilingual and Mandarin-dominant speakers may have started producing Mandarin-like level intonation in their Yami speech. This study aims to provide additional data on this.

1.3. Aims of the study

This study aims to (1) provide a thorough description of key aspects of Yami intonation and (b) study the effects of language background on bilingual intonation patterns. This gives us an opportunity to explore to what extent and in what direction Mandarin influence has diffused through Yami.

2. Methods

2.1. Participants

37 participants completed a modified language experience and proficiency questionnaire (LEAP-Q) [27] about (1) language dominance, (2) first acquired language, (3) relative percentages of language use in social interactions, (4) education level, and (5) the ratio of years in Taiwan to Orchid Island after 15 years old (to seek higher education in Taiwan after finishing junior high school). Based on survey responses, participants were classified into 5 near **Yami-monolinguals** (YM) and 32 Yami-Mandarin bilinguals. To pinpoint potential sources induced by Mandarin, bilinguals were further subdivided into **Yami-dominant** (YD), **balanced bilingual** (BB), and **Mandarin-dominant** (MD) speakers (Table 1).

Table 1: *Participant profile*.

Group	YM	Bilingual		
		YD	BB	MD
# of participant (Average age)	5 (64)	12 (54)	12 (44)	8 (33)

2.2. Stimuli

Spontaneous speech was elicited using Interactive Card Games [27]. Seven sentence types were included: (1) neutral statement (ST), (2) narrow focus statement (NF), (3) neutral question (NQ), (4) confirmation-seeking statement question (SQC), (5) default statement question (SQ1), (6) statement question with *lighter* incredulity (SQ2), and (7) syntactically-marked WH-questions (WHQ). To compare sentence types across pragmatic conditions, six disyllabic target items (basic Yami words) were chosen: [a.ŋit] *'sky'*, [ʤi.la] *'tongue'*, [a.jo] *'river'*, [a.taʊ] *'sea water'*, [poŋ.ʂo] *'island'*, and [və.ʁan] *'moon'*. Ten other Yami words were also included as fillers.

2.3. Task design and corpus collection

Game 1: two participants communicated with each other to have six target cards matched in pairs. This elicited 6 NQ-ST pairs from each participant. **Game 2**: participants randomly arranged the six target cards into a 6-pocket sleeve and presented the layout to their partner for 5 seconds. Then, they took turns to ask each other if they could recall the order of the cards from memory. This elicited 12 WHQs-SQCs pairs from each participant. **Game 3**: each participant received a pile of abstract-drawing cards corresponding to the six target items. Participants showed the cards to their partner and asked them to guess what the picture on the card represents. Participants were expected to have difficulty identifying the pictures and express

incredulity/surprise upon hearing the answers given by their partner. The question-answer conversation flow enabled us to elicit 6 WHQs, NQs, STs, SQ1s, NSTs, and SQ2s each from each participant. In total, each participant provided 72 responses, 48 of them contained the 6 target items (denoted by *, the blanks represent the target positions), as seen in Table 2.

Table 2: *Responses elicited from card game dialogues.*

Task	Pragmatic condition	Carrier sentence
Card-matching task	**1. NQ**	**[jamiɛn imo ʂu __?]*** *'Do you have __?'*
	2. ST	**[o jam __.]*** *'This is __.'*
Memory card game	WHQ	[#1-6 am, ikoŋo?] *'What is #1-6?'*
	3. SQC	**[__ ɹi/jan?]*** *'Is that __?'*
	WHQ	[__ am, ɲikapiɹa?]* *'What is the # of __?'*
	SQC	[ɖo #1-6?] *'Is that in #1-6?'*
Picture-guessing task	WHQ	[ikoŋ o ja?] *'What is this?'*
	NQ	[__ ja/ri?] *'Is that __?'*
	ST	[bəkən, o jam __.]* *'No, this is __.'*
	4. SQ1	**[koŋo __ri!?]*** *'This is __!?'*
	NF	[nonan, __ ja.]* *'Yes, this is __.'*
	5. SQ2	**[a __ɹi/ja!?]*** *'This is __!?'*

2.4. Analysis

This study focuses on the five syntactically similar sentences (appearing in blue in Table 2) so that we can examine potential interaction between syntax, discourse pragmatic meanings, and prosody. Three parameters were considered:

(1) Final boundary tone – based on the first author's auditory impression and visual inspection of pitch contour on Praat (version 6.0.17). A ToBI-style annotation for Yami [25, 26, 28] was adopted and percentages of edge tone were calculated.

(2) F_0 slope – defined as the difference between phrase- final and initial F_0 values [29], was calculated for each sentence to reveal both direction and steepness of F_0 change.

(3) Pitch height – measured to see if it helps differentiate sentence types.

All pitch extraction and measurements were done in Praat. F_0 measurements were time-normalized and converted to semitone by implementing the ProsodyPro script [30] to facilitate comparison across speakers in each cohort. One-way independent ANOVAs were performed to study the effect of language background (four levels: Yami-monolingual (YM), Yami-dominant (YD), Balanced bilingual (BB), and Mandarin-dominant (MD)) on F_0 slope. Mean pitch height for each sentence type was also reported.

3. Results

1,110 eligible sentences were examined for the distribution of final boundary tone across the five sentence types. For the F_0 analyses, sound files containing disfluency/hesitation, overlapping, laughing, or background noise that would obscure pitch and contour information were eliminated, yielding a smaller dataset of 701 sentences. A chi-square test examining the distribution of final boundary tone (expressed as *percentages*) between the two datasets was performed. The results confirm that the difference was not significant χ^2 *(14, N=1,000) = 2.74, p = 1*.

3.1. Final boundary tone

Results reveal that, overall, participants distinguished falling STs (90%) from rising SQCs (86%) and SQ1s (68%). NQ and SQ2 intonation patterns are less straightforward as participants showed similar percentages of using either a final H or L tone.

Table 3: *Distribution of final boundary tone.*

	Final rise (H%)	Level contour (M%)	Final fall (L%)	N = 1,100
ST	3 (1%)	26 (9%)	**247 (90%)**	276
NQ	98 (43%)	31 (13%)	100 (44%)	229
SQC	**205 (86%)**	21 (9%)	12 (5%)	238
SQ1	**144 (68%)**	9 (4%)	60 (28%)	213
SQ2	73 (47%)	10 (7%)	72 (46%)	154

Therefore, we conducted a thorough analysis on F_0 slope and pitch height to provide some clarity.

3.2. F_0 slope

Results on F_0 were arranged by sentence type. A one-way independent ANOVA was performed for each sentence type to study the effect of the four-level language background (Yami-monolingual (YM), Yami-dominant (YD), balanced bilingual (BB), and Mandarin-dominant (MD)) on F_0 slope. Since intonation varies widely across speakers [31], examining all comparisons could likely make it too complex to gain a clear picture of Yami intonation. Here we use YM speech as the primary benchmark (except for their SQ2 intonation) [32] to see whether and how the three bilingual groups patterned similar to or divergent from canonical forms.

Statement (ST) were uttered with a sharp negative slope, yet, the steepness differed across groups ($F(3,184) = 5.76, p < .001$). A Tukey post-hoc test suggested significant difference in two comparisons: YM-YD ($p < .01$) and YM-MD ($p < .001$). Participants showed variation in their **neutral question (NQ)** intonation ($F(3,101) = 8.38, p < .001$). A significant difference was found between YM and MD ($p < .001$) in that the former showed a shallow negative slope, whereas the latter a positive one. **Confirmation-seeking statement question (SQC)** were chiefly realized with a positive slope, and average slope steepness was not significantly different across groups ($F(3,155) = 2.75, p = .05$). Participants uttered **statement question (SQ1)** with a rising SQ1 pattern. No significant difference was found between YM and any other groups. **Statement question conveying lighter incredulity (SQ2)** were produced with varied patterns $\chi^2 (3, N=98) = 21.77, p < .001$. A Dunn post-hoc test with Bonferroni correction showed a total of three significant differences between MD-YM ($p < .05$), MD-YD ($p < .001$), and MD-BB ($p < .001$) comparisons. Note though that we should treat SQ2 intonation with caution, because even though the sentences were clearly elicited under the SQ2 context, the YM and some YD speakers had trouble separating SQ2s from SQ1s. Therefore, we cannot draw strong conclusions based on their data (Table 4).

Table 4: *F_0 slope (references = blue and bold).*

Sentence	Main effect: Language background			
	YM	YD	BB	MD
ST***	**-3.37**	-1.68**	-2.12 n.s.	-1.02***
NQ***	**-0.82**	-0.01 n.s.	0.2 n.s.	2.39***
SQC n.s.	**3.25**	1.96 n.s.	3.51 n.s.	3.78 n.s.
SQ1**	**2.26**	1.35 n.s.	1.17 n.s.	4.84 n.s.
SQ2***	0.36	-0.17	-1.11	4.82***

Note: one-way ANOVA was performed for ST, NQ, and SQC. When a significant effect was found, a Tukey's post-hoc test was conducted to make pair-wise comparisons. A Kruskal-Wallis test was performed for SQ1 and SQ2 (pink-shaded), and a Dunn post-hoc test with Bonferroni correction was conducted as necessary.

Using YM speech as the reference, slope direction and steepness can be generalized as below:
(1) Negative slope (falling category): ST > NQ
(2) Positive slope (rising category): SQC > SQ1

3.3. Pitch height

To better depict Yami intonation, pitch height (in semitone) was also measured. Note that here we arranged the results by language background because in this case this method is more informative. Within each level, the five utterances were classified acoustically into two broader categories: falling versus rising (green shaded) intonation. Since these data are non-parametric and not balanced, we only report average pitch height for the comparison (Table 5).

Table 5: *Mean pitch height by speaker group.*

Group	Intonation	Main effect: Sentence Type				
		ST	NQ	SQC	SQ1	SQ2
YM	Falling	89.75	88.26			
	Rising			90.29	91.66	86.85
YD	Falling	89.5	90.1			91.64
	Rising			90.71	93.2	
BB	Falling	93.09				93.51
	Rising		92.51	92.96	94.56	
MD	Falling	89.61				
	Rising		89.75	89.18	91.86	93.52

Temporarily leaving out the less-clear SQ2 intonation, the mean pitch height can be generalized as:
(3) Falling category: ST ≈ NQ
(4) Rising category: SQ1 > SQC

4. Discussion and Conclusions

Prior to this study, we only knew that Yami STs and WHQs have a falling intonation (L% edge tone), while YES/NO questions show a rising pattern (H%) [25, 28]. However, YES/NO question is a broad term covering various subtypes (NQ, SQC, SQ1, etc.) to fulfill speakers' communicative intentions. Looking at YES/NO question alone would conceal potential interaction between pragmatics, syntax, and prosody. To advance our understating of Yami YES/NO question, a more fine-grained analysis is necessary.

4.1. Yami intonation

Essentially, results from YM speakers suggest that STs have a negative slope, while SQCs and SQ1s have a positive slope. Particular attention will be directed toward NQs and SQ2s.

NQ intonation is less evident as the participants displayed both inter- and intra-group variation. The reference group, YM speakers, adopted a final L tone in 71% of their NQs, which are acoustically characterized by a shallow falling pitch contour (M = -0.82). The YD and BB groups displayed wide variation in their choice of final boundary tone. This results in flat pitch contours in their NQs (M = -0.01 and 0.2 respectively), which can barely be interpreted as having an authentic falling or rising pattern. This necessitates the addition of a new final level tone (M%) into the Yami intonation inventory. MD speakers showed a salient deviation from other groups by using a clear final rise

(M = 2.39) in their NQs. Based on the fact that YM speakers tend to end their NQs with a terminal fall, it seems plausible to argue that canonical Yami NQs have a falling pattern.

SQ2 intonation is even trickier because older speakers in YM and YD groups often confused between SQ1s and SQ2s. Even though BB and MD speakers could pull these apart, their intonation differed markedly: falling intonation for BB speakers and steep rising pattern for MD speakers. It could be that, older speakers had difficulty with the task or it could quite possibly that in fact, there is **no** SQ2 in Yami. The reason BB and MD groups can distinguish between SQ1s and SQ2s is because they map Mandarin phono-syntactic pattern onto a Yami substrate. More data will be needed to clarify the issue.

4.2. Interplay between F_0 slope and pitch height

The results suggest a sophisticated interplay between F_0 and pitch height. Within the falling category, STs and NQs are similar in pitch height but differ in their steepness (ST > NQ). For the rising category, sentences having steeper slopes are lower in pitch, while those with shallower slopes are higher in pitch (Figure 1). This applies to the YM, YD, and BB groups.

	Falling category			Rising category		
Steepness	ST	>	NQ	SQC	>	SQ1
Height	ST	≈	NQ	SQ1	>	SQC

Figure 1: *Interplay between pitch slope and height.*

MD speakers, though they categorized the sentences differently, also displayed an interplay between slope and height. As appears in Figure 2, SQ1s stand out in pitch steepness and height. NQs and SQCs are close in pitch height, but differ in steepness (SQC > NQ).
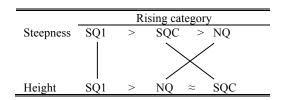
	Rising category				
Steepness	SQ1	>	SQC	>	NQ
Height	SQ1	>	NQ	≈	SQC

Figure 2: *Interplay between pitch slope and height among MD speakers.*

4.3. Mandarin influence in Yami

Having obtained a broad picture of Yami intonation, we would like to address the inconsistency in participants' NQ and SQ2 intonation. Canonical Yami NQs have a shallow falling pattern. A stark difference was found in the MD group, who explicitly showed a rising pattern. The YD and BB groups also diverged from the traditional falling pattern by using a final level tone (M%).

YD and BB's non-typical level pattern could possibly be seen as the product of transfer from Mandarin because Mandarin NQs are featured with a level intonation [23, 24].

Although one could argue that language attrition is not uncommon in endangered communities [33, 34], we have compelling reasons to see YD and BB's level NQ intonation as the "side effect" of language contact. In fact, all YD and BB

participants reported Yami as their L1, which had remained their primary language at preschool age. For the majority of YD participants, Yami is still used as their primary language. Although the BB group does not use as much Yami as their YD counterparts, they still show perfect competence in Yami. It is therefore hard to explain the intonational variation solely through a language attrition model (i.e., inadequate language knowledge), given speakers grammatical proficiency. We attribute YD and BB's non-canonical NQ patterns to Mandarin influence via different mechanisms: for BB speakers, the Mandarin-like level pattern was transferred to their Yami via direct transfer. YD speakers may have also indirectly acquired/transferred the Mandarin-like pattern into their Yami speech when they are surrounded by BB speakers. MD's rising intonation is hard to be explained through Mandarin influence. It it possible that, due to the lack of Yami competence, they are developing a new prosodic device to encode their NQs.

For SQ2, we argue that Yami may not have authentic SQ2s. The new question type, however, seems to have been transplanted into Yami primarily by MD speakers because they typically acquired Mandarin before Yami, thus being subject to greater influence from Mandarin. However, the Mandarin high-level SQ2 intonation (↑M%) is not jointly transferred into Yami. Rather, MD speakers fill the new category by mapping the already-existing Yami SQ1 intonation (↑H%) onto the newly added SQ2s. This demonstrates an interesting case of hybridization where a Mandarin phono-syntax (SQ2) is fused with a Yami SQ1 intonation (yellow shaded in Figure 3).

Yami		Newly styled Yami			
Phonosyntax	SQ1	SQ1			
Intonation	↑H%	↑H%			
	→				
		↑H%			
		SQ2	← SQ2	SQ1	Phonosyntax
			↑M%	↑H%	Intonation
					Mandarin

Figure 3. *Hybridization of Mandarin phono-syntax and Yami intonation by Mandarin-dominant bilinguals.*

In sum, Yami STs and NQs are characterized by falling intonation, whereas SQCs and SQ1s are realized with a rising pattern. A closer examination of bilinguals' intonation shows that when two distinct systems are competing, YD and BB speakers showed L2-to-L1 transfer, while MD speakers deployed an innovative rising intonation in their NQs. The non-native SQ2 has also been freshly carried over to the Yami system via MD speakers. From their NQ and SQ2 data, we argue that MD bilinguals are now in a transition phase. If these changes continue, a rising NQ intonation and a mixed SQ2 pattern may eventually resulted in a new-styled Yami as Mandarin is gaining ground on the Yami soil.

5. Acknowledgements

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