

VARIATION AND CHANGE OF THE PHRAE PWO KAREN VOWELS AND TONES INDUCED BY LANGUAGE CONTACT WITH THE TAI LANGUAGES

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Abstract

This paper aims to analyze and compare the acoustic characteristics of the vowels and tones in the Phrae Pwo Karen spoken by three generations. The data was collected at Khangchai Village in Wang Chin District, Phrae Province. A wordlist of Pwo Karen vowels and tones was recorded directly on to computer using Adobe Audition version 2. Fifteen female informants were divided into three groups: those over 60 years old, those 35-50 years old and those under 25 years old. The total number of test tokens was 405 for vowel analysis, and 810 for tone analysis. The fundamental frequencies and formant frequencies were measured using Praat version 5.1.43.

The results show that there are nine monophthongs in Phrae Pwo Karen, namely /i, e, ε, i, ə, a, u, o, ɔ/. Considering the vowel spaces, it is noticeable in the over-60 group that front vowels /i, e, ε/ occur very close to each other, i.e., with only a little difference in the tongue height position (F1). Whereas the back vowels /u, o/ occur close to each other, the vowel /ɔ/ appears close to the vowel /a/. In the 35-50

group and the under-25 group, the vowel /ε/ moves downward and the vowel /ɔ/ moves upward. There are 4 tones, namely, the high tone, mid tone, low tone and falling tone. In the over-60 group, the high tone begins at a high pitch and stays level until the end. The mid tone starts at a mid pitch and stays level until the end. The low tone starts at a mid pitch and falls to a low pitch. The falling tone begins at a high pitch and then rises slightly before sharply falling to a low pitch. For the 35-50 group, the acoustic characteristics of the 4 tones are similar to those of the older group; however, the high tone behaves differently. The onset of the high tone is lower and rises slightly until the end. The change of the high tone is clearer in the under-25 group. It starts from a mid pitch and rises sharply to a high pitch.

In conclusion, the acoustic characteristics of the vowels and tones as spoken by three generations suggest that Phrae Pwo Karen is changing because of the variation among the three groups. The variation and change seems to be caused by language contact with Tai Yuan and Standard Thai.

1. Introduction

Pwo Karen is one of the six Karen languages spoken in Thailand. The other five are Sgaw, Pa-O, Kayan, Kayah, and Kayaw. Pwo Karen and Sgaw Karen are the two languages with the greatest number of speakers. Pwo Karen can further be subdivided into dialects on the basis of classical criteria such as their degree of lexical similarity (or mutual intelligibility) and geographic distribution. The three examples below provide a glimpse into cross-dialect differences which including the presence of some non-cognate words and differences in consonants, vowels and tones between

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cognates. ‘Sangkhla’ refers to the dialect of Sangkhla District, Kanchanaburi Province, ‘Omkoï’ for that of Omkoï District, Chiangmai Province (Phillips 2009), and ‘Khangchai’ for the variety spoken in Khangchai Village, Wangchin District, Phrae Province.

Sangkhla	Omkoï	Khangchai	Gloss
θaŋ ³¹	θaŋ ³²	sa ³³	‘heart’
na ²¹ kuŋ ⁵¹	nɛ ³⁴	na ²¹	‘ear’
phlɔ ⁵¹	ke ³¹ ma ⁴⁵	ʔaŋ ³³ klaŋ ⁴⁵	‘to give’

The present study focuses on the third of these dialects: Khangchai. It belongs to the Phrae Pwo Karen dialect of Pwo Karen, which is also known as North-eastern Pwo (Lewis 2009). The speakers of Pwo Karen in Phrae Province have been settled in this area for at least 150 years (National Archives of Thailand 1999). Pwo Karen speaking people outnumber those of the other non-Tai ethnicities, e.g. Hmong, Akha, Lisu, and Mlabri. Khangchai Village is one of fourteen Pwo Karen speaking villages (in two districts) and almost all the speakers are bilingual. They can speak Phrae Tai Yuan, with the exception of some elderly speakers who are passive bilinguals. The young generation can also speak Standard Thai very well, since they have been educated in school.

The factors which bring about language variation and change can be distinguished into two groups, internal and external. Internal factors deal with features of a language itself, for example, vowel shifting in English, whereas external factors usually deal with language contact and social factors, e.g. age, gender, social class, etc. Weinreich (1968: 3) explains that among the extra-linguistic factors which must be considered in a language

contact situation, some are inherent in the bilingual speakers’ relation to the languages they come into contact with. These include, for example, the speakers’ facility of verbal expression in general and their ability to keep the two languages apart, their relative proficiency in each language and specialization in the use of each language by topic and interlocutor. In addition, there are certain features of bilingual groups such as size, demographic facts, and political relations.

Further, Thomason (2001:60) also concluded that the results of language contact can be classified into three types: contact-induced change, extreme language mixture, and language death. Contact-induced change is varied in the kind and degree of change by two predictors: social factors and linguistic factors. Social factors include intensity of contact, presence vs. absence of imperfect learning and speakers’ attitude. Linguistic factors include universal markedness, the degree to which features are integrated into the linguistic system, and typological distance between source and recipient languages. The next type of result of language contact is extreme language mixture. This level leads to pidgins, creoles, and bilingual mixed languages. The last type is language death. This occurs through attrition or the loss of linguistic material and grammatical replacement.

Many scholars have studied tonal variation and change in Southeast Asian languages (Akharawatthanakun 2002 and 2009, Intajamornrak 2011, L-Thongkum 1994, Teeranon 2002) and found that acoustic characteristics of tones are influenced both by internal factors and by external factors. There are also generational differences in acoustic characteristics of vowels (Cox 1999, Decker and Mackenzie 2000,

Jacewicz, Fox and Salmons 2011). As the language used by different generations can provide insights into variation and change, this paper aims to analyze and compare the acoustic characteristics of the vowels and tones of Phrae Pwo Karen as spoken by three generations.

2. Phonological system of Phrae Pwo Karen (Khangchai Village)

Fieldwork data collected in 2010-2011 show that the Pwo Karen dialect spoken at Khangchai Village has 21 consonant phonemes. Only /ʔ/ and /ŋ/ can occur in final position. There are 9 monophthongs and 4 diphthongs, without vowel length distinction. The tonal system comprises 4 tones in non-checked syllables and 2 tones in checked syllables.

Consonants

	Bilabial	Alveolar	Palatal	Velar	Glottal
Stop	p p ^h b	t t ^h d	c c ^h	k k ^h	ʔ
Nasal	m	n		ŋ	
Fricative		s		x ɣ	h
Approximant	w		j		
Lateral		l			

Vowels

Monophthongs	Front		Central		Back
	High	i		ɨ	
Mid	e		ə		o
Low	ɛ		a		ɔ
Diphthongs		ai	ɔi	ai	au

Tones

Non-checked syllable (CV/CVN): /high/ [44 ~ 45] /mid/ [33] /low/ [21]
/falling/ [41]

Checked syllable (CVʔ): /midʔ/ [332 ~ 33] /fallingʔ/ [442 ~ 42]²

² /ʔ/ is marked for tones that occur in checked syllables. It does not mean a glottalized tone

3. Methodology

The data was collected at Khangchai Village in Wangchin District, Phrae Province. Because of the variation among Pwo Karen dialects, the 1,000 vocabulary items were collected in the first fieldwork. The vocabulary included action verbs, stative verbs, body parts and secretion, natural objects and phenomena, manmade objects and constructions, kinship terms, numerals, colors, time, direction and location, pronouns, and questions³. After that, a wordlist for acoustical measurement of vowels and consonants was chosen from among these vocabulary items.

The words for acoustical measurement of the nine monophthongs are all mid tone and occur in non-checked syllables. The initials are voiceless aspirated stops which prevent the acoustic analysis from being affected by phonation. A wordlist for vowels is shown below.

Vowels

/i/ khi ³³	‘tick’
/e/ kheŋ ³³	‘cricket’
/ɛ/ the ³³	‘to crack’
/ɨ/ phi ³³	‘short’
/ə/ khəŋ ³³	‘to dig’
/a/ khaŋ ³³	‘calf’
/u/ khuŋ ³³	‘smoke’
/o/ thoŋ ³³	‘bag’
/ɔ/ thoŋ ³³	‘blood vain’

The words for acoustical measurement of tones occur both in non-checked syllables

and checked syllables and also have voiceless aspirated stops as initial consonants. A wordlist for tones is shown below.

Tones

Non-checked syllables⁴

/high/ khəŋ ⁴⁵	‘chopping board’
/mid/ khəŋ ³³	‘to dig’
/low/ thəŋ ²¹	‘comb’
/falling/ phəŋ ⁴¹	‘hole’
/high/ thaŋ ⁴⁵	‘gizzard’
/mid/ thaŋ ³³	‘exit’
/low/ thaŋ ²¹	‘to hit’
/falling/ phaŋ ⁴¹	‘lance’
/high/ phoŋ ⁴⁵	‘abdomen’
/mid/ thoŋ ³³	‘bag (shoulder~)’
/low/ thoŋ ²¹	‘turn upside down’
/falling/ theŋ ⁴¹	‘to turn back’

Checked syllables

/midʔ/ thauʔ ³³	‘to polish’
/fallingʔ/ theʔ ⁴¹	‘to fall’
/midʔ/ thaiʔ ³³	‘thigh’
/fallingʔ/ thaʔ ⁴¹	‘needle’

⁴ The word khəŋ⁴⁵ ‘chopping board’ is a loanword from Thai, but it has been used for a long time. The older speakers also use this word. Even though it is a loanword, it doesn’t affect the tone shape since it is integrated in the native lexicon. The word thoŋ³³ ‘bag (shoulder~)’ is not borrowed from Thai word thuŋ²⁴ ‘plastic or paper bag’ because Pwo Karen also has the word ta²¹ soŋ³³, which means ‘plastic bag’.

³ The Thai and English gloss for collecting the vocabulary was conducted by Prof. Dr. Theraphan L-Thongkum, the head of the “Karen Linguistics” project.

/midʔ/ phaiʔ³³ 'skin'
/fallingʔ/ thuʔ⁴¹ 'pig'

The wordlist of Pwo Karen vowels and tones was recorded directly on to computer using Adobe Audition version 2. Fifteen female⁵ informants were divided into three groups: those over 60 years old, those 35-50 years old, and those under 25 years old. The informants were asked to pronounce each test-word three times randomly for each list, with a three-to-five second break between each word. The total number of test tokens was 405 (9 words x 3 times x 15 informants) for vowel analysis, and 810 (18 words x 3 times x 15 informants) for tone analysis.

The formant frequencies were measured at every 10 millisecond interval between 25% - 75% using Praat version 5.1.43. Then, the variation of each vowel within its space was plotted by vowel plot program⁶ on a graph for each speaker.

The fundamental frequencies were measured at every 10% of normalized duration using Praat version 5.1.43. The measured fundamental frequencies in Hertz were converted into semitone values. The formula was semitones = 3.32 x 12 x Log (Hz to be translated / Hz reference level). This is to help minimize the variation among the pronunciation of the five female speakers in each group. Microsoft Excel 2007 was used to analyze and plot graphs of the semitone values.

⁵ Only female informants were selected because different gender affects acoustical measurement.

⁶ Created by Mr. Patavee Chanvivit and thanks to Ms. Supaporn Phalipat for her help in drawing the graphs from the vowel plot program.

4. Results

4.1 Vowels

The results show the vowel spaces of the nine monophthongs in Phrae Pwo, Karen namely /i e ε i ə a u o ɔ/. The formant frequencies of the Phrae Pwo Karen vowels were divided into 3 groups, the over-60 group, the 35-50 group, and the under-25 group, as shown in Figures 1, 2, and 3.⁷

Figure 1 shows that the overall space of the nine monophthongs as spoken by five speakers of the over-60 group is similar. The front vowels /i e ε/ occur very close to each other, i.e., with only a little difference in the tongue height position or the first formant frequency (F1) especially for speakers 1, 2 and 4. The central vowel /i ə/ and the back vowels /u o/ occur close to each other, whereas the vowels /a/ appears close to the vowel /ɔ/. Concerning the tongue height position, there are only two low vowels, which are /a/ and /ɔ/.

In terms of the tongue advancement or the second formant frequency (F2), there are front vowels /i e ε/, central vowels /i ə a/, and back vowels /u o ɔ/. The front vowels occur quite separately from the central and back vowels. It also appears that the vowels /a/ and /ɔ/ occur close to each other, with only a little difference in the tongue advancement position.

⁷ See the formant frequencies of each vowel in Appendix 1.

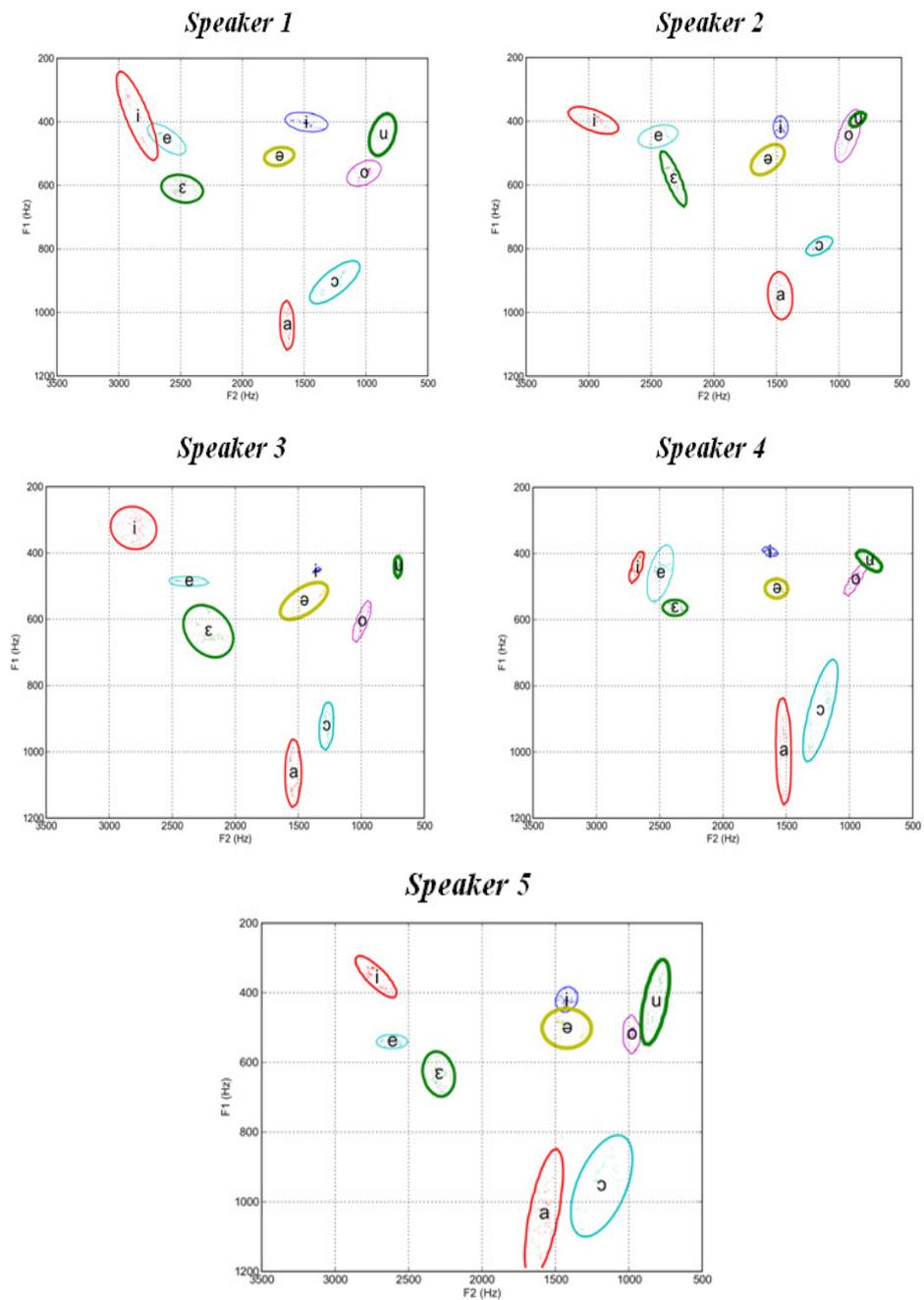


Figure 1 Vowel spaces of Phrae Pwo Karen vowels as spoken by five speakers of the over-60 group

Variation and Change of the Phrae Pwo Karen Vowels and Tones

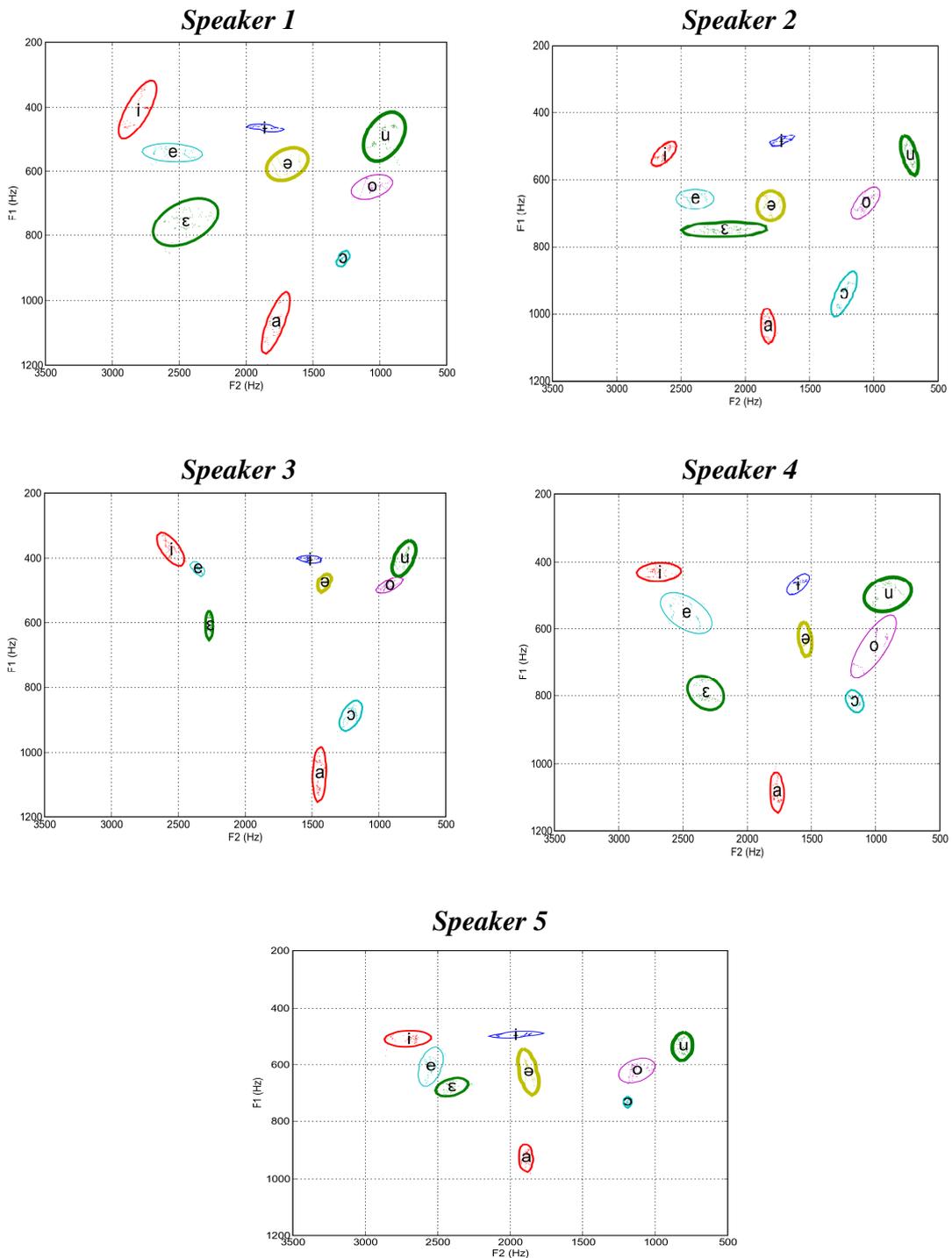


Figure 2 Vowel spaces of Phrae Pwo Karen vowels as spoken by five speakers of the 35-50 group

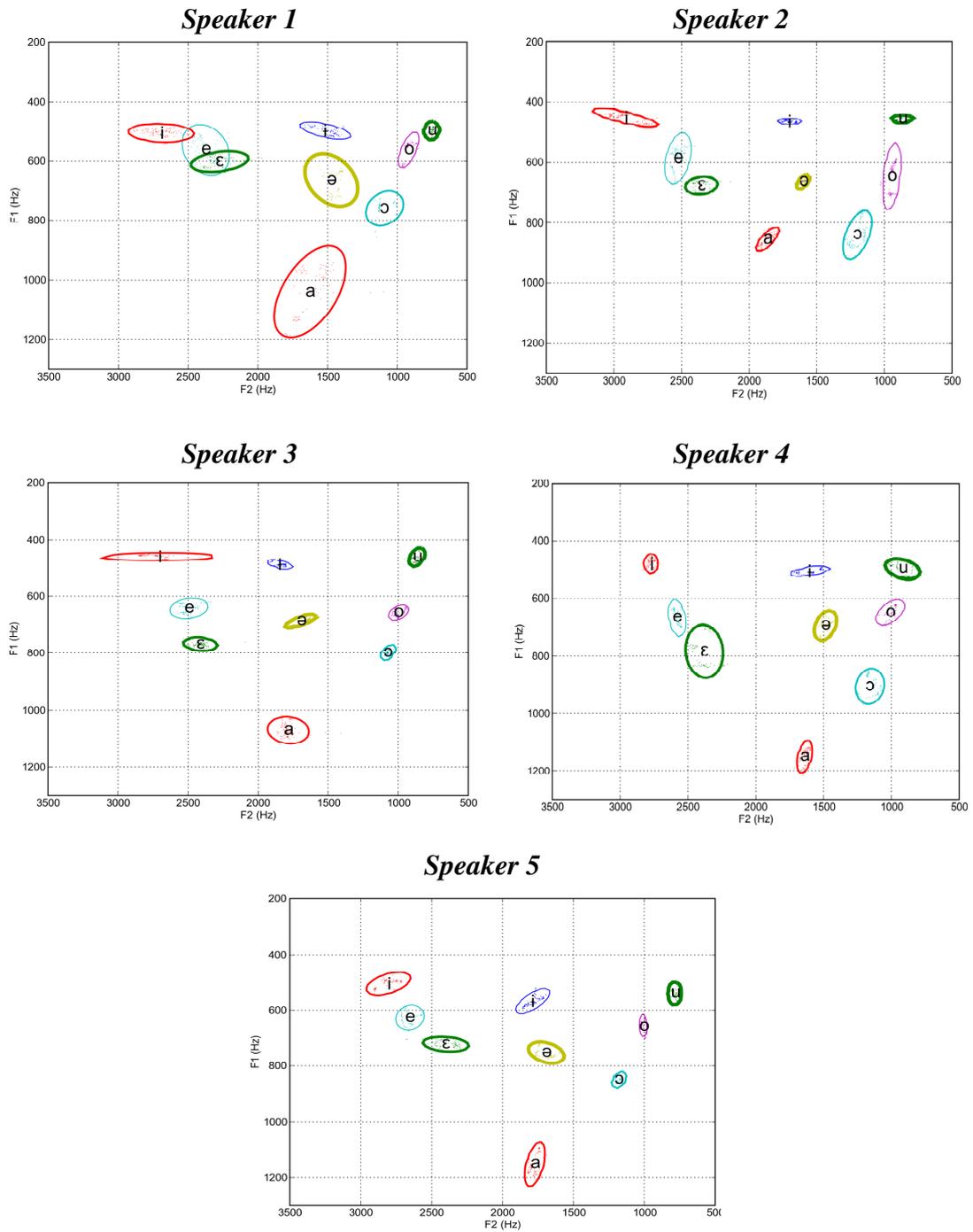


Figure 3 Vowel spaces of Phrae Pwo Karen vowels as spoken by five speakers of the under-25 group

Figure 2 shows that the overall space of the nine monophthongs as spoken by five speakers of the 35-50 group seems to be different from that spoken by the over 60 group. Even though the front vowels /i e ε/ occur close to one another, it can be clearly seen in speakers 1, 3, and 4 that the vowel /ε/ moves downward separately from the vowels /i e/. This means that the difference of tongue height position or the first formant frequency (F1) is wider in these three speakers. The central vowels /i ə/ occur close to each other separately from the vowel /a/. It is also noticeable that the back vowel /ɔ/ moves upward in the data from speakers 4 and 5. It can be said that these speakers move the tongue height position higher than the other speakers.

Considering the tongue advancement or the second formant frequency (F2), the tongue position of the vowels /a/ and /ɔ/ occurs separately from each in all of the speakers except for speaker 3. It clearly shows that for the vowel /ɔ/, the back of the tongue moves to a similar position as the vowels /u o/. It is noticeable that the vowels /a/ and /ɔ/ of speaker 3 occur close to each other, with only a little difference in the tongue advancement position which is similar to the over-60 group.

In Figure 3, the overall space of the nine monophthongs as spoken by five speakers of the under-25 group looks similar to that spoken by the 35-50 group. Considering the front vowels, the vowel /ε/ moves downward, whereas the vowel /ɔ/ moves upward in the vowel area. The difference of the tongue height position of the vowels /i e ε/ is clearer, except for speaker 1. As

for the vowel /ɔ/, the tongue moves to the higher position in all of the speakers.

In conclusion, the vowel /ε/ moves downward in speakers 3 and 5 of the over-60 group (see Figure 1), in speakers 1, 2, and 4 of the 35-50 group (see Figure 2), and in speakers 2, 3, 4, and 5 of the under-25 group (see Figure 3). The vowel /ɔ/ moves upward in the vowel area as seen in Figure 2 in which the vowel /ɔ/ moves upward in speakers 1, 2, 4 and 5. In Figure 3, the vowel /ɔ/ moves upward in all of the speakers. It looks as if the variation and change occur in Phrae Pwo Karen vowels as clearly seen in the 35-50 group and the under-25 group.

4.2 Tones

There are 4 tones in Phrae Pwo Karen, namely, the high tone, mid tone, low tone and falling tone with an allotone in the mid tone and falling tone. Phonetically, the high tone is high level and high rising [44 ~ 45], the mid tone is mid level [33], the low tone is low falling [21], and the falling tone is high falling [41]. The mid tone in checked syllables is [332 ~ 32] and the falling tone is [442 ~ 42].

The semitones converted from fundamental frequencies of each tone as spoken by five speakers of each group were plotted using Microsoft Excel 2007 as shown in Figures 4, 5, and 6.⁸

⁸ See the fundamental frequencies of Phrae Pwo Karen tones of each speaker in each group in Appendix 1 and Appendix 2.

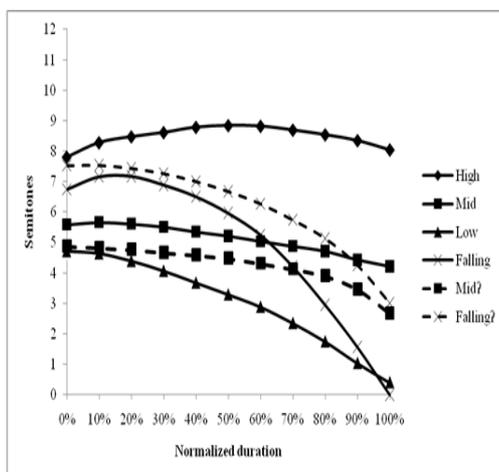


Figure 4 Semitones of Phrae Pwo Karen tones as spoken by the over-60 group⁹

Figure 4 shows that in the over-60 group, in non-checked syllables, the high tone begins at a high pitch and stays level until the end. The mid tone starts at a mid pitch and also stays level until the end. The low tone starts at a mid/low¹⁰ pitch and falls to a low pitch. The falling tone begins at a high pitch and then rises slightly before sharply falling to a low pitch.

In checked syllables, the mid tone starts at a mid/low pitch and stays level before falling slightly at 80% of the duration. The falling tone begins at a high pitch and then falls to a mid/low pitch.

For the 35-50 group as shown in Figure 5, the acoustic characteristics of the 4 tones are similar to those of the over-60 group. In non-checked syllables, the high tone begins at a high pitch and rises slightly until the end. The mid tone starts at mid pitch and also stays level until the end.

The low tone starts at a mid pitch and falls sharply to a low pitch. The falling tone begins at a high pitch and then sharply falls to a low pitch at 50% of the duration. However, it is noticeable that the high tone behaves differently from that of the over-60 group.

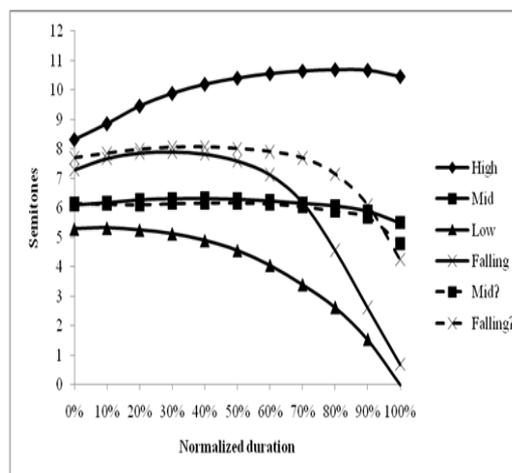


Figure 5 Semitones of Phrae Pwo Karen tones as spoken by the 35-50 group

In checked syllables, the mid tone has a similar contour as in non-checked syllables. It starts at mid pitch and also stays level until the end. The falling tone begins at a high pitch and stays level until 60% of the duration before falling to a mid pitch.

In Figure 6, in non-checked syllables, the change of the high tone is clearer in the under-25 group. It starts from a mid pitch and rises sharply to the highest pitch of the scale. The acoustic characteristic of the mid tone is mid level starting at a mid pitch and staying level to the end of the duration. The low tone is low-falling starting at a mid pitch and falling sharply to a low pitch. The falling tone is high-falling starting at a high pitch and slightly rising before sharply falling at 60% of the duration.

⁹ Solid line represents a non-checked syllable. Dotted line represents a checked syllable.

¹⁰ The mid/low pitch means a mid pitch which moves to a low pitch.

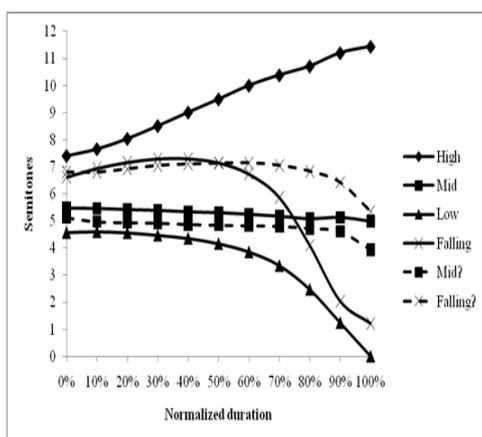


Figure 6 Semitones of Phrae Pwo Karen tones as spoken by the under-25 group

In checked syllables, the mid tone starts at a mid pitch and stays level before falling slightly at the last 10% of the duration. The falling tone begins at a high pitch and stays level until 70% of the duration before falling to a mid pitch.

It looks as if the acoustic characteristics of Phrae Pwo Karen tones as spoken by the 35-50 group and the under-25 group have changed, i.e., the contour of the high tone in non-checked syllables has changed from high level to mid-rising.

5. Conclusion and discussion

The acoustic characteristics of the vowels and tones in the Phrae Pwo Karen spoken by three generations are shown below;

5.1 Vowels

As mentioned in the Introduction, there are nine monophthongs in Phrae Pwo Karen, without length distinction: /i e ε i ə a u o ɔ/. The front vowels /i e ε/ occur very

close to one another, i.e. with only a little difference in tongue height position (F1). The central vowels /i ə/ and the back vowels /u o/ occur close to each other, whereas the vowel /a/ appears close to the vowel /ɔ/. See Figure 7.

In Figure 7, it is noticeable that the vowel /ɔ/ starts to move upward in the 35-50 group and obviously changes its position in the under-25 group. This situation might be explained in terms of external factors. If the overall space of Standard Thai vowels (Intajamornrak 2002)¹¹ and of Tai Yuan vowels is considered¹², the tongue height position (F1) of the vowel /ɔ/ is similar to the low front vowel /ε/ (see Figure 8). Contact with Standard Thai or Tai Yuan might cause the vowel /ɔ/ to shift upward. This evolution is at its clearest in data from speakers 4 and 5 of the 35-50 group (see Figure 2) and also in speakers 3, 4, and 5 of the under-25 group (see Figure 3). A noticeable evolution also affects the front vowel /ε/, which moves downward in speakers 1 and 4 of the 35-50 group (see Figure 2) and also in speakers 3 and 4 of the under-25 group (see Figure 3). Speakers 1 and 2 in the under-25 group are not included because their vowels /ε/ and /ɔ/ do not have the same tongue height position, and the vowel /ɔ/ also appears close to the vowel /a/.

¹¹ Standard Thai speakers are 45-60 years old. See the word list in Intajamornrak 2002.

¹² Only long vowels are considered because the duration of vowels in Phrae Pwo Karen is phonetically similar to the duration of long vowels in Standard Thai and Tai Yuan.

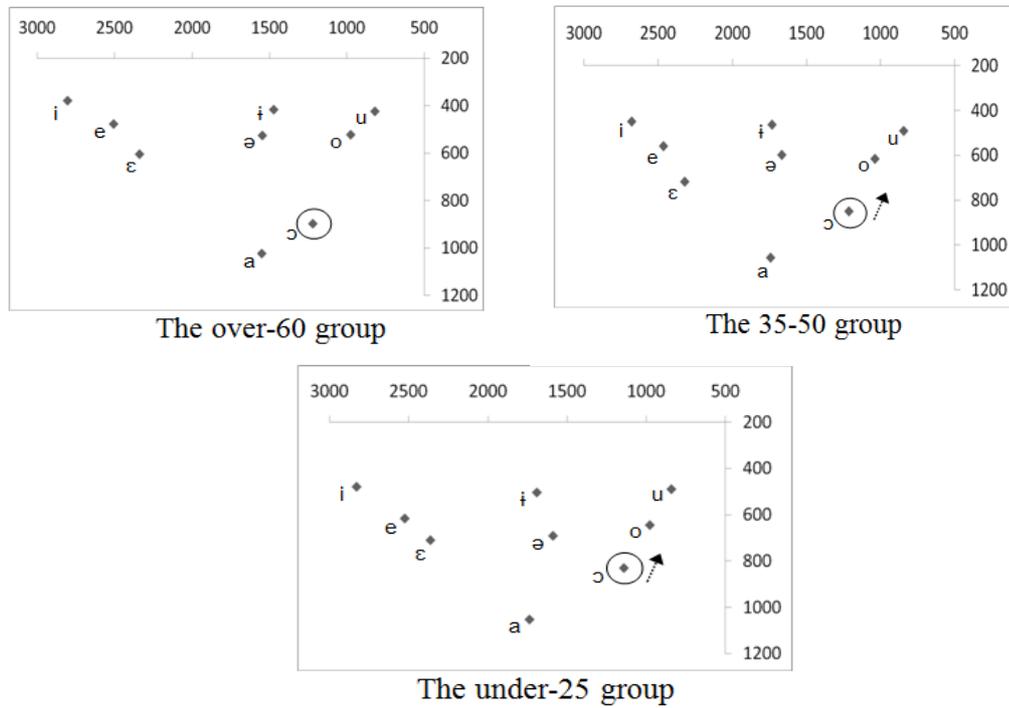


Figure 7 The overall space of Phrae Pwo Karen vowels as spoken by three groups of speakers

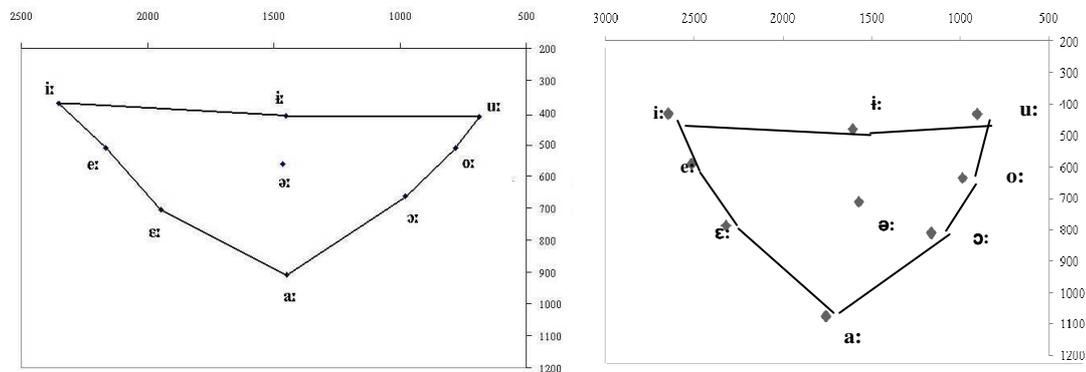


Figure 8 The overall space of Standard Thai long vowels (left) and of Tai Yuan long vowels¹³ (right)

¹³ The Tai Yuan long vowels were spoken by three female Tai Yuan (Phrae) native speakers between 35-50 years old which can be compared with Standard Thai from Intajamornrak 2002 and this age represents language in the present. The methodology for acoustical measurement of Tai Yuan vowels is the same as for Phrae Pwo Karen vowels. See the wordlist below.

/ii/ pii	'year'	/ii/ khii	'to be'	/uu/ khuu	'ditch'
/ee/ thee	'to pour'	/əə/ thəə	'you'	/oo/ too	'big'
/εε/ phεε	'raft'	/aa/ thaa	'to paint'	/ɔɔ/ khɔɔ	'neck'

* For the words 'thee' 'thəə' 'too', the informants use these words sometimes and pronounce them with Tai Yuan tones.

Figure 8 shows the overall space of Standard Thai long vowels and Tai Yuan long vowels. The position of the vowel /ɔ:/ for both Standard Thai and Tai Yuan is closer to the other back vowels /u: o:/ than the vowel /a:/. Considering the F1, the vowels /ɛ:/ and /ɔ:/ appear in the same tongue height position. Additionally, with regard to the tongue advancement, the vowel /a:/ is a central vowel, while the /ɔ:/ is a back vowel. In language-contact situations, the difference between a language spoken by a majority group and a language spoken by a minority group is one of the factors which bring about language variation and change. Karen is said to be a minority language whereas Tai Yuan is a majority language in Phrae as is Standard Thai, which is a majority language of the country. Thomason (2001: 66) explains that if one of two groups in contact is much larger than the other, the smaller group's language tends to acquire features from the larger group's language.

5.2 Tones

Recall that there are four tones in Phrae Pwo Karen, namely the high tone, mid tone, low tone and falling tone. However, based on the over-60 group, the acoustic characteristics of each tone reveal that: *the high tone* is high level starting at a high pitch and staying level to the end of the normalized duration; *the mid tone* is mid level starting at a mid pitch and then slightly falling over 75% of the duration; *the low tone* is mid-falling starting at a mid pitch and sharply falling to a low pitch; *the falling tone* is high-falling starting at a high pitch and sharply falling to a low pitch. In checked syllables, the mid tone is mid level with the same contour as those in non-checked syllables;

the falling tone is high-falling with less degree of pitch change than for those occurring in non-checked syllables.

However, the shape or contour of the four tones as spoken by each group of speakers is very similar except for the high tone. Figure 9 shows that the tonal contour changes from level to rising. In the over-60 group, it begins at a high pitch and stays level to the end point. The high tone of the 35-50 group also starts at a high pitch but continually rises which can be seen in the difference from the onset to the offset. The change is clear in the under-25 group, where it becomes a rising tone with an obvious degree of pitch change or pitch contour. Moreover, the tonal onset is lowered from a high pitch to a mid-high pitch. The acoustic characteristics of the high tone in the under-25 group and some speakers of the 35-50 group seem to be very similar to the high tone of Standard Thai. The Tai Yuan high tone is high-level (Intajamornrak 2011) which is similar to the high tone of the over-60 group. Therefore, in this situation it might not influence the Pwo Karen high tone.

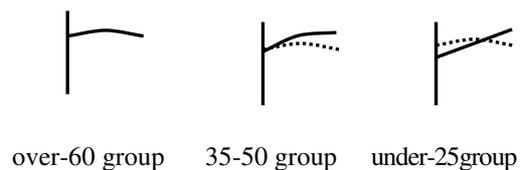


Figure 9 The high tone as spoken by three groups of speakers

Teeranon and Rungrojsuwan (2009) analyzed the high tone of Standard Thai and found that there are three variants of high tone as spoken by the under-20 group: high level [34], rising with slightly falling [322] and rising [334]. The variant that has the highest frequency distribution is rising [334] (78%) (see Figure 10). Moreover, the pitch height of the high tone

as spoken by the under-20 group moves downward from high to mid. Since the young generation studies Standard Thai in school, the high tone of Standard Thai may influence the native high tone.



Figure 10 The high tone variants in the under-20 group (adapted from Teeranon and Rungrojsuwan 2009: 41)

However, if the fundamental frequencies of Phrae Pwo Karen high tones as spoken by each speaker of the group are considered (see Appendix 2), the variation seems to occur in middle age as seen in speakers 1 and 2. It is possible that some Karen speakers at this age went to school and also work in the Khangchai Women's Weaving Group, so they have a chance to use Tai Yuan and Standard Thai frequently.

In conclusion, the acoustic characteristics of the vowels and tones as spoken by three generations suggest that Phrae Pwo Karen is in the process of changing because of the variation among the three groups. The variation and change seems to be caused by language contact with Tai Yuan and Standard Thai. As Weinreich (1968) said, the bilingual speaker's relation to the languages that come into contact must be considered in language contact situations. Here, contact with Tai Yuan and Standard Thai is a factor that brings about variation and change in Pwo Karen because of being the majority language of Phrae and the national language. However, as the high

tone shows, the situation occurs differently among the different groups of speakers. The over-60 group seems to be more familiar with Tai Yuan than Standard Thai, whereas the speakers of the 35-50 group have a chance to use Standard Thai, so tonal variation can be seen in the latter group. In the under-25 group, they are definitely familiar with Standard Thai because they use it in school and they are also very good at Tai Yuan. Therefore, their language seems to be influenced by both Standard Thai and Tai Yuan.

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Appendix 1

Table 1 The formant frequencies of Phrae Pwo Karen vowels: the over-60 group

	i	e	ɛ	ɨ	ə	a	u	o	ɔ
F1	2772.81	2542.18	2354.57	1465.39	1534.90	1545.20	820.64	965.56	1223.36
F2	376.79	466.02	601.80	423.40	483.95	1022.35	423.17	491.65	905.56

Table 2 The formant frequencies of Phrae Pwo Karen vowels: the 35-50 group

	i	e	ɛ	ɨ	ə	a	u	o	ɔ
F1	2688.82	2475.75	2341.73	1731.33	1675.31	1736.77	832.06	1021.55	1213.64
F2	457.02	545.79	705.07	464.44	579.72	1048.48	501.55	603.83	842.69

Table 3 The formant frequencies of Phrae Pwo Karen vowels: the under-25 group

	i	e	ɛ	ɨ	ə	a	u	o	ɔ
F1	2774.39	2550.49	2529.50	1677.74	1577.62	1728.39	838.92	973.99	1126.47
F2	503.80	606.70	699.18	506.70	682.67	1069.53	496.25	626.10	818.85

Table 4 The fundamental frequencies (Hz) of Phrae Pwo Karen tones: the over-60 group

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
H	183.33	182.52	179.94	176.57	172.65	168.82	164.89	159.88	154.40	148.18	142.82
M	192.72	193.59	193.01	191.93	190.13	188.66	186.74	184.99	183.24	180.28	178.03
L	206.05	211.10	211.28	207.83	203.27	196.97	189.01	177.98	165.52	152.79	139.55
F	218.96	225.13	227.67	229.50	231.84	232.59	232.32	230.60	228.54	226.00	222.03
M?	184.98	184.45	183.77	182.76	181.86	180.74	179.01	177.11	174.80	170.44	162.85
F?	215.64	215.77	214.55	212.41	209.26	205.33	200.55	194.49	187.81	178.47	166.06

Table 5 The fundamental frequencies (Hz) of Phrae Pwo Karen tones: the 35-50 group

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
H	215.31	215.69	214.77	213.24	210.46	206.34	200.39	192.93	184.53	173.22	158.63
M	225.69	226.65	227.92	228.43	228.48	228.16	227.43	226.38	225.27	222.95	217.94
L	241.77	247.21	249.89	250.48	249.34	246.00	239.49	226.86	206.54	184.47	165.05
F	256.56	264.68	273.99	280.90	285.96	289.41	291.99	293.46	294.24	293.90	290.31
M?	226.46	226.08	225.84	226.40	226.65	226.71	226.19	225.01	222.93	220.22	209.17
F?	247.52	249.69	251.60	252.62	252.82	252.02	250.55	247.43	239.78	225.69	202.68

Table 6 The fundamental frequencies (Hz) of Phrae Pwo Karen tones: the under-25 group

	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
H	230.64	231.02	230.49	229.26	227.75	225.21	221.25	214.88	204.20	190.16	176.98
M	242.78	242.63	242.06	241.63	240.90	240.46	239.62	238.66	237.43	238.08	236.13
L	259.57	264.40	267.88	269.94	269.97	267.62	261.28	248.52	224.35	199.11	189.81
F	271.48	275.41	281.58	289.39	297.91	306.40	315.50	322.58	328.79	338.24	342.89
M?	238.00	235.95	235.51	235.28	234.59	234.22	233.94	233.68	232.59	231.02	222.07
F?	262.15	262.19	263.93	265.92	266.74	267.20	267.41	265.99	262.73	256.55	241.09

H = high tone, M = mid tone, L = low tone, F = falling tone

M? = mid tone in checked syllable, F? = falling tone in check syllable

Appendix 2

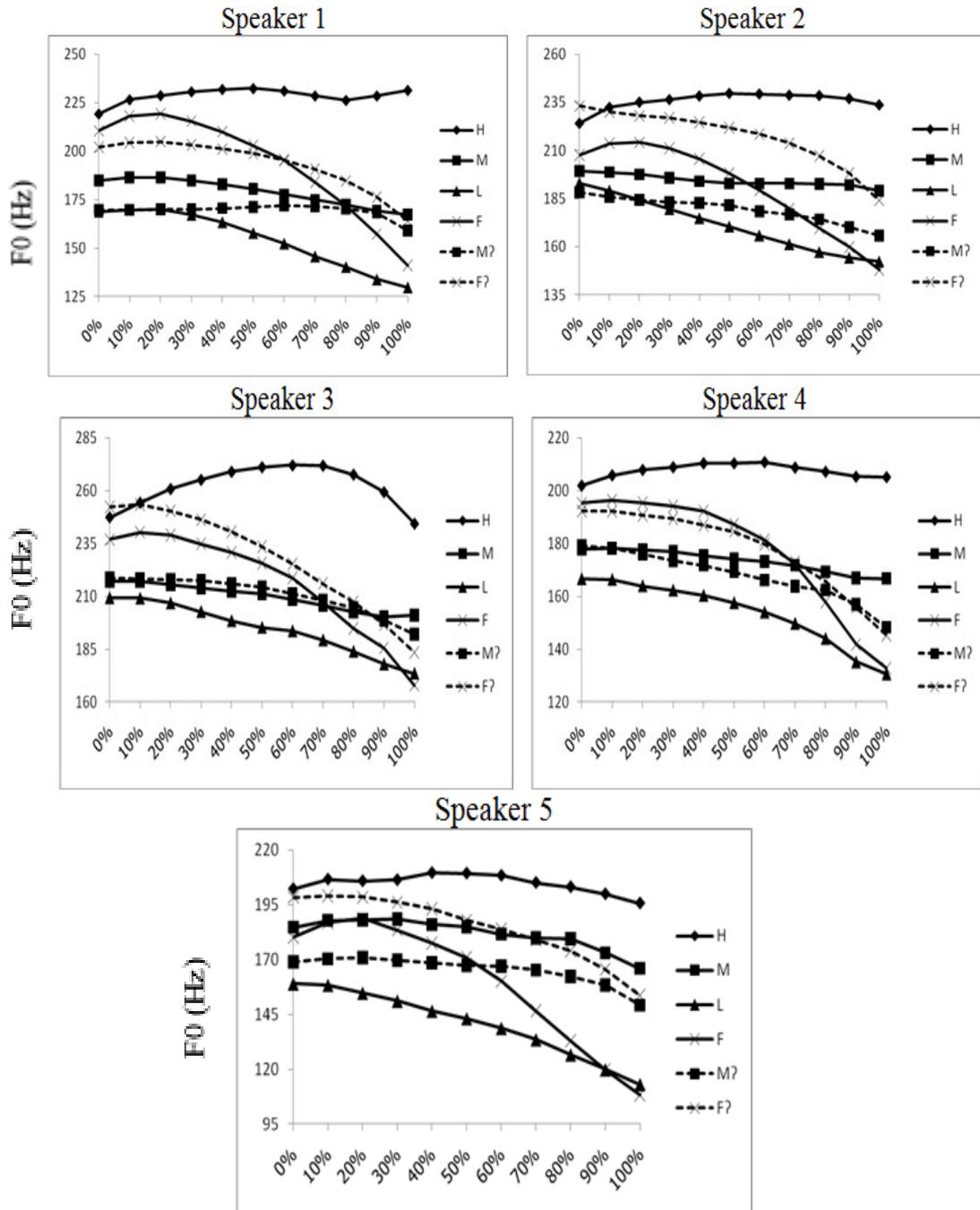


Figure 1 Fundamental frequencies of Phrae Pwo Karen tones as spoken by the over-60 group

Variation and Change of the Phrae Pwo Karen Vowels and Tones

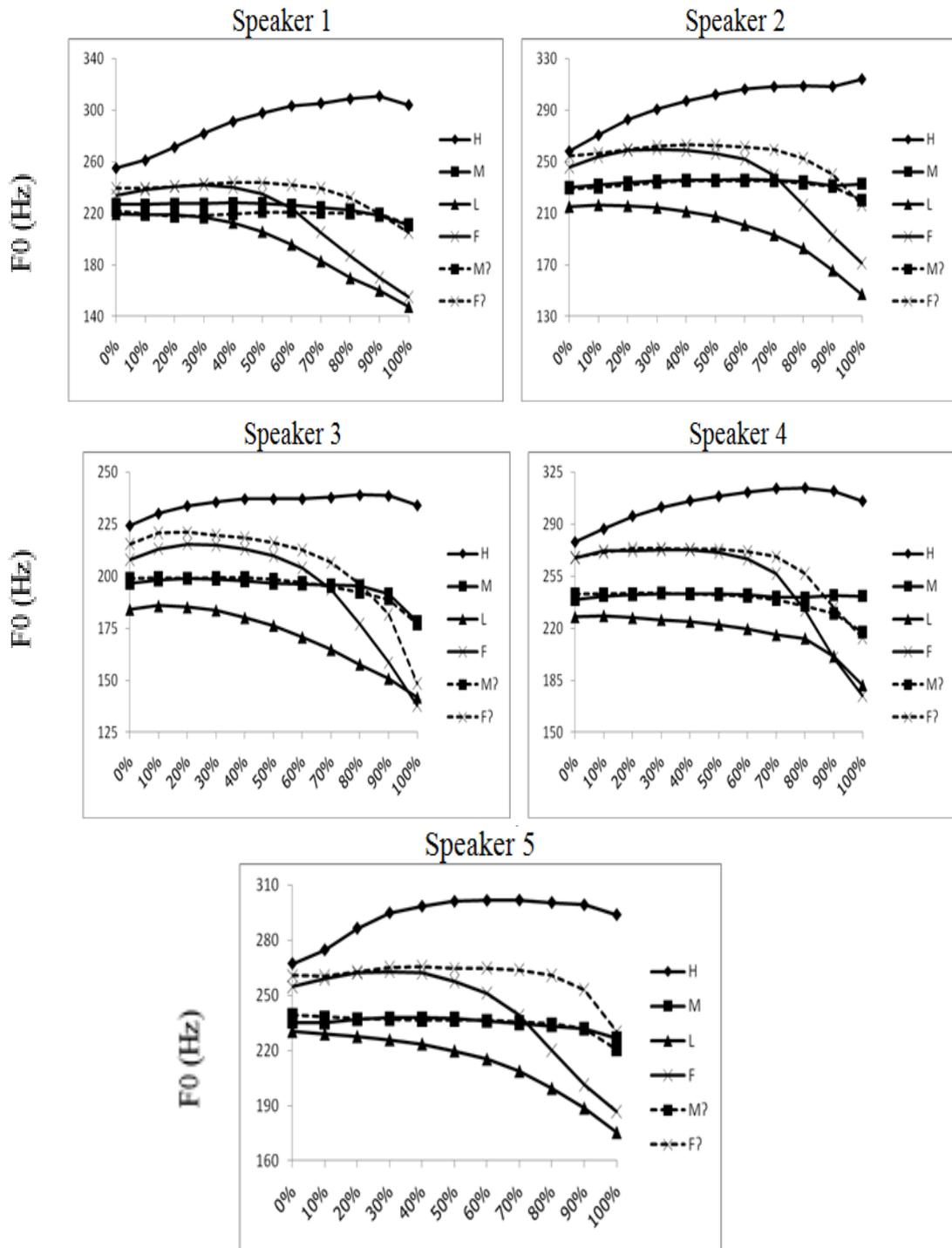


Figure 2 Fundamental frequencies of Phrae Pwo Karen tones as spoken by the 35-50 group

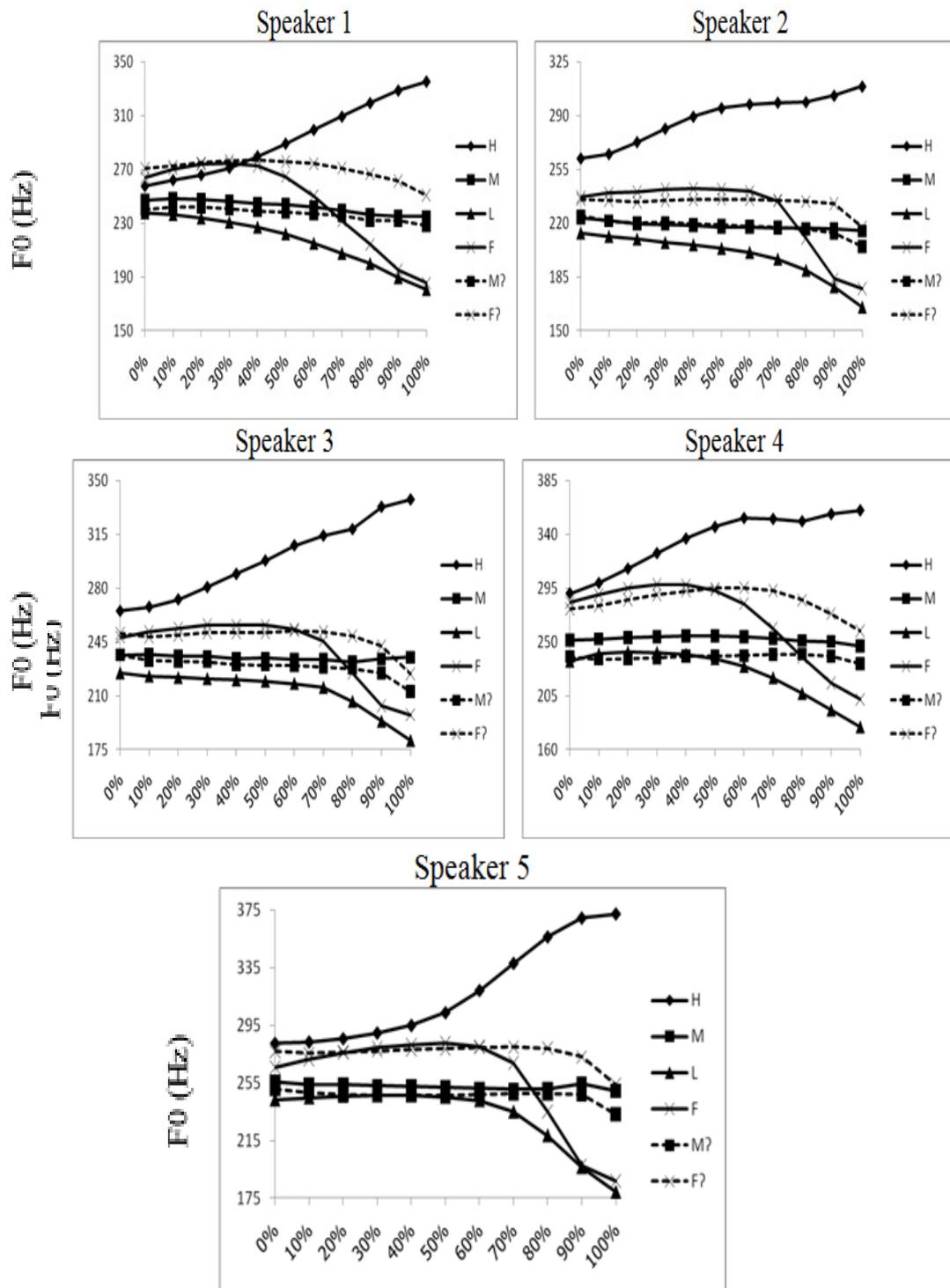


Figure 3 Fundamental frequencies of Phrae Pwo Karen tones as spoken by the under-25 group