

An Experimental Study of Monosyllabic Tones in Tianshui Dialect

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ABSTRACT

This paper uses the method of experimental phonetics analysis the tones of Tianshui dialect. Through recording, extracting and analysis data, we get a conclusion that there are three tones in Tianshui dialect, they are Ping (24), Shang (51), Qu (55). The analysis found that Ping in Tianshui dialect is not divided into Yin and Yang, and Ru merged into Ping. In addition, the voiced of Shang merged into Qu.

KEYWORDS

Tianshui dialect, monosyllabic tones, experimental phonetics.

INTRODUCTION

Tianshui, formerly known as Qin Zhou, is located in the southeastern in Gansu Province. It is located in the junction of Gansu Province and Shanxi Province. The dialects in Gansu Province include Zhong yuan Mandarin, Lan yin Mandarin and Southwest Mandarin. Tianshui dialect belongs to the Zhong yuan Long zhong Mandarin. The most important feature of Long Zhong dialect is that Ping is not divided into Yin and Yang. Up to now, there are many studies on Tian shui dialect, such as Liu Xiangqin in her article *On the point of Qin Zhou dialect phonology* point out that there are three tones in Tian shui dialect and they are Ping (13), Shang (53) and Qu (44). She said that in Qin Zhou dialect Ping does not divided into Yin and Yang. Previously, voiceless, aspirational voiceless and secondary voiced of Shang is still Shang. Voiced of Shang was merged into Qu and Ru was merged into Ping. Other studies on Tianshui dialects are available, such as *Three-tone dialect Tian shui dialect read two-tone tone* and *Phonological Features of Tian shui Dialect in Three Tune Dialects* from Zhang Wenxuan. In this thesis, we use experimental phonetics to study the tone of Tianshui dialect. In this way, we can use scientific methods to describe Tianshui dialect objectively and to provide a reference for further study of Tianshui dialect.

EXPERIMENTAL DESCRIPTION

Pronunciation table

The main task of this experiment is to have a comprehensive depiction and analysis to Tianshui dialect using the method of experimental phonetics. Based on the

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TABLE 1. PRONUNCIATION LIST.

Ancient tone	Ancient sound	Cases of words	Ancient tone	Ancient sound	Cases of words
Ping	Voiceless	东、该、灯、风	Qu	Voiceless	冻、怪、半、四
	Asperational voiceless	通、开、天、春		Asperational voiceless	痛、快、寸、去
	Secondary voiced	门、龙、牛、油		Secondary voiced	卖、路、硬、乱
	Voiced	铜、皮、糖、红		Voiced	洞、地、饭、树
Shang	Voiceless	懂、古、鬼、九	Ru	Voiceless	谷、百、搭、节、急
	Asperationl voiceless	统、苦、讨、草		Asperationl voiceless	哭、拍、塔、切、刻
	Secondary voiced	买、老、五、有		Secondary voiced	六、麦、叶、月
	Voiced	动、罪、近、后		Voiced	毒、白、盒、罚

China Language Work Committee issued the *China language resources survey Handbook* to determine the experimental pronunciation list (Table 1). The table selects examples according to four tones: Ping, Shang, Qu and Ru. Each tone was divided into four groups.

Experimental equipment

A computer, a microphone and Adobe Audition 3.0 recording software. Praat5.0 speech analysis software is used to segment and mark speech samples and extract experimental data.

Experimental process

Recording. The speaker living in Tianshui all the time. We are recording at the phonetic laboratory. When recording, we use the Adobe Audition3.0, the sampling frequency is 22050Hz, mono recording and the sampling accuracy is 16 bits. The speaker with natural intonation and speed read each word and saved as wav.

Data extraction. Remove the elbows and tails of all the words with Praat and keep its stationary parts, then save the basic frequency of that part. Then processing all fundamental frequency data and all values are normalized. The fundamental frequency is normalized by Shi Feng's proposed T-value fundamental frequency normalization formula:

$$T = [(lgF_0 - lgmin) / (lgmax - lgmin)] * 5$$

F₀ is the average fundamental frequency of the observation point, min and max are the minimum and maximum fundamental frequency value, T is the normal result. The value of the T calculated in this way is in the range of 0-5. The correspondence between T and the fifth values are: T value in the 0-1 interval, five degrees is 1; T value between 1-2 is 2; T value between 2-3, recording 3; T value between 3-4, five degrees is 4; T value between 4-5, five degrees is 5.

DATA ANALYSIS

After extracting the fundamental frequency data of all the samples and normalizing them, calculate the average of voiceless, aspirational voiceless, secondary voiced and voiced of each tone, then make figures (Fig.1, Fig.2, Fig.3 and Fig.4). Finally get their domain value.

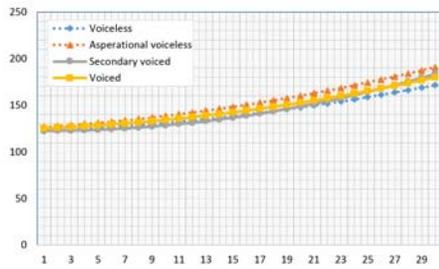


Fig. 1. Fundamental frequency curve of Ping.

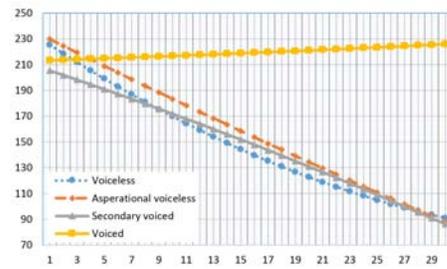


Fig. 2. Fundamental frequency curve of Shang.

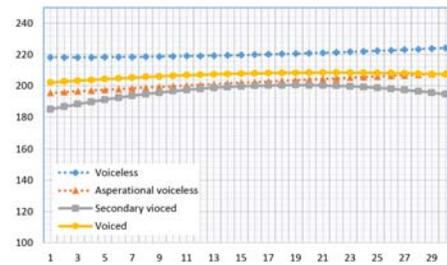


Fig. 3. Fundamental frequency curve of Qu.

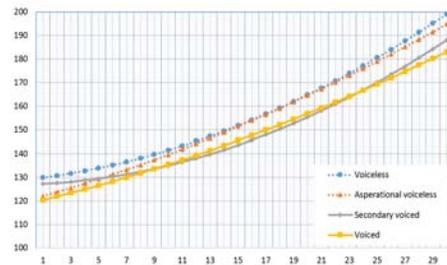


Fig. 4. Fundamental frequency curve of Ru.

Ping In ancient phonology, Ping was divided into Yin and Yang in most dialects. Figure 1 is the basic frequency curve for Ping. In Tianshui dialect, Ping was not divided into Yinping and Yangping. The maximum and minimum fundamental frequency are 226.1Hz and 155.1Hz respectively and its domain value is 71Hz.

Shang Figure 2 is the fundamental frequency curve for Shang. In Tianshui dialect, Shang was divided into two tones. Voiceless, aspirational voiceless and secondary voiced are both falling tones, and the maximum fundamental frequency is 246Hz and the minimum is 73.3Hz, its domain value is 172.7Hz. The voiced Shang is a level tone and the maximum and minimum fundamental frequency are 251.1Hz and 228.3Hz, the domain value is 22.8Hz.

Qu Figure 3 is the basic frequency curve for Qu and in Tianshui dialect it is a level tone. The maximum and minimum fundamental frequency are 277Hz and 181.5Hz and the domain value is 95.5Hz. So, we can know that the range of Qu is a bit wide.

Ru Figure 4 is the basic frequency curve for Ru. Ru is a rising tone and the maximum and

Minimum fundamental frequency is 240.6Hz and 114.6Hz and its domain value is 126Hz. So, in Tianshui dialect, Ru is a rising tone.

Through the above analysis we know, in Tianshui dialect, Ping was not divided into Yin and Yang and it is a rising tone. Shang was divided into two tones, voiceless, aspirational voiceless and secondary voiced are falling tones and turbidity is a level tone. Qu is a level tone and its fundamental frequency is relatively close to turbidity of Shang. Finally, Ru is a rising tune.

FIVE DEGREES CALCULATION

According to Mr. Shi Feng's T value method, the fundamental values of 30 points of each word extracted from this experiment are substituted into F0 respectively. Then put the calculated data into the Excel and draw the T value curves for four tones in Tianshui dialect. The abscissa is the number of tones and the ordinate is the value of T.

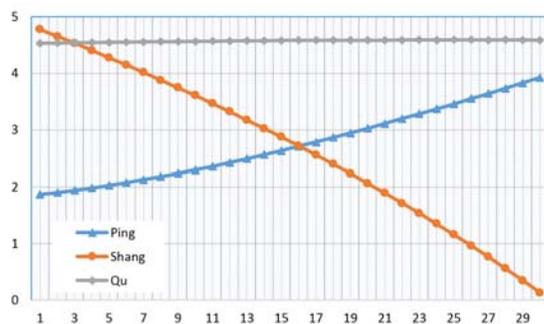


Fig. 5. The T - value Curve of single tone in Tianshui Dialect.

After analysis the five values, we make sure that Ping and Ru can be merged into a tone and voiced Shang and Qu can be merged, too. We finally get a conclusion that there are three tones in Tianshui dialect and figure 5 is the diagram for them.

SUMMARY

Through the acoustic analysis of Tianshui dialect tones and the statistics and calculation of experimental data, this paper draws the following conclusions: (1) In Tianshui dialect, there are three tones. (2) In Tianshui dialect, Ping was not divided into Yinping and Yangping, it is a rising tone and its value is 24. (3) Voiceless, aspirational voiceless and secondary voiced of Shang are still Shang and it is a falling tone, its value is 51. (4) Voiced of Shang was merged into Qu and Qu is a level tone and the value is 55. (5) Ru are all merged into Ping.

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