Analysis of Monosyllabic Voice Parameters of Tibetan Lhasa Based on EGG

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Abstract: In this paper, the Real-Time EGG Analysis software on Kay's Multi-Speech 3700 processing platform is used to extract the parameters of Tibetan monosyllabic Lhasa. The average pitch, pitch range, average velocity quotient, velocity quotient range, and average open quotient. Average open quotient range. This paper analyzes the monosyllabic of Lhasa in male and female voices based on the characteristic parameters of the voice. The three most valuable parameters are selected, which are mainly used to compare the male and female voices of Tibetan Lhasa monosyllabic syllables for the fundamental frequency, open quotient and velocity quotient of monosyllabic syllables. The amplitude of female voices is analyzed from the perspective of fundamental frequency. Be lower than the male voice. However, from the perspective of business start-up, there is no obvious difference between male and female voices. Combined with the fundamental frequency analysis, the inverse relationship between business and tone is derived from the data. From the perspective of speed quotient, the average speed of male voice is higher than that of female voice.

1. Introduction

Research on Tibetan experimental phonetics. In the late 1980s, Bao Huaiqiao and Kong Jiangping began the study of Tibetan experimental phonetics, and Jiang Yan researchers also conducted related research on Tibetan language natural language understanding. Although China is the country with the largest Tibetan population and the longest Tibetan history, the study of modern phonetics started very late. In terms of Tibetan speech, there are only some acoustic studies on Tibetan speech, such as Hu Tan's "*Language (Lhasa) Tone Study*" (1980), and published "*Tibetan Studies Literary Theory*" (2002). [1] brings together the results of Tibetan studies of Mr. Hutan for many years; Bao Huaiqiao et al. "*The Tibetan Lhasa Speech Acoustic Parameter Database*" (1992); [2] Kong Jiangping's "*Tibetan (Lhasa) Tone Perception Research*" (1995); Tan Kerang, Kong Jiangping's "*Experimental study on the relationship between Tibetan vowel length and tone*" (1991); [3] with the development of speech signal processing and experimental phonetics technology, great Promoting the study of national speech, quantifiable data facilitates horizontal comparison between languages, and large-scale data processing enables the common commonality of language to be discovered. In this paper, the basic parameters of the arpeggio signal are extracted by EGG technique, and the parameters are compared and analyzed.

2. Research methods

In this experiment, 200 monosyllabic arpeggio signals were taken as the research object. The experimental pronunciations all meet the experimental requirements. Because the female voice's voice glottal impedance signal is more difficult to collect, there are many signals whose arpeggio signal noise is too large. After noise reduction preprocessing. The effect is not ideal, so the female voice's arpeggio signal statistical analysis is to extract 120 voices with better signal-to-noise ratio

from 200 monosyllabic voice signals for parameter extraction of fundamental frequency, open quotient and velocity quotient. [4]

The arpeggio signal is acquired by laryngography. The extraction of the arpeggio parameters. We use the Real-Time EGG Analysis software on the Kay Multi-Speech 3700 processing platform to select the fundamental frequency stabilization segment for each syllable. Extract the base frequency, open quotient and Voice velocity quotient, [5] save in the TXT format file, the data processing needs to write MATLAB program, and the data to be used is imported into the EXCEL table in batches. The extracted parameters are mainly: pmean (average pitch), prang (tone range), smean (average speed quotient), srang (speed quotient range), omean (average open quotient), orang (open quotient range).

2.1 Fundamental frequency analysis

The average frequency parameters of the fundamental frequency, the open quotient and the velocity quotient are extracted for the fundamental frequency stability segments of the 200 monosyllabic and female voices of the monosyllabic syllables. Such parameter analysis makes the conclusion more general. Figures 1-2 show the male and female distribution of several main parameters of the fundamental frequency.

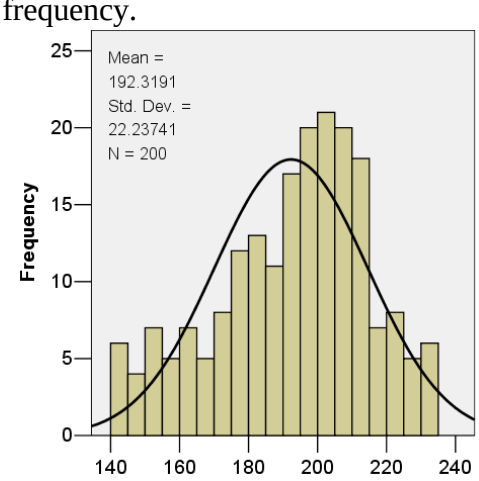

Figure 1. Basic frequency distribution (male)

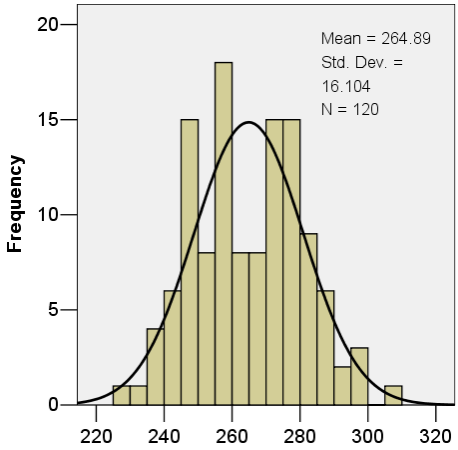

Figure 2. Basic frequency distribution (female)

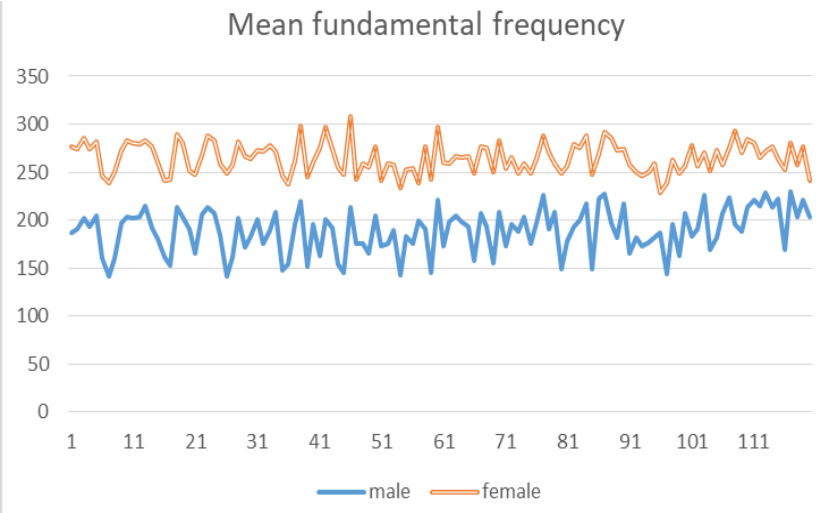

Figure 3. Fundamental frequency comparison diagram

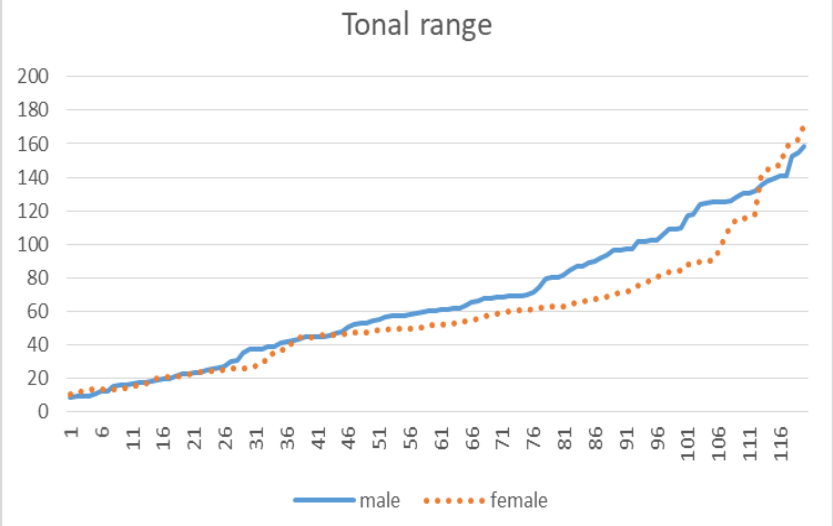

Figure 4. Tonal comparison diagram

It can be seen from the figure that the average fundamental frequency of male voices is mainly distributed between 140 hz-235 Hz, and there is a concentrated peak value at 205Hz, and the average value is 192.3Hz. The average value of monosylsyllabic fundamental frequency of female voice is mainly distributed between 240 hz-290 Hz, and there is a relatively concentrated peak value at 255Hz. There are three secondary peaks at 245Hz, 270Hz and 275Hz respectively, and the average value is 264.9Hz. The fundamental frequency distribution range of male voice is wider than that of female voice, and the fundamental frequency distribution of female voice is more concentrated than that of male voice.

From the comparison of the average frequency of male and female voices, the average frequency of female voices is higher than the average frequency of male voices, but the fundamental frequency of female voices is not as large as that of male voices; from male and female voices. The pitch range is observed. The range of the male voice is lower than that of the female voice, and the range of the male voice's pitch is close to a linear change.

2.2 Open quotient analysis

The open quotient is defined as: the ratio of the open phase to the cycle; Figure 5 and Table1 are the distribution of the main parameters of the open quotient.

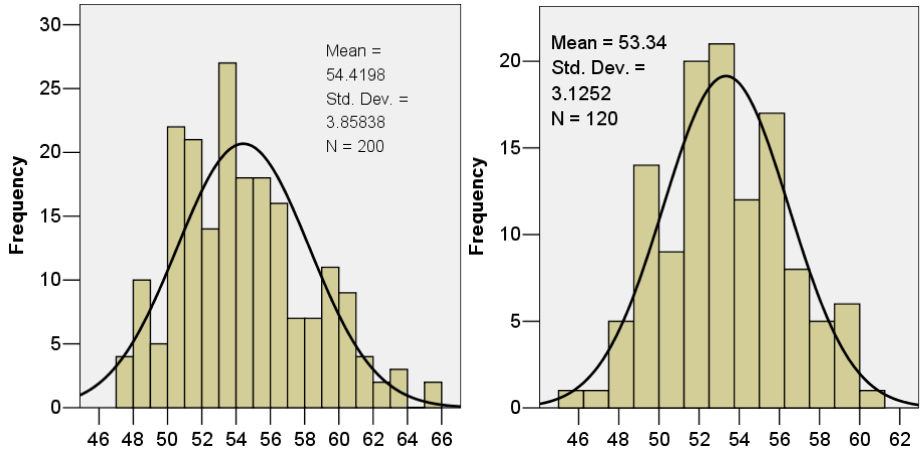

Figure 5. Distribution of the average value of the open quotient (male and female)

From the distribution of the average value of the open quotient. The average open quotient of male voices was 54.4%, and the average open quotient of female voices was 53.3%. The open quotient of male and female voices was relatively close, and the range was basically between 48% and 60%. Male voices peaked at 53%, and female voices also a peak occurred at 53%. There is no significant difference in the distribution of open quotient between men and women.

Table.1. Average of fundamental frequency and starting parameters

	pmean	prang	pmin	pmax	pstd	pjit	omean	orang	omin	omax	ostd
Male	192.32	72.21	152.01	224.22	21.91	0.50	54.42	13.49	47.00	60.48	3.75
Female	264.89	58.28	230.45	288.73	15.65	0.82	53.34	14.64	46.30	60.94	3.14

Table 1 shows the relationship between male and female voice open quotient and fundamental frequency. It can be seen from the table that with the improvement of the fundamental frequency, although the business change is not large, it can be observed that the business is gradually reduced, the open quotient and the pitch is inversely proportional, reflecting another fundamental and most important property of the type of voice. There is not much difference between the standard deviation between men and women. In addition, the upper and lower limits of the open quotient of men and women are larger than those mentioned in "*On Language Phonation*". [6] The average value of the business is not very close to the minimum value, which may be related to a specific speaker.

2.3 Speed quotient analysis

The speed quotient is equal to the ratio of the open phase to the closed phase. Figure 6-8 shows the male and female distribution of the main parameters of the velocity quotient.

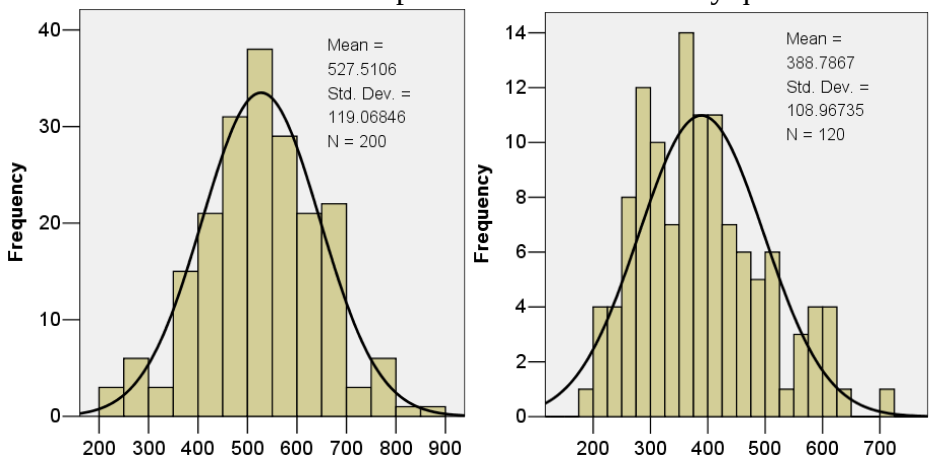

Figure 6. Distribution of velocity quotient mean (male and female)

It can be seen from the figure that the average syllable velocity quotient of male voices is mainly between 400% and 700%, with an average of 527.5%; the average syllable velocity quotient of female voices is mainly distributed between 250% and 500%. The average is 388.8%. The distribution of the speed quotient of the male voice is wider than that of the female vocal quotient. The distribution of the speed quotient of the female voice is more concentrated. The range of the speed quotient of the male voice is also significantly larger than that of the female voice; the difference between the speed quotient of male and female is relatively large, the average speed of the male voice is higher than that of the female voice.

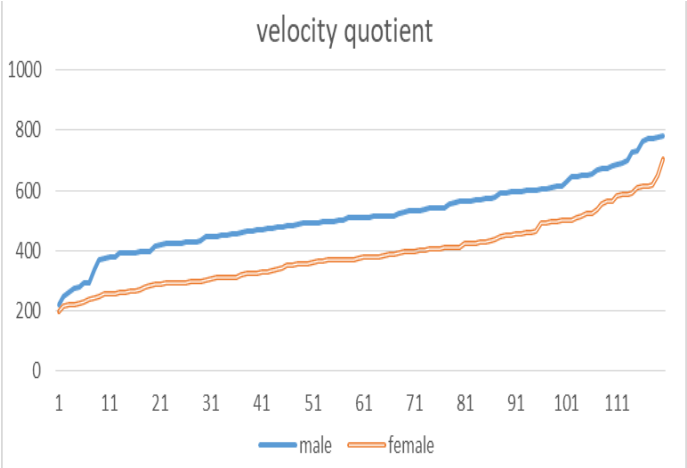

Figure 7. Velocity quotient comparison

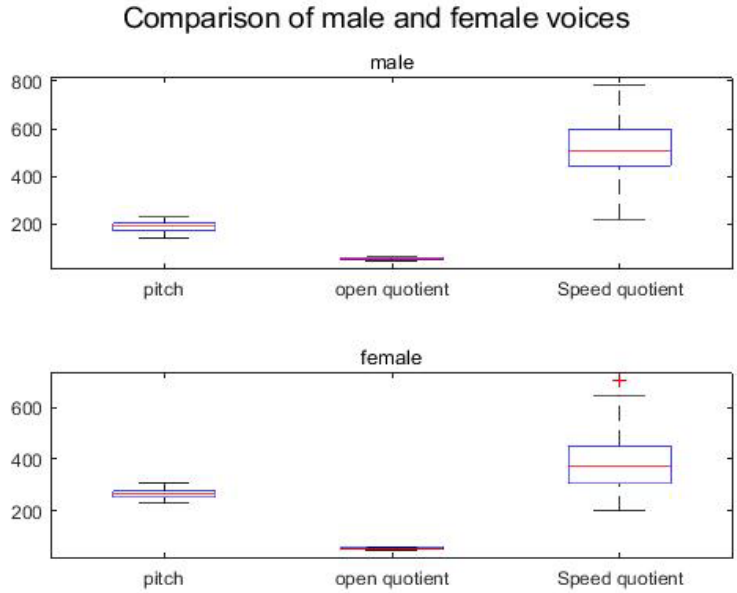

Figure 8. Main parameters box drawing

Table.2. Mean values of fundamental frequency and velocity quotient parameters

	pmean	prang	pmin	pmax	pstd	pjit	smean	srang	smin	smax	sstd
Man	192.34	71.67	152.34	224.01	21.74	0.50	527.51	673.14	99.01	772.15	107.17
Female	264.89	58.28	230.45	288.73	15.65	0.82	388.79	618.25	82.34	700.59	132.55

Table 2 shows the relationship between the speed quotient and the fundamental frequency of male and female voices. It can be generally seen from the table that, with the increase of the fundamental frequency, [7] the speed quotient gradually decreases, and the speed quotient is inversely proportional to the tone, reflecting another fundamental and most important property of voice types. Observed from the figure to analyze the change of speed, range, variation range of male than female, but male traders were greater than the speed of the female, from box figure, above, male, below for

the girl, the fundamental frequency of different confirm the view of the previously mentioned in this article, both the speed of the business by contrast, the male of the upper quartile, median and lower quartile are larger than the female, the speed of the boys was close to normal distribution, the speed of the female voice for positive skewness.

3. Summary

The difference between male and female vocal cords is that male voices are thick and long, and relatively wide. The vocal cords of female voices are short and narrow. Reflected in acoustics, first of all, the fundamental frequency of male voice is lower, the fundamental frequency of female voice is higher, and this characteristic of fundamental frequency is common to all languages. Business and speed quotient vary widely in different languages and are determined by language. [8] The different acoustic properties of the language vary greatly. This is because the vocalization methods used in different languages are different. It shows that the vocalization type of the language is very strong. The speed of male voice is greater than that of female voice. [9] Therefore, the high frequency energy of the male voice is higher than that of the female voice, and the high frequency attenuation of the female sound source is faster. In addition, since the vocal cords of female voices mostly leak when vibrating, they often have high-frequency noise, so this is also an important reason why female voice signals are difficult to collect. From the current research, it seems that the opening of business does not have much to do with the difference between male and female voices. Speed quotient is a very important arpeggio parameter because it is closely related to the pitch and on the other hand it reflects the difference between the voices of men and women. From the extracted data, the upper limit of the speed quotient varies greatly, and the change rule of the upper limit of men and women is also different. This must be further studied to explain.

Acknowledgements

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