

An Experimental Study on the Single-tone of Ningxian Dialect

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ABSTRACT

In this paper, the experimental phonetics method is used to study the monosyllable of Ningxian dialect, we normalized and analyzed its frequency and knowing the evolution of the dialect. There four tones in Ningxian dialect: Yinping (51), Yangping (25), Shang (44), Qu (22). Although Shang and Qu are both flat tones, they are quite different and cannot be combined into a tone. This paper makes an objective description of the specific situation of Ningxian dialect, the purpose is to provide some reference for the future research of Ningxian dialect.

KEYWORDS

Ningxian dialect, speech experiment, single tone.

INTRODUCTION

Ningxian is located in the southeastern of Gansu Province, it belongs to Qingyang City. At the same time, it is located in the junction of Gansu, Shanxi and Ningxia Hui Autonomous Region. So, its location is rather special.

There are three dialects in Gansu Province, they are Lan Yin Mandarin, Zhongyuan Mandarin and Southwest Mandarin. Zhongyuan Mandarin has the largest number of users, it can be divided into three parts: Gansu middle plate, Qinlong film and Guanzhong film. The dialect of Qingyang belongs to Qinlong film. Ningxian belongs to Qingyang City, but its dialect belongs to the Guanzhong Dialect. Moreover, it is the only area in Gansu Province which dialect belongs to Guanzhong Dialect. Therefore, whether in location or language, Ningixian is special.

Guanzhong Dialect is one of the most representative dialects in Northwest of China. It is divided into two parts of Dongfu dialect and dialects if Xifu, Ningxian dialect belongs to the latter. The pronunciation of some initial consonants in Guanzhong dialect is different from that of Putonghua. “ŋ” is used as initial consonant in words beginning with vowel or semi vowel, for example “ai” read as /ŋai/, “an” read as /ŋan/. In addition, the mixed reading of ‘j’ and ‘x’, ‘y’ and n in Guanzhong Dialect, these features are also appearing in the Ningxian dialect.

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Up to now, study on Ningxian dialect mainly focus on two aspects of vocabulary and grammar but there is no research on phonetics. In order to have a comprehensive understanding to Ningxian dialect from pronunciation, vocabulary and grammar, this paper makes an analysis on the single tones of Ningxian dialect by the method of experimental phonetics. In this way, the actual tone of this dialect can be described objectively, and it can provide reference for further research.

EXPERIMENTAL EXPLANATION

Pronunciation table

The main task of this experiment is to have a comprehensive depiction and analysis to Ningxian dialect using the method of experimental phonetics. This paper is based on the 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, select sixteen words for each tone and divided them into four groups according to the clear, sub clear, sub turbidity and turbidity, so there are four examples in each group.

Experimental equipment

The experimental equipment and software needed in this experiment are divided into two parts: recording, statistics and analysis. First is the recording equipment. We need a Computer, a microphone and Adobe Audition 3 recording software. Second is the statistics and analysis software. Praat5.0 speech analysis software is used to segment and mark speech samples and extract experimental data. MATLAB 2012 makes the fundamental data were normalized and calculated its value.

Experimental process

Recording. The informant is come from Ningxian and living in there all the time, so his speak a pure dialect. We are recording at the phonetic laboratory of Northwest Minzu University and the time is 2017, 9. We recording uses the Adobe Audition3.0, the sampling frequency is 44100Hz, mono recording and the sampling accuracy is 16 bits. When recording, the informant with natural intonation and speed read each word and we save them as WAV format.

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,
	Asperational voiceless	统, 苦, 讨, 草		Asperational voiceless	哭, 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

Data extraction. Remove the elbows and tails of all the words with Praat and keep its stationary parts, then the basic frequency of the part is extracted by Praat and all the data are saved.

Data processing. Processing all fundamental frequency data with MATLAB, then all values are normalized, and we can get the five degree values of them. The fundamental frequency is normalized by Shi Feng's proposed T-value fundamental frequency normalization formula:

$$T = [(lgF0 - lgmin) / (lgmax - lgmin)] * 5$$

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

FUNDAMENTAL FREQUENCY AND RANGE ANALYSIS

The fundamental frequency of all recordings is extracted and normalized. The four tones of "Ping", "Shang", "Qu" and "Ru" are divided into four groups: clear, sub clear, sub turbidity and turbidity. Listed all values of the starting point, midpoint, and end piont, maximum and minimum of each group. Figures 1, 2, 3 and 4 are the fundamental pitch curves of four tones, we can learn the range of each tone.

Ping

Ping tone is divided into Yinping and Yangping is the most important rule in the development and evolution of tones, so is the Ningxian dialect. Figure 1 is a fundamental mean curve of the Ping tone of Ningxian dialect. The Yinping is a falling tone. The maximum value of fundamental frequency is 195.3Hz and the minimum is 77.1Hz, so the width of the field is 118.2Hz. But the Yangping is a rising tone and the maximum and minimum values of fundamental frequency are 188.1Hz and 76.6Hz respectively, its range width is 111.5Hz. So we can know that the trend of Yinping and Yangping are different, but they are basically same in fundamental frequency, fundamental frequency, range, and so on.

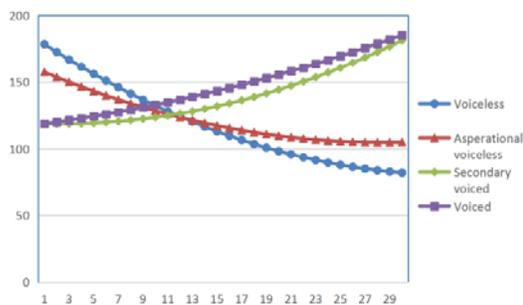


Fig. 1. Fundamental frequency curve of Ping.

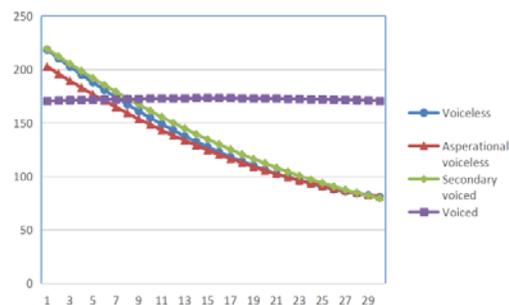


Fig. 2. Fundamental frequency curve of Shang.

Shang

Figure 2 is a fundamental mean curve of Shang and we can see that it can be divided into two tones. The voiceless, aspirational voiceless and muddy of Shang are falling tone but the voiced is a level tone. About the falling tone, the maximum and minimum values of the fundamental frequency are 251.2Hz and 75Hz respectively, its range width is 176.2Hz. The tone type of this tone is same with Yinping, so they can be merged into one. The fundamental maximum of the level tone is 183.8Hz and the minimum is 158.5Hz, its range width is 25.3Hz.

Qu

Figure 3 is a fundamental mean curve of the Qu tone of Ningxian dialect. As shown in Figure 3, we can see that the tone of Qu in Ningxian dialect is a level tone, its fundamental frequency change is not obvious, and the value is mainly between 164Hz and 178Hz. So, we can conclude that Qu in Ningxian dialect is a level tone.

Ru

Figure 4 is a fundamental mean curve of the Ru of Ningxian dialect and it also can be divided into two tones. The voiceless, aspirational voiceless and muddy are falling tone and the voiced of Ru is a rising tone. About the falling tone, its maximum and minimum values of fundamental frequency are 205.7Hz and 76.4Hz and the width is 129.3Hz. It is similar to Yinping tone, so we subsumed it into Yinping tone. However, the voiced of Ru is similar to Yangping, such as its maximum and minimum values of fundamental frequency are 190.3Hz and 108.1Hz and the width is 82.2Hz. So, we subsumed it into Yangping tone.

Through the above analysis, we can see that there are four ancient tones in Ningxian dialect, but to this days, they have changed a lot. The Ping was split into two tones, Yinping and Yangping. The Yinping is a falling tone and the Yangping is a rising tone. Shang have also evolved into two tone letters, they are a falling tone and a level tone respectively. As Qu, it has evolved into a level tone. About Ru, it was differentiated into a falling tone and a rising tone. In addition, the falling tone of Shang and Ru are close to Yinping in the fundamental frequency and width, so they can be merged into Yinping. The rising tone of Ru is close to Yangping, so we merged it into Yangping. The voiced of Shang and Qu are level tones, but there is a big different between the fundamental frequency and width of them, so they cannot be merged. The conclusion of the evolution of Ningxian dialect is shown in Table 2.

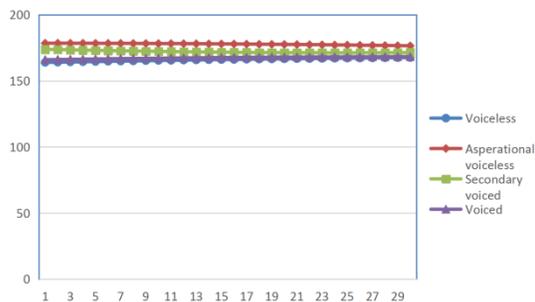


Fig. 3. Fundamental frequency curve of Qu.

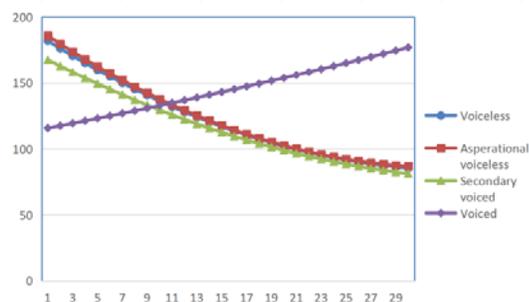


Fig. 4. Fundamental frequency curve of Ru.

TABLE 2. THE CONCLUSION OF THE EVOLUTION OF NINGXIAN DIALECT.

Ping	Voiceless	Yinping
	Asperational voiceless	
	Muddy	Yangping
	Voiced	
Shang	Voiceless	Yinping
	Asperational voiceless	
	Muddy	Shang
	Voiced	
Qu	Voiceless	Qu
	Asperational voiceless	
	Muddy	
	Voiced	
Ru	Voiceless	Yinping
	Asperational voiceless	
	Muddy	Yangping
	Voiced	

FIVE DEGREE CALCULATION

According to the T value algorithm, we substitute the base frequency of the 30 points of each tone extracted in this experiment into F0 and calculated them. The final data into the Excel table and draw the T curve of Yinping, Yangping, Shang and Qu of Ningxian dialect and shown as Figure 5. In this figure, the abscissa is the number of tone points and the ordinate is the T value. From the Figure 5 we can know that the fifth value of Yinping is 51, the value of Yangping is 25, the value of Shang is 44 and Qu is 22. Shang and Qu are both level tone, but there is a big different between their value, so they must be two tones.

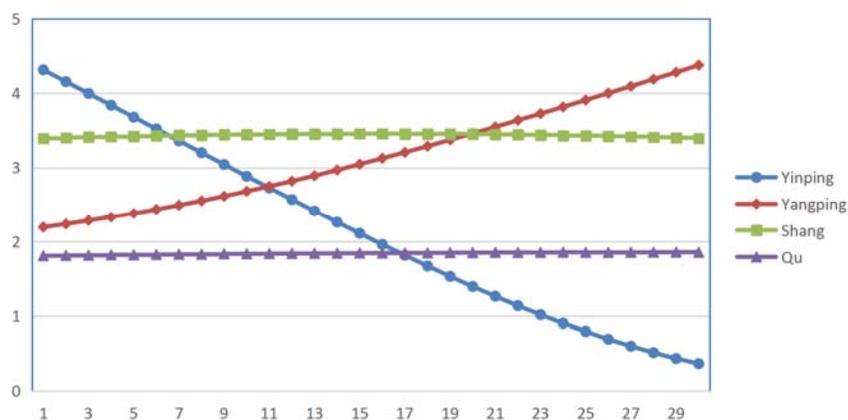


Fig. 5. The T - value Curve of single tone in Ningxian Dialect.

CONCLUSION

By acoustic analysis, this paper summarizes that there are four tones in Ningxian dialect. Ping is divided into Yinping and Yangping, Yinping is a falling tone and Yangping is a rising tone. The voiceless, aspirational voiceless and muddy of Shang are merged into Yinping, but the voiced of Shang still is Shang. The five degrees of the Qu are scattered, and they are distributed between 1-5, but all the tones are flat and mostly concentrated between 1-3 degrees. So, this article for the time being to determine the value of Qu as 22. However, Ru in Ningxian dialect is slightly different from that of traditional phonology. In traditional phonology, Ru was changed and merged into three tones. But in Ningxian dialect, it was changed and merged into three tones, so I think that this situation needs to be further studied and analyzed.

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