Tonal Hybridization in Yami-Mandarin Contact

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Abstract

Yami, an endangered Austronesian language spoken on Orchid Island in Taiwan has been under heavy influence from Mandarin for several decades. In the current linguistic ecology, the pressure of Mandarin on Yami is increasing and its influence has been reported in Yami intonation. This study, on the flip side, examines whether Yami influence has also diffused through the Mandarin spoken on Orchid Island. Taiwan Mandarin speakers make a three-way distinction in sentence intonation: (1) falling statements, (2) level neutral questions and statement questions conveying lighter incredulity, and (3) high-rising default statement questions. Orchid Islanders showed deviation in their default statement question intonation by using a high-level intonation. Interestingly, we observed two hybridization patterns in Yami-Mandarin bilingual intonation: one that fuses Yami phono-syntax with Mandarin intonation in Orchid Island Mandarin, and one that incorporates Mandarin phono-syntax with Yami intonation in young islanders' Yami speech. This provides crucial evidence showing that in addition to the overwhelming phenomenon of transfer/borrowing, speakers may combine discrete (sub)strates from different sources. If the innovative, hybrid pattern continues, present-day Yami intonation may evolve over time into a newly-styled system.

Index Terms: linguistic ecology, Yami, Mandarin, bilingual intonation, hybridization, tonal evolution

1. Introduction

In bilingual contexts, language contact often induces (reciprocal) changes in the speaker's native language. This in turn results in loss, addition, modification, or replacement of pre-existing features, a restructuring process that affects the recipient language system [1, 2]. *Borrowing* of structural features is amongst the most frequently cited mechanism in contact-induced changes. [2, 3]'s intensity of contact model predicts that linguistic structures follow a borrowing hierarchy that begins with non-basic words and then followed by phono-syntactic features. Under extremely intensive contact and heavy social pressure, more fine-grained prosodic structures such as tone and stress 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. Likewise, Yami has revealed signs of contact-induced segmental [4, 5] and prosodic variation [6, 7] under long-standing Mandarin hegemonic language policies (1946-1987).

Contact-induced prosodic change. Early works such as [8] recognized bilingualism as the "locus of language contact". More recent research shows that when distinct prosodic systems are in competition, bilingual speakers may produce fused [9, 10], bi-directional transfer [11], or L2 borrowing [12] patterns.

In multiethnic/multilingual communities, other than ubiquitous L1-to-L2 transfer, transfer of melodic patterns from L2/immigrant languages to L1/host languages is also possible via frequent contact with L2 speakers [13, 14, 15] or through an intermediate L1 variety carrying non-native features spoken by immigrants [14, 16]. However, contact-induced changes are not limited to transfer. In Caribbean creole languages like Papiamentu [17, 18], Palenquero [19], and Saramaccan [20, 21, 22], discrete prosodic typologies are mixed to create new hybrid systems, arguably due to contact between European languages and West African substrates [23].

Yami and Taiwan Mandarin intonations. In Taiwan Mandarin, neutral statements (ST) have a falling intonation [24, 25]. 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: attaching the question particle -ma to the end of the statement (i.e., a neutral question, NQ); using a "statement" construction with a rising intonation to express incredulity/surprise (i.e., default statement question, SQ1); or adding the -ma particle to the end of a statement question to express a lighter degree of incredulity (SQ2). [24, 25] further noted interaction between pragmatics, syntax, and prosody such that 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 and have larger pitch range than those with -ma.

Separate studies [6, 7, 26] on Yami showed that Yami STs also end with a falling intonation. Interestingly, Yami speakers utilize similar strategies to Mandarin speakers in question formation: WHQs are marked by WH-words; NQs are attached by an optional particle *-ri/ja(n)*; confirmation-seeking statement questions (SQC) and SQ1s are also formed by using a "statement" construction. In terms of intonation, Yami WHQs and NQs end with a low edge tone (L%), whereas SQCs and SQ1s display a terminal rise (H%). Although [6, 7] attempted to elicit SQ2s in Yami, Yami speakers tended to confuse SQ1s with SQ2s. As such [6, 7] argued that SQ2 itself may not form a separate phono-syntactic category in Yami (Table 1).

Table 1: *Taiwan Mandarin and Yami intonations.*

	ST	WHQ	NQ	SQC	SQ1	SQ2
Taiwan Mandarin	L%	L%	M%	--	↑H%	↑M%
Yami	L%	L%	L%	H%	↑H%	

Note: L, H, M% denote falling, rising, and level final boundary tone respectively. An upward arrow ↑ represents higher pitch. Mandarin SQC intonation has not been explored in previous studies.

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[6, 7] also show clear effects of language background on bilingual intonation patterns: speakers with excellent Yami proficiency preserved canonical Yami intonation patterns, while those with high Mandarin proficiency borrowed Mandarin NQ intonation (M%) and introduced a new question type, SQ2, into their Yami.

Aims of the study. Prosodic transfer can take place bi-directionally [11]. Given the ecological context, Yami influence in bilinguals' Mandarin speech is also quite plausible. Thus, we aim to see whether/how Orchid Island Mandarin differs from mainland Taiwan Mandarin. Second, we study the co-influence of Yami and Mandarin in bilingual speech. More specifically, we intend to explore, in addition to borrowing, whether bilinguals use innovative patterns that are neither Yami- nor Mandarin-like, i.e., hybrid patterns.

2. Methods

Participants. 39 participants completed a modified language experience and proficiency questionnaire (LEAP-Q) [27] about (a) language dominance, (b) first acquired language, (c) relative percentages of language use in social interactions, (d) education level, and (e) the ratio of years in Taiwan to Orchid Island. Based on survey responses, participants were classified into 7 ethnically Yami, linguistically Mandarin-monolinguals (MM) plus 32 Yami-Mandarin bilinguals. To better isolate language influence, bilinguals were further subdivided into Mandarin-dominant (MD), balanced bilingual (BB), and Yami-dominant (YD) groups (Table 2).

Table 2: *Participant profile*.

Group	MM	Bilingual		
		MD	BB	YD
# of participant (Average age)	7 (25)	8 (33)	12 (44)	12 (54)

Stimuli and corpus collection. Spontaneous Mandarin speech was elicited using an Interactive Card-game Task [6, 7]. Seven sentence types were included: neutral statement (ST), narrow focus statement (NF), neutral question (NQ), confirmation-seeking question (SQC), default statement question (SQ1), statement question with lighter incredulity (SQ2), and marked WH-questions (WHQ). To compare sentence types across pragmatic conditions, six disyllabic target items with identical adjacent lexical tones were chosen: Tone1: [tʰjɛn^{1}.kʰʊŋ^{1}] 'sky'; Tone2: [ʂɤ^{2}.tʰoʊ^{2}] 'tongue', [xɤ^{2}.ljoʊ^{2}] 'river'; Tone3: [xaɪ^{3}.ʂweɪ^{3}] 'sea water', [taʊ^{3}.y^{3}] 'island'; Tone4: [ɥœ^{4}.liaŋ^{4}] 'moon'. Ten fillers were also included.

Task design. 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. They took turns to ask each other if they could recall the order of the cards from memory. This elicited 12 WHQ-SQC 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 had 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, NFs, and SQ2s 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 3.

Table 3: *Responses elicited from card game dialogues.*

Task	Pragmatic condition	Carrier sentence (tones omitted)
Card-matching task	**1. NQ**	**ni joʊ __ ma?*** *'Do you have ?'*
	2. ST	**zɣ ʂɻ __.*** *'This is __.'*
Memory card game	WHQ	#1-6 ʂɻ ʂɣ mɣ? *'What is #1-6?'*
	3. SQC	**ʂɻ __ ma?*** *'Is that ?'*
	WHQ	__ ʂɻ tɕi xɑʊ?* *'What is the # of ?'*
	SQC	ʂɻ #1-6 ma? *'Is that in #1-6?'*
Picture-guessing task	WHQ	zɣ ʂɻ ʂɣ mɣ? *'What is this?'*
	NQ	ʂɻ __ ma? *'Is that ?'*
	ST	bu ʂɻ, zɣ ʂɻ __* *'No, this is .'*
	4. SQ1	**zɣ ʂɻ __!?*** *'This is !?'*
	NF	tueɪ, zɣ ʂɻ __.* *'Yes, this is .'*
	5. SQ2	**zɣ ʂɻ __ ma!?*** *'This is __!?'*

Analysis. This study focuses on the five syntactically similar sentences (appearing in blue in Table 3) to see potential interaction between syntax, pragmatics, and prosody. To facilitate cross-linguistic comparison, three parameters, as in [6, 7], were chosen to characterize sentence types:

(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 [6, 7, 26] 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 [28], was calculated for each sentence to reveal both direction and steepness of F_0 change.

(3) Average 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 [29] to facilitate comparison across speakers in each cohort. One-way independent ANOVAs were performed to study the effect of language background (four levels: Mandarin-monolingual (MM), Mandarin-dominant (MD), Balanced bilingual (BB), and Yami-dominant (YD)) on F_0 slope. Mean pitch height for each sentence type was also reported.

3. Results

The 853 eligible sentences were examined for distribution of final boundary tone across the five sentence types. For the F_0 analysis, files containing disfluency/hesitation, overlapping, laughing, or background noise were eliminated, yielding a smaller dataset of 731 sentences. A chi-square test examining the distribution of final boundary tone (expressed as *percentages*) between the two datasets confirms that the difference was not significant χ^2 *(14, N=1,000) = 0.69, p = 1.*

Final boundary tone. Across all groups, participants opted to realize their STs (67%) with a falling intonation and produce a flat contour in all questions: NQs (89%), SQCs (58%), SQ1s (58%), and SQ2s (63%), all labeled as M%.

However, even though participants produced a flat pitch contour in 58% of their SQCs, falling contour also comprises a significant portion (41%) (shaded in Table 4). A potential explanation for such variation will be offered later on.

Table 4: *Distribution of final boundary tone.*

	Rising contour (H%)	Flat contour (M%)	Falling contour (L%)	n
ST	6 (3%)	54 (30%)	**119 (67%)**	179
NQ	4 (2%)	**142 (89%)**	14 (9%)	160
SQC	1 (1%)	**94 (58%)**	67 (41%)	162
SQ1	53 (29%)	**106 (58%)**	23 (13%)	182
SQ2	16 (9%)	**106 (63%)**	48 (28%)	170
Total				853

Final boundary tone alone, however, is inadequate to specify intonation patterns because all questions are characterized by level intonation. A thorough analysis of F_0 slope and pitch height would help unpack how speakers distinguish different questions through F_0 manipulations.

F_0 slope. Results are arranged by sentence type. A one-way independent ANOVA was performed for each type to study the effect of the four-level language background on F_0 slope. Here we chose Mandarin-monolinguals as the reference group because they acquired Mandarin first and had lived in Taiwan for several years before reaching adolescence. Their speech would thus better approximate Taiwan Mandarin. This enables us to see whether and how the three bilingual groups patterned similar to or divergent from canonical Mandarin forms.

Statements (ST) were uttered with a sharp negative slope. No significant difference in steepness was found across groups *($F(3,153)= 1.9$, $p = .13$)*. **Neutral question (NQ)** had a small negative slope. No significant difference in steepness was found across groups *($F(3, 144) = 1.09$, $p < .36$)*. **Confirmation-seeking question (SQC)** had an intermediate negative slope, and the steepness was not significantly different across groups *($F(3, 144) = 0.02$, $p = 1$)*. Participants showed variation in their **statement question (SQ1)** intonation *($F(3, 145) = 7.16$, $p < .001$)*. Mandarin-monolinguals used a positive slope, whereas other bilingual groups employed negative patterns. A post-hoc Tukey test suggested significant differences between Mandarin-monolinguals compared to Mandarin-dominant bilinguals ($p < .05$), balanced bilinguals ($p < .01$), and Yami-dominant bilinguals ($p < .001$). **Statement question with lighter incredulity (SQ2)** had a shallow negative slope. No significant difference was found across groups *($F(3,125)= 0.95$, $p = .42$)* (Table 5).

Table 5: *F_0 slope by sentence type.*

	Main effect: Language background			
Sentence	**MM**	MD	BB	YD
ST $^{n.s.}$	**-3.86**	-4.85	-5.9	-5.3
NQ $^{n.s.}$	**-0.98**	-1.94	-0.99	-1.32
SQC $^{n.s.}$	-3.92	-3.8	-3.79	-3.88
SQ1 ***	**1.59**	-1.2 *	-1.43 **	-2.01 ***
SQ2 $^{n.s.}$	**-1.43**	-2.18	-2.71	-2.46

Based on Mandarin-monolinguals' speech, we argue they made a three-way distinction in F_0 slope direction and steepness, which can be generalized as below:

- Falling intonation: ST > SQC
- Level intonation: SQ2 > NQ
- Rising intonation: SQ1

Pitch height (in semitone). In this case the results are arranged by language background. Within each level, the five sentence types were classified into falling, flat, and as necessary, rising intonation categories. Since these data are not balanced, we only report average pitch height for the comparison (Table 6).

Mandarin-monolinguals (MM) showed a three-way distinction between (1) falling STs (M = 89.23) and SQCs (M = 89.72), (2) level SQ2s (M = 96.23) and NQs (M = 87.59), and (3) high-rising SQ1s (M = 97.17). **Mandarin-dominant (MD)** speakers split their sentences into falling STs (M = 90.31) and SQCs (M = 92.04) and level questions (M_{SQ1} = 98.36, M_{SQ2} = 95.62, and M_{NQ} = 88.42). Three comparisons differed significantly at $p < .001$: SQ1-SQC, SQ1-NQ, and SQ2-NQ. **Balanced bilingual (BB)** speakers distinguished falling STs (M = 93.9) from all flat-contour questions. Within the flat category, SQ1s (M = 98.71) and SQ2s (M = 97.32) have higher pitch than SQCs (M = 93.75) and NQs (M = 93.34). Four comparisons were statistically significant at $p < .05$: SQ1-SQC, SQ1-NQ, SQ2-SQC, SQ2-NQ. **Yami-dominant (YD)**. Falling category: STs (M = 91.17) are a bit higher than SQCs (M = 89.59) ($p = .21$); flat category: SQ1s (M= 96.4) are highest in pitch, followed by SQ2s (M = 95.99) and then NQs (M = 89.49). Two comparisons differed significantly at $p < .001$: SQ1-NQ and SQ2-NQ.

Table 6: *Mean pitch height by speaker group.*

		Main effect: Sentence Type				
Group		ST	NQ	SQC	SQ1	SQ2
MM	**Falling**	**89.23**		**89.72**		
	Flat		**87.59**			**96.23**
	Rising				**97.17**	
MD	Falling	90.31		92.04		
	Flat		88.42		98.36	95.62
BB	Falling	93.9		93.75		
	Flat		93.34		98.71	97.32
YD	Falling	91.17		89.59		
	Flat		89.49		96.4	95.99

In summary, referring to Mandarin-monolinguals' speech, the mean pitch height can be ranked as:

- Falling category: ST ≈ SQC
- Level (flat ~ shallow falling contour) category: SQ2 > NQ
- Rising category: SQ1

4. Discussion and Conclusions

Prior to this study, we knew that native Taiwan Mandarin speakers make a three-way distinction between (1) falling STs, (2) flat NQs (mid-level) and SQ2s (high-level), and (3) high-rising SQ1s [24, 25]. However, we believe that the Mandarin spoken on Orchid Island may be subject to localized influence due in part to: geographic isolation of the community, typological distance between Yami (stress language) and Mandarin (tone language), and the local linguistic ecology. Therefore, we conducted a thorough acoustic analysis to see whether/how Yami intonation has diffused through Mandarin. Mandarin spoken on Orchid Island. Essentially, results suggest that STs are reliably produced with a falling intonation (L%). Both NQs and SQ2s are featured with a flat pitch contour, but SQ2s are significantly higher in pitch (↑M%) than mid-level NQs (M%). Meanwhile, participants displayed some variation in their SQC and SQ1 intonations.

Mandarin confirmation-seeking questions (SQCs) have not receive much discussion in previous literature, presumably because SQC share similar syntactic frame with NQs (both are marked with the particle -ma), thus fuzzing the SQC-NQ distinction in natural speech. Acoustic analysis provides some evidence for this as we see that across all groups, SQCs and

NQs are similar in pitch height (Table 6). Even though SQCs have steeper slope than NQs (Table 5), the difference in steepness was not easily captured by auditory impression, even with careful auditory analysis. A more salient difference may lie in speaking rate. Auditorily, SQCs are slower than NQs, which may a permit steeper declination than in NQs. [30, 31, 32] noted that read speech (similar to SQCs) had steeper and more frequent declination than spontaneous speech (similar to NQs) Future analysis on speaking rate would help clarify the issue.

Taiwan Mandarin **SQ1**s are typified by high-rising intonation. The results show that only younger Mandarin-monolinguals adopt this pattern. Other groups develop a *high-level* intonation to encode their SQ1s. This finding is surprising and it is hard to consider this a direct intonational borrowing from Yami because Yami SQ1s also take a high-rising pattern. A closer examination on SQ1s and SQ2s reveals that only Mandarin-monolinguals preserved the Mandarin-like SQ1 (high-rising)-SQ2 (high-level) contrast, other groups did not maintain this distinction. The lack of SQ1-SQ2 contrast could arguably arise from Yami influence. We now address this complex intertwining of Yami phono-syntax and Mandarin intonation.

Two-way hybridization. To study the possibility of co-existence of Yami and Mandarin influence in bilingual speech, we compare Yami and Mandarin intonations. Discrepancies between the two languages are observed: there is no authentic SQ2 in Yami [6, 7] and in this study we argue that there is no well-discerned SQC category in Mandarin (Table 7).

Table 7. *Yami and Mandarin intonation.*

	ST	NQ	SQC	SQ1	SQ2
Yami	L%	L%	H%	↑H%	
Mandarin	L%	M%		↑H%	↑M%

Yami influence in Mandarin. Orchid Islanders diverge from Taiwan Mandarin speakers in their SQ1and SQ2 intonation. Since the SQ1-SQ2 contrast only exists in Mandarin and not in Yami, most participants thus tended to group Mandarin SQ1s and SQ2s into a broader category, a phono-syntactic category from Yami. In terms of intonation, they adopted a Mandarin SQ2-like high-level pattern. This embodies a case of fusing Yami phono-syntax and Mandarin intonation (yellow-shaded in Figure 1). The only exception was observed among Mandarin-monolinguals, who contrasted SQ1s (↑H%) with SQ2s (↑M%).

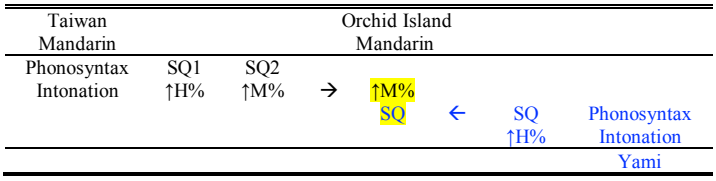

Figure 1. *Hybridization of Yami phono-syntax and Mandarin intonation.*

Mandarin influence in Yami. Interestingly, Mandarin influence is also seen in bilinguals' speech. Canonical Yami sentences are classified into falling STs and NQs versus rising SQCs and SQ1s (Table 7). [6, 7] reported a salient variation introduced by younger bilinguals, whose Mandarin fluency has outstripped their Yami proficiency. As mentioned, SQ2 is not a well-defined phono-syntactic category in Yami because older, fluent speakers showed difficulty capturing the pragmatic nuance between SQ1 and SQ2 in their Yami speech. Younger speakers with higher Mandarin proficiency, in contrast, had no trouble separating the two pragmatic contexts and could offer SQ2s in their Yami speech. It has been argued that in addition to the default SQ1, a new question type SQ2 may have been freshly borrowed/transferred into Yami by these younger bilinguals. However, the Mandarin SQ2 intonation (↑M%) is not jointly transplanted into Yami. Rather, Yami speakers fill the new phono-syntactic vacancy by mapping the already-existing, Yami SQ1 intonation (↑H%) onto the newly added SQ2s. This demonstrates a second case of hybridization where a Mandarin phono-syntax (SQ2) is fused with a Yami SQ1 intonation (yellow-shaded in Figure 2).

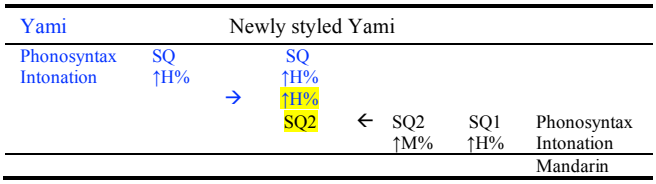

Figure 2. *Hybridization of Mandarin phono-syntax and Yami intonation by Mandarin-dominant bilinguals.*

In sum, the two hybridization cases add important perspectives on contact-induced change because they show that in addition to the overwhelming phenomenon of borrowing, speakers may develop innovative, hybrid patterns by combining discrete strata from different sources (Figures 1and 2). The results also suggest that when two systems are competing, speakers tend to borrow foreign phono-syntactic category and fill the gaps with native, pre-existing intonation (cf. [2, 3] on borrowing hierarchy). It is possible that statement questions are now in a transition phase in Yami. If the hybrid pattern continues and strengthens, present-day Yami intonation may evolve over time into a newly styled system.

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