An Experimental Research on the Intonation of Lahu Language and the Common Speech of China

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Keywords: the Lahu language; the common speech of China; tone experiment.

Abstract: When teaching minority students the common speech of the Chinese language, tone teaching has always been a difficult point. This paper took the intonation of the Lahu language and the common speech of China as research objects, carried out a phonetic experiment to extract acoustic data, and applied the phonology method to summarize and describe the acoustic characteristics of the intonation of the Lahu language and the Mandarin. From the perspective of pitch and length of tone, this paper compared the features of their tones and summarizes relevant rules, with a view to provide useful suggestions for the teaching of tones in common speech of China for Lahu students.

1. Introduction

The proposal to popularize the common speech of Chinese language (Mandarin or Putonghua) was adopted by the Fifth National People's Congress in 1982 and was written into Article 19 of the Constitution of the People's Republic of China. Chinese is a tone language, so tone has always been the focus and difficulty in phonetics learning. When teaching minority students about correct pronunciation of Mandarin, there are some issues deserving attention. These questions include how to carry out targeted teaching in view of students with different mother tongues, what problems should be paid attention to in the teaching process, and what aspects should be noticed to make the teaching more effective. In this paper, an experiment is designed for the teaching of mandarin intonation for Lahu students. By comparing the characteristics of intonation in the Lahu language and the common speech and summarizing relevant rules, the author hopes to provide some practical suggestions for the teaching of tones in mandarin for Lahu students.

2. Experiment Design

In this paper, the praat v4.2.29 speech analysis software and the Microsoft Excel 2007 software were used to extract the basic frequency of tones in the Lahu language and mandarin. Through normalizing the basic frequencies (LZ method), the models of intonation patterns were established. The acoustic characteristics of tones in the Lahu language and the common speech were summarized and describe by means of phonology. From the perspective of pitch and length of tones, the characteristics of the two speeches were compared and the rules were summarized.

2.1 Word list

In this paper, the pronunciation words were provided by Jin-rong Liu, an expert of the Lahu language and professor at the College of Ethnic Culture, Yunnan Minzu University. 10 words were selected for each category of tone. A total of 7 * 10 = 40 words were selected as following.

The first tone

phonetic symbol: tɕa^{33} pa^{33} ma^{33} pha^{33} ta^{33} ɕa^{33} ka^{33} xa^{33} ʑa^{33} na^{33}

meaning: find, change, female, cloth, partner, happiness, install, shadow, compel, listen

The second tone

phonetic symbol: tɕa^{31} pa^{31} ma^{31} pha^{31} ta^{31} ɕa^{31} ka^{31} xa^{31} ʑa^{31} na^{31}

meaning: fierce, this, individual, eulogy, begin, hunt, here, hard, let, sickness

  DOI: 10.25236/icallh.2019.004

The third tone
phonetic symbol: tɕa^{53} pa^{53} ma^{53} pha^{53} ta^{53} ɕa^{53} ka^{53} xa^{53} ʑa^{53} na^{53}
meaning eat, nearby, many, person, other, thin, hear, quick, kid, move
The fourth tone
phonetic symbol: tɕa^{35} pa^{35} ma^{35} pha^{35} ta^{35} ɕa^{35} ka^{35} xa^{35} ʑa^{35} na^{35}
meaning: boil, thin, son-in-law, Hui Nationality, pass, pick, work, rest, model, deep
The fifth tone
phonetic symbol: tɕa^{21} pa^{21} ma^{21} pha^{21} ta^{21} ɕa^{21} ka^{21} xa^{21} ʑa^{21} na^{21}
meaning: crush, mate, military, leaf, da, plug, auxiliary word, love, wrong, early
The sixth tone
phonetic symbol: tɕa^{54} pa^{54} ma^{54} pha^{54} ta^{54} ɕa^{54} ka^{54} xa^{54} ʑa^{54} na^{54}
meaning: strip, collapse, dream, part, select, spread, cold, illusion, spade, black
The seventh tone
phonetic symbol: tɕa^{11} pa^{11} ma^{11} pha^{11} ta^{11} ɕa^{11} ka^{11} xa^{11} ʑa^{11} na^{11} (ma^{53})
meaning: say hi, fall, teach, create, finish, meat, room, poor, press, oil

In this paper, the pronunciation list of the common speech was selected from sample words in the Character List for Dialect Survey (published by The Commercial Press, 1981) compiled by the Language Research Institute of the Chinese Academy of Social Sciences. Eight words were selected for each tone group; a total of 4*8 = 32 experimental words were chosen as follows.

The high and level tone: tian (sky), qi (seven), hua (flower), fei (fly), di (low), zhu (pig), shuo (speak), ge (older brother)

The rising tone: he (river), tou (head), long (dragon), zhu (bamboo), de (gain), ti (question), cai (talent), shi (stone)

The falling-rising tone: ku (bitter), tu (soil), du (bet), hu (tiger), huo (fire), chu (an ancient place name), shu (mouse), bi (pencil)

The falling tone: di (younger brother), qu (go), da (big), si (temple), shi (yes), xiao (laugh), hou (behind), zuo (sit)

2.2 Pronunciation cooperators

The pronunciation partner of the Lahu language comes from the area where people speak correct Lahu language. Hong-mei Gao is a 21-year-old woman from Nuofu Village, Nuofu Township, Lancang County of Yunnan Province. She a junior in the College of Ethnic Culture, Yunnan Minzu University; her major is the Lahu Language.

The pronunciation partner of the common speech of China comes from the area where people speak correct Mandarin. Xue-fei Li is a 32-year-old female from Chaoyang District of Beijing. She is currently teaching senior students in the high school of No. 78 Middle School in Xuanwu District, Beijing. She has the Grade 1 Level B certificate for the National General Language Proficiency Test.

2.3 Experiment steps

2.3.1 The recording

Before the formal recording, the pronunciation partners were asked to read the pronunciation word list several times with normal and suiTable speed. They also needed to listen to each other to ensure they read aloud the word list with normal and natural voice and intonation.

2.3.2 Base frequency extraction

The author first observed the recorded speech materials with Praat software, and then analyzed the broadband and narrow-band speech spectrum to determine the tone carrying segments of each sample, and then carried out the automatic extraction of base frequency. First of all, the author combined the broadband and narrow-band speech map to determine the tone carrying segments. Secondly, the Praat software was used to automatically extract the base frequency value and absolute duration of each sample in the entire tone carrying segments from 11 percentile moment

points from 0% to 100%. Finally, all kinds of data obtained were imported into Excel software.

2.3.3 The normalization process required two different normalization methods.

First was the normalization of the fundamental frequency. The fundamental frequency values of 11 time points were imported into Excel to calculate the average value first. Then the formula $z_i = \frac{y_i - m_y}{s_y} = \frac{\log_{10} x_i - \frac{1}{n}\sum_{i=1}^{n}\log_{10} x_i}{\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(\log_{10} x_i - \frac{1}{n}\sum_{i=1}^{n}\log_{10} x_i)^2}}$ was used to calculate the LZ value. The data were then used to draw the tone pattern. The LZ value was converted to the traditional five-degree value by dividing the field and combining with the listening sense. The normalization of tone length went afterwards. This paper adopted the standardized normalization method used in An Experimental Study on the Tone of Wu Language to calculate the relative tone length. The formula is as follows:

$$ND_i = \frac{D_i}{\frac{1}{n}\sum_{i=1}^{n} D_i}$$

In which D_i was the absolute length value and n is the number of tone categories in the language. According to data obtained, the chart of absolute tone length was made by Excel.

3. Experiment Analysis

The basic frequencies of tones in the Lahu language and the common speech were extracted; the intonation patterns of the two languages were drawn.

3.1 Intonation patterns

3.1.1 Intonation pattern of the Lahu language

There are seven tones in the Lahu language, and there is little difference in the opinions of scholars on the values of these seven tones. There are three main views. Represented by the Brief Introduction to the Lahu Language written by Hong-en Chang, the Language Encyclopedia and Volume 59 of Minority Language in Yunnan Provincial Chronicles share the same opinion. Jin-rong Liu studies of intonation pattern of the Lahu language through the experimental method and published the article, Study on the Quadri-syllabic Words in the Lahu Language. His view on the tone pitch is similar with this kind of opinion. American linguist Matisoff expressed his own ideas on the intonation of the Lahu language in The Grammar of Lahu. You-jing Jin made two field visits on the Lahu language in 1986 and 1987. The intonation he recorded is different from the two kinds of viewpoints mentioned above. Specific values can be seen in the following Table.

Tone	1st tone	2nd tone	3rd tone	4th tone	5th tone	6th tone	7th tone
Hong-en Chang	33	31	53	35	21	54	11
Matisoff	33	21	54	45	2↑	5↓	11 (2)
You-jing Jin	44	31	53	35	21	54	11

This paper compared the results of this study with different views.

Through the experiment, the intonation pattern of the Lahu language was drawn as follows.

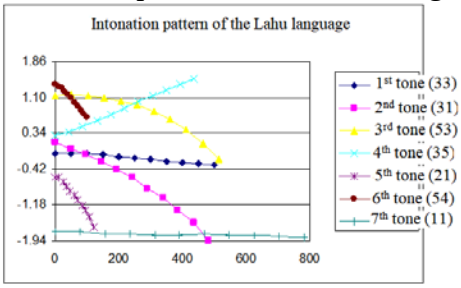

Figure 1. Intonation pattern of the Lahu language

3.1.2 Intonation pattern of Mandarin

There are four tones in the common speech of China. The tone values are high and level tone [55], rising tone [35], falling-rising tone [214], and falling tone [51].

Through the experiment in this paper, the intonation pattern of Mandarin is drawn as follows.

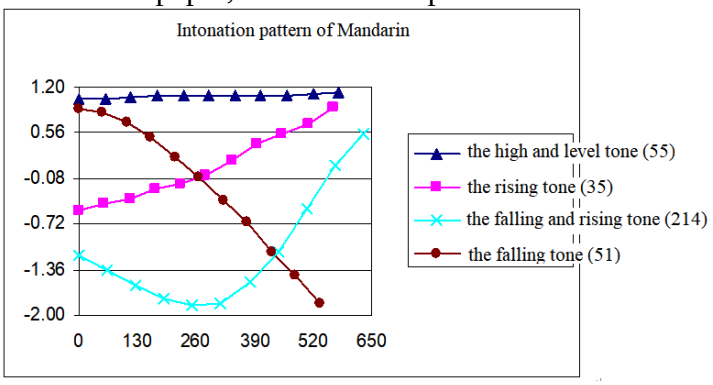

Figure 2. Intonation pattern of Mandarin

3.2 Comparison on the intonation patterns of the Lahu language and Mandarin

This part compared the pitch and length of tones in Lahu language and the common speech, and then analyzed their common characteristics and differences.

3.2.1 Comparison of tonal patterns

From the intonation patterns obtained by the experiment, following features can be found.

There are three tonal patterns in the Lahu language: level tones, rising tones and falling tones. Among them, there are two level tones, which are the medium level tone of the first tone (33) and the low level tone of the seventh tone (11).There is one rising tone, namely the high rising tone of the fourth (35) tone. There are four falling tones: the low falling tone of the 2nd tone (31), the high falling tone of the 3rd tone (53), the relatively low falling tone of the 5th tone (21) and the relatively high falling tone of the 6th tone (54). There are two entering tones, which are formed when the tight vowels appear in the high and low falling tones.

There are four types of tonal pattern in mandarin: level, rising, inflection and falling. There is only one tone for each type, namely the high and level tone (55), the high rising tone (35), the falling and rising tone (214) and the high falling tone (51).

(1) The common features of tonal patterns of the Lahu language and Mandarin

A. Both languages have three basic types of tones: flat, rising and falling.

B. There is only one rising tone in each language. Both of them are high rising tones.

B. Both of them have high falling tones.

(2) The differences of intonation patterns of the Lahu language and Mandarin

A. The Lahu intonation is relatively simple, without inflection tones; Mandarin intonation is relatively complex with twists and turns.

B. The Lahu language has two entering tones which are not possessed by Mandarin.

C. The common speech has less number of similar intonation types than the Lahu language. For example, there are four level tones and two rising tones in the Lahu language, but there is only one in the common speech.

3.2.2 Comparison of tone pitches

From the experimental tone pattern, following features can be found.

The intonation values of the Lahu language are: the first intonation [33], the second intonation [31], the third intonation [53], the fourth intonation [35], the fifth intonation [21], the sixth intonation [54], and the seventh intonation [11]. Although the results of this study are different from previous studies on intonation values (see above), there are only minor differences, such as [31] or [21], [53] or [54]. The results of this experiment are consistent with those of Chang’s hearing and Liu’s experiment.

The intonation values of the common speech are the high and level tone [55], the rising tone [35], the falling-rising tone [214], and the falling tone [51]. It is consistent with the records of previous studies.

From above analysis, the results of this experiment are consistent with those of traditional studies.

Tone pitch refers to the change of the length, level and inclination of tones, that is, the actual pronunciation of tones. The pitch value described in the quintile system is relative, not absolute physical value. Therefore, there is no comparability between the tone values of two different language systems.

3.2.3 Comparison on the lengths of tones

The data of absolute intonation lengths of the Lahu language were extracted directly by voice software, and then the data of relative intonation lengths of the Lahu language were calculated. The data are as follows.

Lengths of tones in the Lahu Language

tone	1st tone	2nd tone	3rd tone	4th tone	5th tone	6th tone	7th tone
absolute length	470	438	489	411	90	97	878
comparative length	1.15	1.07	1.19	1.00	0.22	0.24	2.14

From these data, it is obvious that except for the 5th and 6th tones, the absolute lengths of other tones are more than 400 ms, while the absolute lengths of the 5th and 6th tones are 90 ms and 97 ms, which are quite different from other tones. Combining with the intonation pattern of the Lahu language, it can be seen intuitively that the inclination of the two tones is relatively large, which indicates that the two tones are very short compared with other tones. It can be seen that these two tones should be entering tones.

The data of absolute intonation lengths of Mandarin were extracted directly by voice software, and then the data of relative intonation length of the common speech were calculated. The data were as follows.

Lengths of tones in Mandarin

Tone	high and level tone	rising tone	falling-rising tone	falling tone
Absolute length	577	565	631	534
comparative length	1	0.97	1.09	0.93

From these data, it is obvious that the rising tone is longer than the other tones; the absolute time is longer than 600 ms. Other three tones are not more this figure.

Based on the comprehensive analysis of the tone length of the two languages and the intuitive tone pattern, the commonness and differences of the Lahu language and the common speech are obtained.

(1) The common features of the Lahu Language and Mandarin in the length of tone

A. The lengths of level tones are longer than those of falling tones.

B. The shortest pitches are the lowest pitches.

(2) Differences of the Lahu Language and Mandarin in the length of tone

A. Features of the length of tone in the Lahu language:

In the Lahu language, the relative length of the level tone (11) is the longest; the relative lengths of two entering tones (21 and 54) are the shortest. The length of the rising tone (35) is the shortest in all long tones, but longer than the two entering tones.

B. Features of the length of tone in the common speech:

The inflection tone of the common speech is the longest, followed by the level tone, the rising tone and the falling tone.

4. Experiment Conclusion: Suggestions on the Teaching of Mandarin Intonation to Lahu Students

According to the results of the comprehensive analysis on acoustic data obtained in this experiment, the author put forward several suggestions for Lahu students who learn the common

speech, hoping to provide some help for relevant teaching practice.

4.1 The high and level tone

Lahu students should pay attention to raising their pitch when learning the high and level tone (55). There are only medium (33) and low flat tones (11) in the Lahu language. When Lahu students pronounce the high and level tone, it is easy for them to fall or bend the pitch.

4.2 The rising tone

When learning the rising tone (214), Lahu students should pay attention to the cyclic process that their vocal cords should be tightened first, then loosened and then tightened again. Since there are no inflection tones in the Lahu language, it is difficult for them to control the tightness of their vocal cords. The low and high pitches may not be pronounced correctly. Therefore, this tone should be the focus of teaching; relevant practice should be strengthened.

4.3 The falling tone

When Lahu students learn the falling tone (51), they should pay attention to the tension of vocal cords, the high pitch of pronunciation, and the height of glide. Although there are four downward tones in the Lahu language, two of them are entering tones with very short pronunciation. The gliding height of the other two tones cannot reach the height of the [51] tone.

The study of rising tone may be relatively easy for Lahu students. There are also high-pitched tones in the Lahu language, and the tone value is also [35]. The Lahu students may not have any obstacles in learning this tone.

5. Conclusion

In the teaching of the common speech of China to minority students, only by breaking through the difficulties of tone can we realize the real education of Putonghua and lay a solid foundation for students to learn the common speech.

Acknowledgement

The project supported by the Foundation for Scientific Research Projects of Yunnan Provincial Department of Education, Project No.: 2015Y522.

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