An Experimental Study on the Bi-syllable in Guangling Dialect

Hongjie Wang[a], Yonghong Li[b, *]

Key Lab of China's National Linguistic Information Technology, Northwest Minzu University , Lanzhou, 730030 China

[a]1778157404@qq.com, [b]lyhweiwei@126.com

*corresponding author

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Abstract. In this paper, the experimental phonetics method is used to analyze the bi-syllable tone of Guangling dialect, the fifth degree value is obtained by normalizing the double word fundamental frequency. After comparing with the mono-syllable, we found that 1) the front words and back words in the bi-syllable words of Guangling dialect are both changed. On the tone, there are two types of tone transposition and non-transposable tone. 2) in all the bi-syllable words, the post-word value is generally low. 3) Guangling dialect also found a total of seven tone pattern.

1. Introduction

Guangling County is located in Datong City, Shanxi Province. Its dialect has four tones: Yinping(52), Yangping(41), Shang(44)and Qu(413). Although Guangling County is located in Shanxi Province, but its dialect does not belong to Jin language, but belongs to Jilu Mandarin.

Jilu Mandarin is a branch of Chinese Mandarin, distributed in most parts of Hebei Province, western Shandong and Pinggu District of Beijing, Guangling County, Shanxi Province and Inner Mongolia Ningcheng County. Jilu Mandarin can be divided into Baotang film, Shiji film and Cang Hui film three parts. Guangling dialect belongs to the Lai Fu pieces in Bao Tang film. So far, Only Ma Wenzhong carried out an in-depth study of Guangling dialect. In his book *Guangling Dialect*, the interchange of Guangling dialect is analyzed from two angles: non-stacked words and stacked words. The conclusion shows that there are two cases in Non-stacked words and all previous words are changed. There are three situations in the tone of stacked words, the tone of the second word are changed. The study uses a more traditional method, this experiment will use experimental phonetics instruments, methods and software on the Guangling dialect tone analysis. Comparing the pitch of the front and back words in the bi-syllable words with the mono-syllable, summed up all the changes in the double tone.

2. Experimental description

2.1. Experimental design

Through the study of the mono-syllable of Guangling dialect, we know there are four tones in Guangling dialect. In this paper, we use T1, T2, T3 and T4 refers to four mono-syllable respectively. "T1 + Tx" means a combination of T1 and each tone, and so on. Four tones are grouped together with each other and the experimental word table is determined according to the principle of the double word design. Now each combination lists only one word.

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Table 1 Guangling dialect double word tone pronunciation table

Front \ Back	Yinping(T1)	Yangping(T2)	Shang(T3)	Qu(T4)
Yinping(T1)	春天	高粱	烧饼	冬至
Yangping(T2)	葵花	厨房	云彩	头发
Shang(T3)	雨衣	语文	讲解	姊妹
Qu(T4)	夏天	木头	地板	政治

2.2. Experimental process

Recording. Using Adobe Audition3.0 recording software recording, sampling frequency of 22050Hz, monophonic recording, sampling accuracy of 16. The informant is come from Guangling County, Shanxi Province, 24 years old, who read all words with a natural tune, each word read three times, a total of 318 sound samples.

Clips. Use Praat to distinguish all words from the boundaries of the preceding and post words, to remove the elbow and descending segments of each sound text, only retain its tune section.

Data extraction and processing. First, for all bi-syllable words, use Praat and normalized script to extract the value of 30 base points for the first and subsequent words respectively. Then, calculate the average of the fundamental frequency of each point.On this basis to make the basic frequency curves.

In order to derive the fifth-order value of each word and make the respective T-values, we normalize the F0 data. 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.

3. Guangling dialect double word T value and the adjusting pattern

There are two types in the change of bi-syllable tones: transposition and non-transposition. Transposition means tone letters changed, such as level tone changed to falling tone. Non-transposable means tone letters do not changed but only the value changed.

According to the data, we obtained the T - value curves of bi-syllable words in Guangling dialect (Figure 1-Figure 4) and analyze them in T1 + Tx mode. Some combinations differ in value, but there is no difference when listen them, so we combined them.

3.1. T1-Yinping

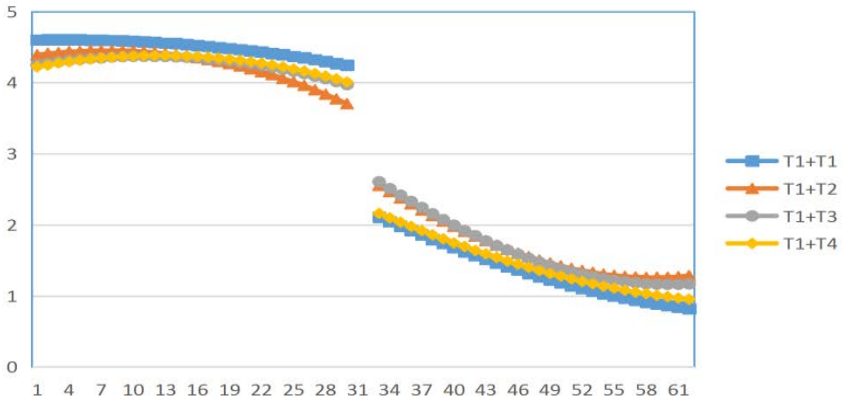

Fig.1 T-curve of T1 + Tx in Guangling dialect

Table 2 Guangling dialect Yin Ping tone adjustment variant

Combination of tones		Original transfer	Values after combination
T1+Tx	T1+T1	52+52	55+31
	T1+T2	52+41	55+31
	T1+T3	52+44	55+31
	T1+T4	52+413	55+31

From this figure we can see that, when the front word is T1, its tune is very high. The value of T1+T1 changed from 52 + 52 to 55 + 31. Compared with mono-syllable, the front word changed from down to a level tone, it is a transposition; the second word changed from the high down to low down, is a non-transposed tone. The combination of T1+T2 changed from 52 + 41 to 55 + 31. The former type of tone from falling to a level tone. The second word is not changed, the tone is still a falling tone, so it is a non-transposable tone. The value of T1+T3 changes from 52 +44 to 55 + 31. The former word changed from the high down to high level tone. The second word changed from a level tone to a falling tone. The combination of T1+T4 changes from 52 + 413 to 55 + 31. The former word becomes a high level and the second word becomes a low-falling tone. The tone letters of them both changed.

3.2. T2-Yangping

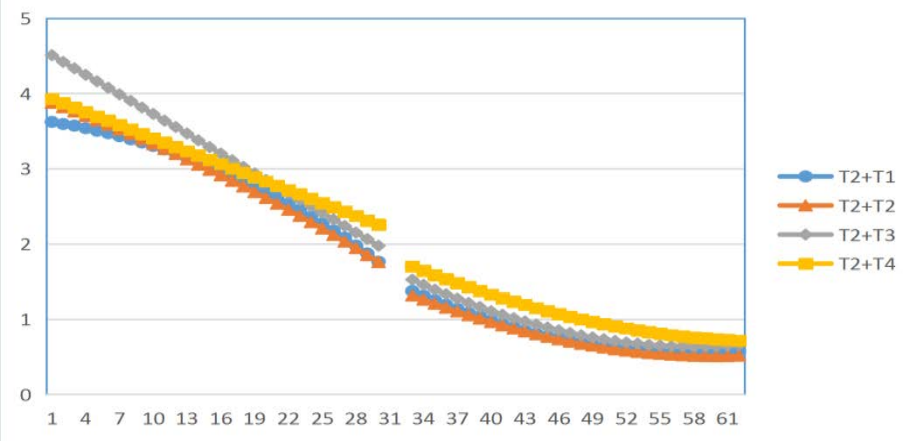

Fig.2 T-curve of T2 + Tx in Guangling dialect

Table 3 Guangling dialect Yangping tone adjustment variant

Combination of tones	Original transfer	Value after combination
T1+Tx	T1+T1	41+52	42+21
	T1+T2	41+41	42+21
	T1+T3	41+44	42+21
	T1+T4	41+413	42+21

It can be seen from the Figure 2, when the front word is Yangping, it is a high falling tone and its tone letter and register are same with smono-syllable. The combination of T2+T1 changed from 41 + 52 to 42 + 21. The former word did not change. The second word is still a falling tone, the value declined and the field of tone narrowed, it is a non-transposed tone. The combination of T2+T2 changed from 41 + 41 to 42 + 21. The former word and the second word has not much changed, only the value declined, so they both belong to non-transposed tone. The value of T2+T3 changed from 41+44 to 42+21. Compared with the mono-syllable, the value of front word decreases. The second changed in tone letters, its register and value both declined. So the former and back words are transposition tone. The combination of T2+T4 changes from 41 + 413 to 42 + 21. Compared with the mono-syllable, the former word basically unchanged, but the second word cahnged from zigzag tune to a falling tune.

3.3. T3-Shang

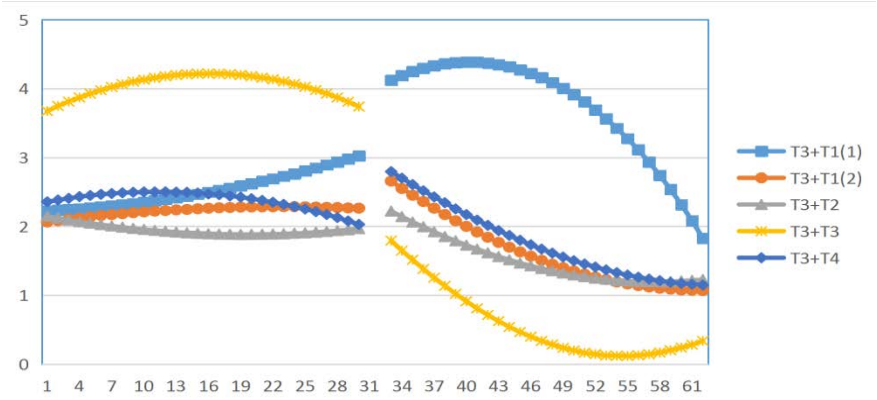

Fig.3 T-curve of T3 + Tx in Guangling dialect

Table 4 Guangling dialect Shang tone adjustment variant

Combination of tones	Original transfer	Value after combination
T1+Tx	T1+T1	44+52	23+52/22+31
	T1+T2	44+41	22+31
	T1+T3	44+44	55+31
	T1+T4	44+413	22+31

It can be seen from Figure 3, when the tune of front word is Shang, the combination can be divided into two forms. In the first one, the former word is a high-level tone and the register and the tone letters are same with the single word. In the second one, its value is lower than the first one and its register is declined.

The value of T3+T1 changed from 44+52 to 23+52 and 22+31. When is become to 23+52, the second word haven't changed but the former word changed from level tune to a rising tune. However, when it changed to 22+31, the patterns of front and back words both have not changed and the value and register are decreasing. So the change of front and back words are non-transposable tone. The value of T3+T2 changed from 44+41 to 22+31. Compared with the mono-syllable, front and back word are non-transposed tone and their value both declined. About T3+T3, its value changed from 44+44 to 55+31. Compared with mono-syllable, the front word is non-

transposable tone and the back word is transposition. The value of T3+T4 changed from 44+413 to 22+31. Compared with the mono-syllable, the value of the front word declined but the tone letters don't changed. The back word is a transposition and it became a falling tune.

3.4. T4-Qu

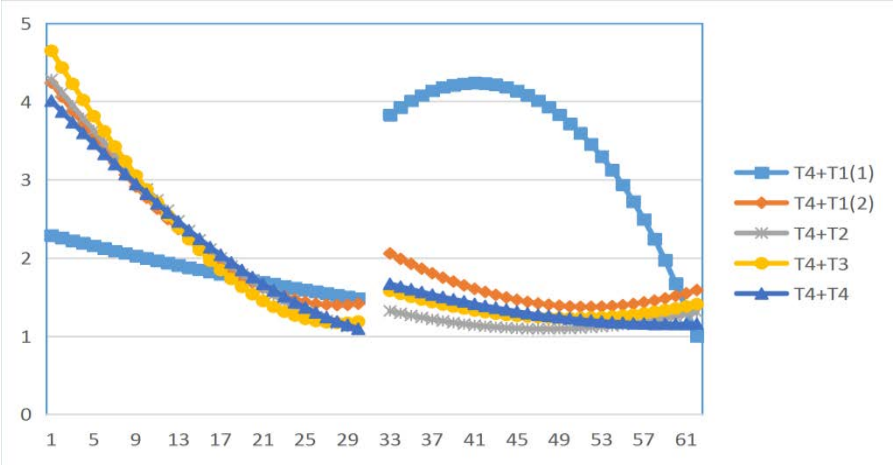

Fig.4 T-curve of T4 + Tx in Guangling dialect

Table 5 Guangling dialect Qu tone adjustment variant

Combination of tones		Original transfer	Value after combination
T1+Tx	T1+T1	413+52	32+51/52+22
	T1+T2	413+41	52+22
	T1+T3	413+44	52+22
	T1+T4	413+413	52+22

It can be seen from Figure 4, when the type of front word is Qu, there are two different variations. When back words are a part of Yinping, the front word become a falling tune and its register is between 2-3. In other cases, the front word will become a high-falling tune and its register is between 1-5.

The value of T4+T1 changed from 413+52 to 32+51 and 52+22. When it become to 32+51, the front word changed from zigzag to a low-falling tune and the back word do not changed in tone letters and the range of register become wider. When it become to 52+22, the front word changed from Qu to Yinping, a substantial change has taken place. The back word become to a low-level tune and its tone letters has changed. The combination of T4+T2 changed from 413+41 to 52+22. Compared with mono-syllable, the front word changed into Yinping and the back word changed into a low-level tune. They both are transposition. The value of T4+T3 changed from 413+44 to 52+22. In this combination, the front word changed into Yinping but the back word is still a level tune. About T4+T4,its value changed from 413+413 to 52+22. Compared with mono-syllable, the front word changed from Qu into Yinping and the back word changed from zigzag tune into a level tune,so they both belong to transposition.

4. Summary

Table 6 Guangling dialect double tone mode

Front \ Back	Yinping(T1)	Yangping(T2)	Shang(T3)	Qu(T4)
Yinping(T1)	55+31	55+31	55+31	55+31
Yangping(T2)	42+21	42+21	52+21	42+21
Shang(T3)	23+52/22+31	22+31	55+31	22+31
Qu(T4)	32+51/52+22	52+22	52+22	52+22

In this paper, we combining the method of field investigation and acoustic experiment to studies the bi-syllable tone sandhi mode and the tone type of disyllabic words in Guangling dialect. Through the above analysis of the acoustic experiment of Guangling dialect, summing up its double tone and finally we can draw the following conclusions: (1) In summary, the change of the double tones in Guangling dialect is more special than other dialect. Most of the double tones in northern dialect only changed the front word, but in Guangling dialect, the front and back words both changed. (2) The main form of tone change is tone transposition. (3) There are seven type of bi-syllable tune in Guangling dialect, they are 55+31, 42+21, 52+21, 23+52, 22+31, 32+51, 52+22.
The method of acoustic experiment is used to analyze the bi-syllable tune of Guangling dialect, which not only provide a deeper understanding of Guangling dialect but also will provide some reference materials for later research.

Acknowledgements

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