Generational changes in Iu-Mien prevoicing

Ela Thurgood*

*Department of English, California State University,
Chico, 400 West First Street, Chico, CA 95929-0830, USA*

(Received 22 May 2017, Accepted for publication 15 October 2017)

Keywords: Iu-Mien, Voice Onset Time, Prevoicing, Bilingualism

PACS number: 43.70.-h, 43.70.+i [doi:10.1250/ast.39.140]

1. Introduction

1.1. Iu-Mien

Iu-Mien is a Hmong-Mien language, spoken in southern China, Vietnam, Laos, and Thailand. Over forty years ago the first Mien speakers arrived in the United States as refugees. Now a large concentration of roughly 35,000 Mien people can be found in Northern California, particularly in the Sacramento area [1].

1.2. The focus of this paper

The focus of this study is on Iu-Mien speakers who in their families of 8 to 10 children are in the middle age-wise being the 4th or the 5th child among their siblings. They are bilingual in both Iu-Mien and English; as the interviews attest, they regularly use Iu-Mien with their parents and older siblings, and English with their younger siblings.

During the interviews, they reflected on their bilingualism being different from that of their older siblings and that of their younger siblings. The distinction is important for the present study in that the oldest siblings are Iu-Mien dominant speakers and non-native English speakers, while the youngest siblings are English-dominant speakers with only limited knowledge of Iu-Mien. Those in the middle, being strong bilinguals in Iu-Mien and English, constitute a bridge between the older siblings and the younger siblings. Their Iu-Mien stops, and specifically their Iu-Mien prevoiced stops are the focus of the present analysis.

The results achieved by the full bilinguals are compared with the results achieved by the Iu-Mien dominant speakers. We are particularly interested in whether the three-way contrast system of Iu-Mien is preserved and separated from the two series system of English, in which initial /b, d, g/ and /p, t, k/ show short and long VOTs, respectively, with no prevoicing present [2–4].

The study focuses on the Iu-Mien bilabial stops /p^h, p, b/ and the dental stops /t^h, t, d/. There were not enough tokens of the velar stops /k^h, k, g/ to be included in the analysis.

1.3. Aims of this study

We first investigate how the two groups of Iu-Mien speakers, the Iu-Mien dominant speakers (referred to as Group 1) and the fully bilingual speakers (referred to as Group 2), contrast the two aspirated stops /p^h, t^h/ with their unaspirated counterparts /p, t/. We then turn to the main aim of this study, the analysis of the two prevoiced stops /b, d/.

We first look at their distribution across the two groups of speakers. In particular, we want to know whether the fully bilingual speakers (Group 2) produce the prevoiced stops on a regular basis, a category present in Iu-Mien but not in English. We then analyze the VOT durational values of /b, d/ across the two groups of speakers.

1.4. VOT

Languages differ with respect to the number of contrasts in their stop series. Iu-Mien belongs to the 25 percent of the world languages that have a three-way stop series [5]. These contrasts are identified along Voice Onset Time (VOT) where VOT is identified as the time from the release burst of the stop consonant to the onset of the vocal fold vibration. Long (positive) VOT durations characterize aspirated stops, much shorter (positive) VOT durations that are close to zero characterize unaspirated stops, and negative VOT durations that correspond to voicing during the stop closure characterize voiced stops.

2. Methods

2.1. Subjects

Seven Iu-Mien speakers were recorded. Two of them, a female (Fem1) and a male (M1), were in their 50s, and came to the US from Laos via Thailand when they were 18 and 20, respectively. They are native speakers of Iu-Mien and non-native speakers of English. They not only speak Iu-Mien at home, but also are involved in language preservation in the Mien community. In the study, they are referred to as Group 1.

The remaining five subjects were between 23 and 29 years old. Two of them, Fem4 and M2, were born in Sacramento. Three, Fem2, Fem3, M3, were born in Thailand. They came here when they were 2 to 4 years old. However, regardless of their birth place, all five of them identified themselves as fully bilingual speakers of Iu-Mien and English. In the study, they are referred to as Group 2.

All the subjects were familiar with the Iu-Mien writing system.

2.2. Data

The words, elicited in isolation, were given in English. If help was needed to come up with a translation of a given English word, the Iu-Mien word was provided in a written form. However, despite this help, not all the words could be elicited from all the subjects of Group 2. We discuss it later when the variation in the production of prevoicing is analyzed.

*e-mail: ethurgood@csuchico.edu

Table 1 Averaged VOT values in ms with standard deviations in parenthesis for voiceless stops.

Subjects	/p ^h /	/p/	/t ^h /	/t/
<i>Group 1</i>				
Fem1	83 (11)	8 (3)	67 (12)	10 (4)
M1	93 (25)	8 (2)	107 (25)	10 (3)
<i>Group 2</i>				
Fem2	108 (15)	5 (2)	91 (23)	13 (4)
Fem3	94 (16)	9 (5)	122 (20)	12 (2)
Fem4	85 (17)	12 (3)	97 (10)	11 (2)
M2	62 (22)	6 (1)	57 (22)	16 (6)
M3	73 (15)	10 (6)	93 (5)	13 (3)

During elicitation, each word was repeated three times. The first and second repetitions were measured. For the bilabial series /p^h, p, b/, the list consisted of 10 words with /p^h/, 6 words with /p/, and 10 words with /b/. For the dental series /t^h, t, d/, the list consisted of 7 words with /t^h/, 8 words with /t/, and 9 words with /d/. All together 658 tokens were analyzed.

2.3. Procedure

The recordings were made in a quiet room on a Mac using Sound Studio software (version 3.0.4) and a head mounted Telex H-831 mic. The speech signals were digitized at 10 kHz. For prevoiced tokens, VOT was measured from the onset of low-amplitude periodic voicing to the onset of aperiodic burst activity, usually signaled by a sharp peak of higher amplitude. For the voiceless tokens, VOT was measured from the first indication of initial aperiodic activity to the beginning of subsequent periodic voicing.

3. Results

3.1. Voiceless stops

The VOT durational values for voiceless aspirated and unaspirated stops with standard deviations in parenthesis are given in Table 1. The subjects always contrasted the aspirated voiceless stops /p^h t^h/ from their unaspirated counterparts /p t/. For all the speakers, VOT differences between aspirated and unaspirated stops are statistically significant at both places of articulation ($p < 0.001$ in all cases).

3.2. Prevoiced stops

In contrast to the voiceless stops that were always produced with either a long (positive) VOT for /p^h, t^h/ or with much shorter (positive) VOT for /p, t/, the prevoiced stops /b, d/ were not always produced with the expected negative VOT. Table 2 shows the VOT distribution for /b/, Table 3 for /d/. The tokens of /b/ and /d/ are consistently characterized by a voicing lead in the production of the Iu-Mien dominant speakers, Fem1 and M1 (Group 1).

The fully bilingual subjects (Group 2) show some variation in their production of prevoiced stops. The most marked production characterizes speaker Fem4. Her stops are prevoiced only from 42% to 46% with the majority of them produced as voiceless unaspirated stops. Sometimes prevoicing correlates more with a particular stop. For example, subject Fem3 always produces /d/ with the negative VOT,

Table 2 VOT distribution of /b/.

Speakers	<i>n</i>	–VOT	+VOT
<i>Group 1</i>			
Fem1	20	20 (100%)	0 (0%)
M1	20	20 (100%)	0 (0%)
<i>Group 2</i>			
Fem2	17	14 (82%)	3 (18%)
Fem3	17	14 (82%)	3 (18%)
Fem4	13	6 (46%)	7 (54%)
M2	6	4 (67%)	2 (33%)
M3	20	12 (60%)	8 (40%)

Table 3 VOT distribution of /d/.

Speakers	<i>n</i>	–VOT	+VOT
<i>Group 1</i>			
Fem1	18	18 (100%)	0 (0%)
M1	18	18 (100%)	0 (0%)
<i>Group 2</i>			
Fem2	18	15 (83%)	3 (17%)
Fem3	18	18 (100%)	0 (0%)
Fem4	12	5 (42%)	7 (58%)
M2	14	6 (43%)	8 (57%)
M3	16	12 (75%)	4 (25%)

Table 4 Averaged VOT values in ms with standard deviations in parenthesis for voiced stops.

Subjects	/b/	/d/
<i>Group 1</i>		
Fem1	–118 (49)	–125 (28)
M1	–157 (48)	–134 (25)
<i>Group 2</i>		
Fem2	–124 (29)	–91 (17)
Fem3	–127 (24)	–128 (25)
Fem4	–71 (26)	–69 (12)
M2	–61 (13)	–68 (17)
M3	–109 (39)	–87 (28)

but not /b/, which she produces with a voicing lead in 82% of the collected data. Subject M3 shows a slight preference for a prevoiced /d/ that he produces with a negative VOT in 75%, while prevoicing /b/ in 60%. Subject M2, on the other hand, produces prevoiced /b/ in 67%, but prevoiced /d/ in 43% only. Finally, speaker Fem2 produces prevoiced /b/ in 82% and prevoiced /d/ in 83%.

The averaged VOT values for prevoiced stops are given in Table 4. Interestingly, the shortest voicing leads for /b/ and for /d/ are produced by the two speakers, Fem4 and M2, who produced the majority of prevoiced stops as voiceless unaspirated stops. In the production of Fem4, the voicing lead of /b/ when present is from 99 ms to 27 ms long, and the voicing lead of /d/ is from 88 ms to 54 ms long. In the

Table 5 Averaged VOT values in ms for voiced stops produced as voiceless unaspirated stops.

Subjects	/b/ → [p]	/d/ → [t]
<i>Group 1</i>		
Fem1	—	—
M1	—	—
<i>Group 2</i>		
Fem2	11.1	9.3
Fem3	7.5	—
Fem4	7.4	6.1
M2	5.9	6.2
M3	11.8	9.4

production of M2, the voicing lead is from 71 ms to 42 ms long, and the voicing lead of /d/ is from 82 ms to 36 ms long.

The prevoiced stops /b/ and /d/, when produced without the voicing lead, are not distinguishable from the voiceless unaspirated stops /p/ and /t/, respectively. They have a short lag that is on average from 6 ms to 12 ms long. Table 5 gives the averaged VOT values for voiced stops produced with short positive VOT values for the five speakers. For comparison, the two Iu-Mien dominant speakers have also been included.

3.3. VOT durational results

Figure 1 presents the averaged VOT durational values for the two series of stops, /p^h p b/ and /t^h t d/. The values of /b/ and /d/ were not included when they showed a short-lag positive VOT and thus merged with the short-lag stops /p/ and /t/, respectively.

Figure 1 shows that the speakers significantly distinguish the three target consonants. The VOT varies in a decreasing order, /p^h > p > b/, and /t^h > t > d/, that is the aspirated target consonants have the longest VOT and the voiced target consonants have the shortest VOT, the unaspirated VOT falls in-between.

4. Discussion

A primary question set forth in this study has been whether the 3-way VOT contrast is present in the production of the younger Iu-Mien generation. As stated earlier, the speakers of this generation identify themselves as fully bilingual in both Iu-Mien and English. The study has shown that they differ linguistically from the older, Iu-Mien dominant speakers. The difference is based on a variation found in the group of full bilinguals (Group 2) but not in the group of the Iu-Mien dominant group (Group 1).

The Group 2 speakers are able to produce the 3-way VOT contrast found in Iu-Mien. In other words, they developed a voicing contrast present in Iu-Mien, but not in English. The feature of particular interest has been the voicing lead characterizing Iu-Mien /b d g/. The study has shown that

Fig. 1 Averaged VOT pooled across all speakers.

this very feature is not always present in the production of full bilinguals.

The analysis of the distribution of the voicing lead shows that among the group of full bilinguals some speakers produce the prevoiced /b d/ more regularly than others. The number of produced prevoiced stops correlates with the number of words that the speakers remembered during the recording session. Speakers M2 and Fem4 had the most trouble recalling the words. They also often produced what should have been prevoiced stops but without a voicing lead. Additionally, when they produced the voicing lead, it was shorter than when it was produced by the other subjects.

5. Final notes

The study has shown that the occurrence of prevoicing in the production of the generation of full bilinguals correlates with their language competence, which influences language transmission. The next step in the research on Iu-Mien voicing contrast would be to analyze the same speakers in 10–20 years, and see what further adjustments have occurred.

References

- [1] H. Purnell, *An Iu-Mienh—English Dictionary with Cultural Notes* (Silkworm Books/Center for Lao Studies, San Francisco, 2012).
- [2] L. Lisker and A. Abramson, “A cross-linguistic study of voicing in initial stops: Acoustical measurements,” *Word*, **20**, 384–422 (1964).
- [3] R. D. Kent and Ch. Read, *The Acoustic Analysis of Speech* (Singular Publishing Group, Inc., San Diego, London, 1992).
- [4] A. Abramson and D. H. Whalen, “Voice Onset Time (VOT) at 50: Theoretical and practical issues in measuring voicing distinctions,” *J. Phon.*, **63**, 75–86 (2017).
- [5] I. Maddison, *Patterns of Sounds* (Cambridge University Press, Cambridge, 1984).