

# An Experimental Research on the Monosyllabic Tone of Yongchang Dialect

Jinling Luo<sup>a</sup>, Yonghong Li<sup>b,\*</sup>

Key Laboratory of China's Ethnic Languages and Information Technology of Ministry of Education,  
Northwest Minzu University, Lanzhou, Gansu, 730000, China

<sup>a</sup>514063938@qq.com, <sup>b</sup>lyhweiwei@126.com

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**Abstract:** This paper takes the monosyllabic tone of Yongchang dialect as the research object, adopts the means of experimental phonetics to analyze the tone types and values of Yongchang dialect and finally gets the conclusion that Yongchang dialect has three tones, namely Yinping (33), Yangping (13) and Qusheng (51).

## 1. Introduction

Yongchang is a county lying in Jinchang, northwest of Gansu province. It is in the east of Hexi Corridor, at the northern foot of Qilian Mountains, to the southern edge of ALashan. The latitude and longitude of Yongchang is about 101 ° 04 ' - 102 ° 43'E, 37 ° 47 ' - 38 ° 39'N.

Yongchang dialect is a sub-dialect in HeXi Area, a Variant of Lanzhou & Yinchuan Mandarin Dialect. So far, studies involving Yongchang dialect are relatively few. Zhang Shengyu proposes in his paper "*Chinese Dialect in Hexi Corridor*" (1993) that Ping Sheng of Yongchang dialect is divided into Yin Ping and Yang Ping. Yin Ping is derived from ancient voiceless initials with the tone of Pingsheng. Yangping comes from the initials of ancient voiced Pingsheng, ancient voiceless and secondary voiced initials with the tone of Shangsheng, and voiced obstruent initials with the tone of Rusheng. Qusheng is derived from ancient Chinese Qusheng, ancient full-voiced initials with the tone of Shangsheng, ancient voiceless and secondary voiced initials with the tone of Rusheng. Meanwhile, he states that most of the ancient voiceless and secondary voiced initials with the tone of Rusheng are read as Qusheng, but a minority of them also can be read as Yinping or Yangping. Zhang proposes that the tone pitch of Yongchang dialect can be defined as follows: Yinping (33), Yangping (55), and Qusheng (31). In the paper "*A Brief Analysis of the Similarities and Differences in Tone between Jinchang Dialect and Mandarin*" (2010), Yuan Liang makes a comparison between Jinchang dialect and Mandarin from the perspective of tone type and value and gets the conclusion that Yongchang dialect has three tones, and there is no Shangsheng in the dialect. Bao Weifang sorted the sound system of Yongchang dialect in the paper "*Investigation on the Pronunciation of Yongchang Dialect Jinchang, Gansu Province*" (2015) and made a comparison between Yongchang dialect and Mandarin.

## 2. Design of the experiment

### 2.1 Preparations.

The list is made according to *Handbook for Survey on Chinese Language*. According to voicing, the word samples are further divided into four types: full-voiceless, secondary voiceless, secondary voiced and full-voiced. For each type, I choose four sample words. Of course, there is a difference for the full-voiceless Rusheng, so I choose 39 words for this class. Totally, there are 100 words chosen.

I choose a local young man as the pronunciation cooperater. The man has been living in Yongchang since he was born and seldom leaves. He is educated and articulates clearly. The tools used for recording are as follows: ThinkPad laptop, External sound card, Collar-clip microphone, Adobe Audition3.0. The tools used for data collecting and analyzing are as follows: Praat5.0 for

analyzing data and extracting pitch data, MATLAB for normalization, Microsoft Excel2007 for data-saving and chart production.

Table. 1 Word List

Tones	Pingsheng	Shangsheng	Qusheng	Rusheng
QQ	东该灯风	懂古鬼九	冻怪半 四	谷百节急别笔北剥逼发法福得扎摘桌着竹夹甲格 隔鸽各郭击骨结吉橘菊角脚割刮雪作积壁
CQ	通开天春	统苦讨草	痛快寸 去	哭拍塔切刻
CZ	门龙牛油	买老五有	卖路硬 乱	六麦叶月
QZ	铜皮糖红	动罪近后	洞地饭 树	毒白盒罚

(QQ=full voiceless; CQ=secondary voiceless; QZ=full voiced; CZ=secondary voiced)

## 2.2 Recording.

The recording is completed in a house with good sound insulation. Before recording, the cooperater should be familiar to the word list, keep in a calm state. Also, we should adjust the distance between the speaker and the microphone to avoid the ineffectiveness. The recording should be saved as .wav format.

## 2.3 Data Extracting and Analyzing.

In phonetics, the fundamental frequency is the frequency of pitch. It decides pitch of the sound. “The starting point of the load segment is from the beginning of the rhyme (vowel), from the second pulse of the vowel sound on the diagram. The end is based on amplitude and the second format. There are respective standards for rise tone and fall tone. The end of rise tone is set at the peak of fundamental frequency on narrow-band graph. The end of fall tone is set at the end of the regular and proportional interval of the baseband straight bars on the wideband graph.” (Zhu Xiaonong, 2010) The measurement should be adjusted according to the actual situation. When the load segment is made, the values of fundamental frequency on each load segment are extracted with Praat. Then the data is saved into Excel and normalized with MATLAB script. So, we can get the average of each tone. After we get the average, we could use T-score proposed by Shi Feng to convert the normalized fundamental frequency into Chinese traditional five degrees. The formula is:

$$T = [\lg f_0 - \lg(\min) / \lg(\max) - \lg(\min)] \times 5$$

In this formula,  $f_0$  stands for the average of fundamental frequency,  $\min$  stands for the minimum frequency of the pitch range,  $\max$  surely stands for the maximum frequency of the pitch range.  $T$  stands for the result of the normalized frequency. The value of  $T$  calculated by this algorithm ranges from 0 to 5. The relationship between the  $T$ -value and the value of the five degrees is stated as follows: if the  $T$ -value is 0-1, it is described as 1; if the  $T$ -value is 1-2, it is described as 2; if the  $T$ -value is 2-3, it is described as 3; if the  $T$ -value is 3-4, it is described as 4; if the  $T$ -value is 4-5, it is described as 5.

## 3. Result and Discussion

### 3.1 Analysis of Fundamental Frequency.

We can see from the table that the tone of Yongchang dialect can be divided into Yinping and Yangping. Yinping comes from the ancient voiceless Pingsheng. Yangping comes from the ancient voiced Pingsheng. From the data, we can see that the ancient voiceless Pingsheng is a fall-rise tone and the ancient voiced Pingsheng is a rising tone. The maximum fundamental frequency value of Yinping is 116.9 Hz and the minimum fundamental frequency value of Yinping is 101.9 Hz. The range of the fundamental frequency is 17 Hz. The maximum fundamental frequency value of

Yangping is 124.5 Hz and the minimum fundamental frequency value of Yangping is 88.4 Hz. The range of the fundamental frequency is 36 hz.

Table. 2 Fundamental Frequency Parameters of monosyllabic tone in Yongchang dialect

FF TT		AS	AM	AE	MAX	MIN
Ping sheng	QQ	110.08	107.9	108.15	111.8	105.5
	CQ	112.53	108.83	110.35	116.9	101.9
	CZ	98.43	105.73	115.5	124.5	96.4
	QZ	95	103.25	120.15	123.2	88.4
Shang sheng	QQ	98.85	102.98	108.85	108.85	98.85
	CQ	94.65	101.6	111.8	111.8	94.65
	CZ	99.63	103.43	109.7	109.7	99.63
	QZ	132.55	115.3	94.68	132.55	94.68
Qu sheng	QQ	133.2	112.25	96.85	133.2	96.85
	CQ	139.58	120.3	101.75	139.6	101.7
	CZ	134.98	116.25	100.33	135	100
	QZ	135.7	118.18	98.68	135.7	98.6
Ru sheng	QQ	95.4	102.2	108.2	108.2	95.4
		125.8	116	101.9	125.8	101.9
	CQ	126.32	111.4	101.88	126.32	101.88
	CZ	121.3	113.9	99.53	121.3	99.53
	QZ	96.83	102.08	112.13	112.13	96.83

(FF=fundamental frequency; TT=types of tones; AS=the average of the starting point; AM= the average of the middle point; AE= the average of the ending point; MAX=the maximum fundamental frequency; MIN= the minimum fundamental frequency)

The ancient voiceless and secondary voiced Shangsheng has gradually evolved into Yangping. The maximum fundamental frequency value is 111.8 Hz and the minimum fundamental frequency value is 94 Hz. The ancient full-voiced Shangsheng is a fall and has evolved into Qusheng. The maximum fundamental frequency value is 132.6 Hz and the minimum fundamental frequency value is 94.6 Hz. The ancient Qusheng in Yongchang is a definite fall and keeps its character. So far, it has still been Qusheng. The maximum fundamental frequency value is 139.6 Hz and the minimum fundamental frequency value is 96.9 Hz. The evolvement follows general rules. The ancient Rusheng in Yongchang is unique. The fundamental frequency of the full voiceless Rusheng develops in two ways, one is rising and the other is fall. The secondary voiceless is a fall. It is the same as the secondary voiced. The full-voiced Rusheng is rising. So, it still needs to be tested further whether the evolvement of Rusheng follows the general rules of tone evolvement.

### 3.2 Analysis of Five Degree values.

The normalized fundamental frequency is transformed into Chinese traditional five degrees with T-score proposed by Shi Feng. Then a scatter diagram of the T-value should be plot. The abscissa stands for the numbers of the tone. The ordinate stands for T-value. The details are shown in the following figures:

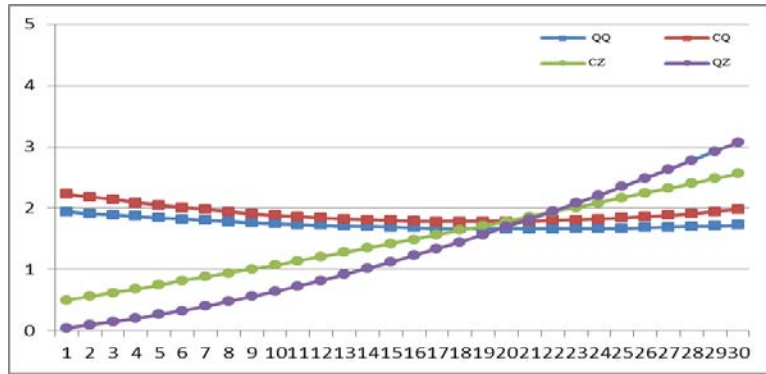


Fig. 1 T-value curve of Pingsheng

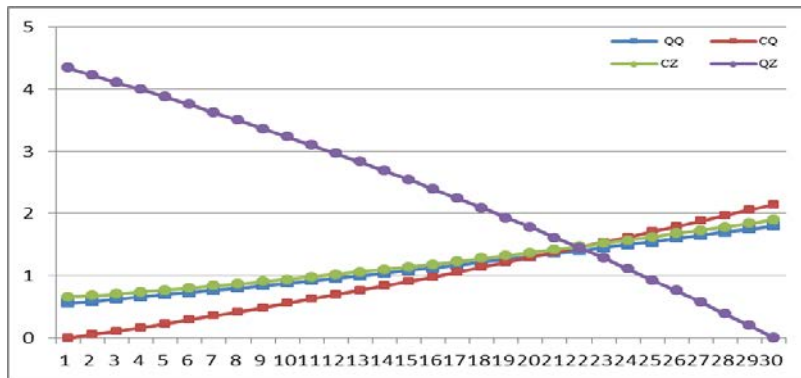


Fig. 2 T-value curve of Shangsheng

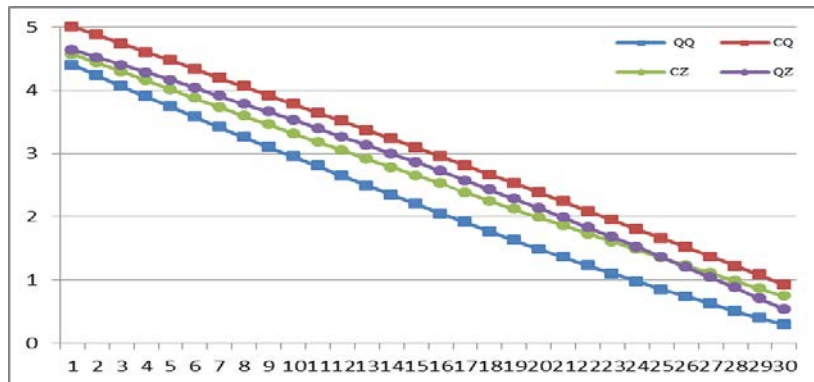


Fig. 3 T-value curve of Qusheng

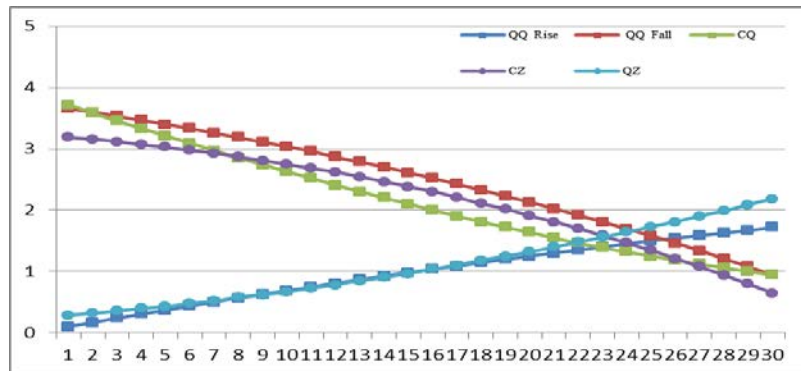


Fig. 4 T-value curve of Rusheng

We can see in chart1 that the value of Yinping is 33 and Yangping is 13. Chart 2 shows that the value for voiceless Shangsheng is 13 and for the full-voiced is 51. Chart3 figures that the value of Qusheng is 51. As is shown in chart 4, the full-voiceless Rusheng can be divided into two types: a

rise tone (values 13) and a fall tone (values 51). The value of the voiced Rusheng is 13 and the rest is 51.

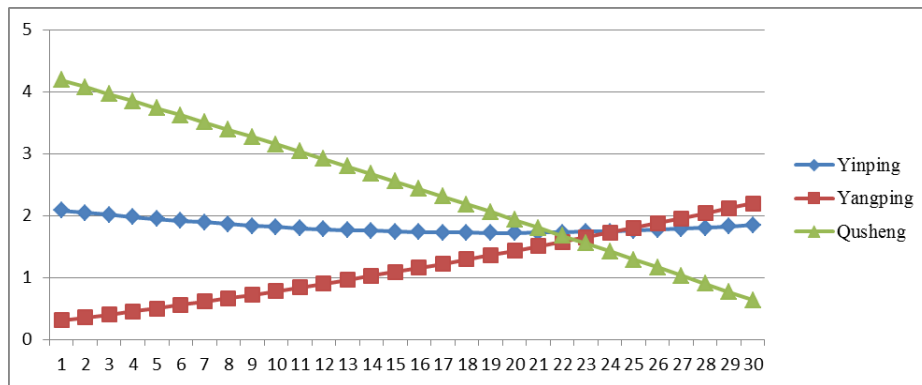


Fig. 5 T-value curve of the monosyllabic tone in Yongchang dialect

#### 4. Conclusion

This paper makes an acoustic analysis and statistical calculation of the monosyllabic tones in Yongchang dialect from the perspective of experimental phonetics and draws a conclusion that there are three tones in Yongchang dialect: Yinping, Yangping and Qusheng. The value for Yinping is 33. It comes from the ancient voiceless initials with the tone of Pingsheng. The value for Yangping is 13. It comes from the initials of ancient voiced Pingsheng, ancient voiceless and secondary voiced initials with the tone of Shangsheng, and some of them also come from the voiced initials with the tone of Rusheng. The value for Qusheng is 51. Qusheng is derived from ancient Chinese Qusheng, ancient full-voiced initials with the tone of Shangsheng, ancient secondary voiceless and secondary voiced initials with the tone of Rusheng; also, some of them come from ancient full-voiceless initials with the tone of Rusheng.

Table. 3 Value and the Development of Tone in Yongchang Dialect

	Pingsheng				Shangsheng				Qusheng			
	QQ	CQ	CZ	QZ	QQ	CQ	CZ	QZ	QQ	CQ	CZ	QZ
category	Yinping				Yangping				Qusheng			
value	33				13				51			

(QQ=full voiceless; CQ=secondary voiceless; QZ=full voiced; CZ=secondary voiced)

Table. 4 Value and the Development of Rusheng in Yongchang Dialect

Rusheng			
QQ	CQ	CZ	QZ
Yangping		Qusheng	
13		51	
13		13	

So, in Yongchang dialect, Pingsheng can be divided into Yinping and Yangping. But the development of the ancient full-voiceless initials with the tone of Rusheng in Yongchang dialect is out of the general rules. It has split up to Yangping and Qusheng. This is not consistent with the result of other scholars, which may owe to the influence of Mandarin.

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