

# Experimental Research on Disyllabic Tone of Heshun Dialect in Shanxi Province

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**Abstract.** In this paper, we use the method of experimental phonetics and listening perception to analyze the forms of disyllabic tone in Heshun dialect. The experimental result shows that there are twenty types of disyllabic tone in Heshun dialect. Among them, Yinping, Yangping, Shang, Qu, and Ru have four types, respectively.

**Keywords:** Heshun dialect, disyllabic tone, tone sandhi.

## 1. Introduction

The county of Heshun is located in the east of Shanxi province and the west of Taihang Mountain. From the dialect partition, Heshun dialect belongs to Dabao region of Jin language. At present, the research about Heshun dialect is still in the stage of traditional speaking and listening. With the rapid development of experimental phonetics, it is extremely urgent and meaningful to conduct further research. This paper is based on the experimental research of citation tone, continue to explore the disyllabic tones, and reveal the features of Heshun dialect in dynamic language research.

## 2. Experimental Description

### 2.1 Pronunciation Partner

This study selected a 25-year-old male speaker who is a native of Heshun. He has a certain education and is familiar with Heshun dialect. Above all, he pronounces clearly.

### 2.2 Experimental Equipment

The recording software is Adobe Audition 3.0, the sampling rate is 44100s, with 16-bit resolution. The analysis software includes Pratt5.0 and Matlab, which Praat5.0 is used to segment and mark speech samples and extract experimental data.

### 2.3 Pronunciation Table

Through the preliminary research, we know that Heshun dialect has five citation tones: Yinping (51), Yangping (42), Shang (55), Qu (242), and Ru (?32). So the combinations of disyllabic words should have  $5 \times 5 = 25$ . In this experiment, we use T1, T2, T3, T4, and T5 to represent Yinping, Yangping, Shang, Qu and Ru, respectively. Each combination selected four common words, and there are 100 disyllabic words. The specific pronunciation vocabulary is as follows:

### 2.4 Data Extraction and Analysis

Firstly, we use Praat5.0 software and normalized script to extract the fundamental frequency of 30 fundamental points for the first and last words respectively. Then normalize the F0 data and use the specific formula to convert the five-degree value. Finally, make the corresponding T-value curves, and combined with the auditory perception to determine the types and value of disyllabic tones.

Table 1. Vocabulary of Heshun dialect

Back Front	T1(51)	T2(42)	T3(55)	T4(242)	T5(?32)
T1(51)	天窗 高低 搬家 西瓜	光荣 新闻 帮忙 家庭	辛苦 工厂 高考 经理	书记 车票 空气 方便	中国 方法 钢笔 天黑
T2(42)	同乡 年轻 农村 提高	皮球 厨房 旗袍 长城	团长 存款 长短 牛奶	排队 程度 脾气 群众	毛笔 求职 红木 人物
T3(55)	火车 普通 打开 买花	保持 厂房 党员 本来	水果 保险 表演 处理	广告 好看 眼镜 买菜	小吃 普及 主食 满足
T4(242)	汽车 健康 地方 路灯	透明 面条 院墙 地球	报纸 代表 大米 胃口	纪念 种树 大树 另外	印刷 性别 办法 艺术
T5(?32)	结冰 昨天 说书 目标	国旗 发明 杂粮 绿茶	作品 热水 月饼 脚底	实际 国庆 失败 热菜	法则 蜡烛 直达 积极

### 3. Experimental Results and Discussion

There are two types of tone sandhi: transposition and non-transposition. Transposition means tone letters changed, such as level tone changed to falling tone. Non-transposable means tone letters do not change but only the value changed. In this experiment, we use "T1+X" to represent the combination of T1 and each tone, and so on. If some tones combined with the T5, T5 still remains its value in the process of sandhi, the “\_” is added under the value to distinguish it from other tones. The T value curve of each combination is as follows:

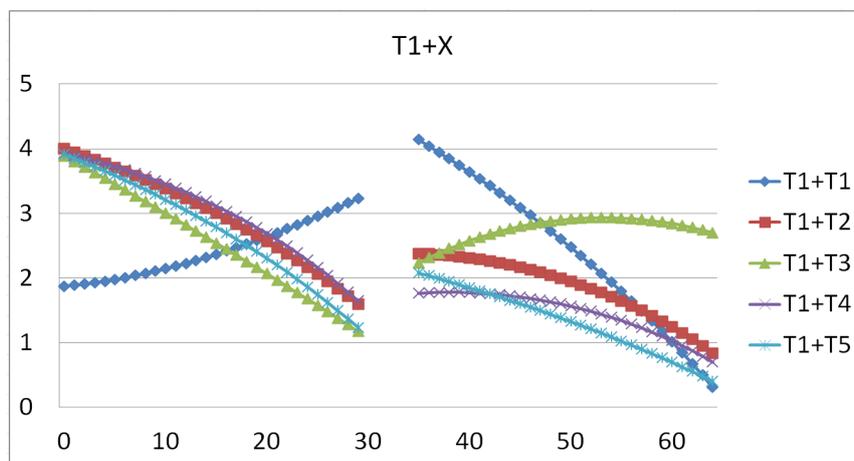


Fig. 1 Five-degree curve diagram of T1+X

Figure 1 is the five-degree curve for “T1+X”. There are two types of tone sandhi when the T1 is used as the front word. In the combination of T1+T1, the first word T1 is changed from a high falling tone 51 to a medium rising tone 24. In the T1+T2/T3/T4/T5 combinations, the curve trend and tone type of T1 is the same, but compared with the result of citation tone, the level of the curve starting point and the end point are different. The value of T1 is changed from 51 to 42.

In the combination of T1+X, there are four types of tone sandhi. T1+T1, its original tone value is 51+51, the form of tone sandhi is 24+51. T1 as the last word, it still maintains the original tone type and tone value. T1+T2 and T1+T4, the original tone values are 51+42 and 51+242, but the tone value becomes 42+21 in disyllabic words. T1+T3, from the original value 51+55 to 42+33, due to the influence of high falling tone of the front word, T3 changed from high level tone 55 to medium level tone 33. T1+T5, the original value is 51+32 to 42+21, and the value of T5 is reduced by one degree. Among the four forms of tone sandhi, 42+21 is the dominant form.

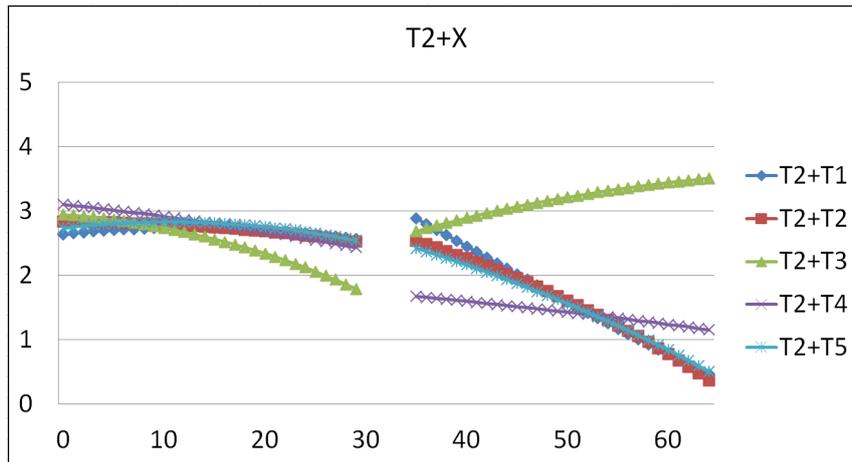


Fig. 2 Five degree curve diagram of T2+X

Figure 2 is the five-degree curve for “T2+X”. When the T2 is used as the front word, four curves are consistent in the slope and level, except for the T2+T3 combination, this slope is slightly different from others, but the value is all 33. Compared with the monosyllabic measurement, T2 from a falling tone 42 to a level tone 33.

In the combination of T2+X, there are four types of tone sandhi. The combination of T2+T1 and T2+T2 has the original value of 42+51 and 42+42, respectively. The latter word T1 and T2 are affected by the combination to some extent, and the tone value is reduced to 33+31. T2+T3 is changed from the original value of 42+55 to 33+33. T2+T4, from the original value of 42+242 to 33+22, T4 as the latter word is easily affected by the combination and change its value. T2+T5, the original tone value is 42+32, and the form of tone sandhi is 33+31. Among the four forms of tone sandhi, 33+31 is the dominant form.

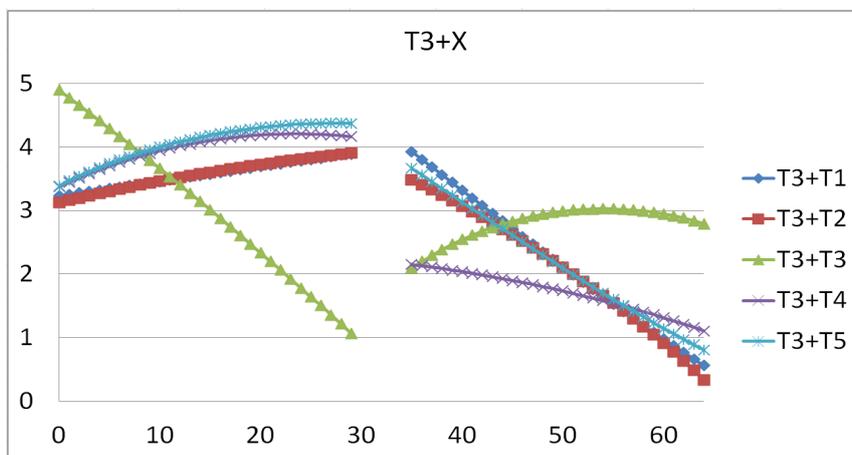


Fig. 3 Five-degree curve diagram of T3+X

Figure 3 is the five-degree curve for “T3+X”. When the T3 is in the front word, its tone type and tone value are quite different from citation tone. In the combinations of T1+T2/T3/T4/T5, the tone type of T3 tends to be basically the same. Combining with the method of auditory perception, it changed from 55 to 34. In the T3+T3 combination, T3 is changed from a high-level tone 55 to a high falling tone 51.

In the combination of T3+X, there are four types of tone sandhi. T3+T1 and T3+T2 have original value of 55+51 and 55+42, respectively, and the form of tone sandhi is 34+41. T3+T3 is changed from 55+55 to 51+33. The latter word T3 is the same in T1/T2/T3+T3 combinations, it is a level tone 33. T3+T4 is changed from 55+242 to 34+21, the latter words are affected by the combination and become a low falling tone. T3+T5, the original value is 55+32, the form of tone sandhi is 34+41. Among the four forms of tone sandhi, 34+41 is the dominant form.

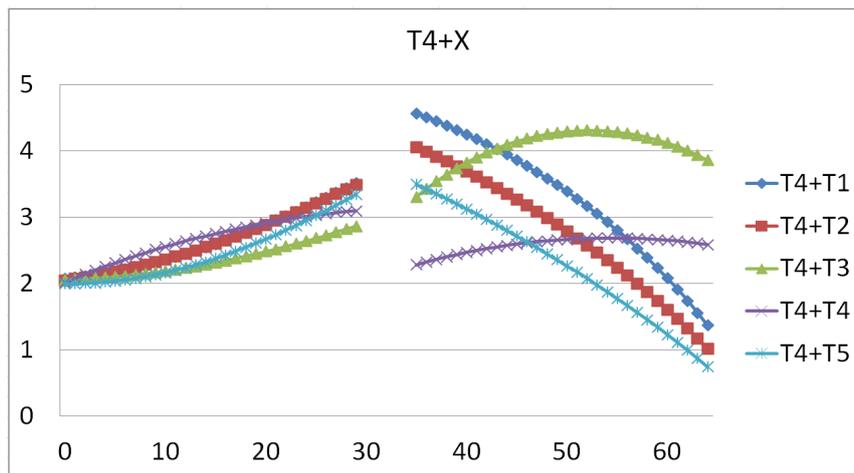


Fig. 4 Five-degree curve diagram of T4+X

Figure 4 is the five-degree curve for “T4+X”. When the T4 is in the front word, the slope and level of the five curves is consistent, and the value is 24.

In the combination of T4+X, there are four types of tone sandhi. The original tone value of T4+T1 and T4+T2 is 242+51 and 242+42 respectively, and the tone value becomes 24+51. The two groups of vocabulary were difficult to distinguish in the sense of hearing. T4+T3 is changed from original value 242+55 to 24+35. T3 used as the last word only in the combination of T4+T3, it changed from a level tone to a rise tone. T4+T4, the original value of 242+242 is changed to 24+33. T4+T5, the original value is 242+32, in order to maintain consistency and appropriate adjustment, its value changed to 24+41.

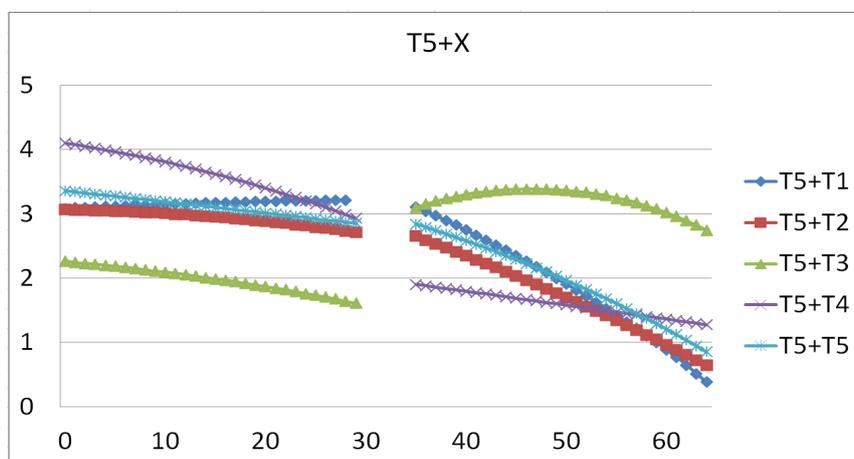


Fig. 5 Five-degree curve diagram of T5+X

Figure 5 is the five-degree curve for “T5+X”. T5 is a promoting tone with a short length and easy to synergize with other tones. There are three types of tone sandhi of T5: T5+T1/T2/T5 combinations, T5 is a mid-level tone 33; T5+T3, it is a low-level tone 22; T5+T4, it is a falling tone 43.

In the combination of T5+X, there are four types of tone sandhi. The combinations of T5+T1 and T5+T2 have the original value of 32+51 and 32+42, respectively. T1 and T2 will be affected by the inertia of the first word and the tone value reduced to 33+31. T5+T3 is changed from the original value of 32+55 to 22+33. T5+T4 is changed from the original value of 32+242 to 43+21, and the latter word is affected by the combination, becomes a low falling tone. T5+T5 is changed from the original value of 32+32 to 33+31. Among the four forms of tone sandhi, 33+31 is the dominant form.

## 4. Conclusion

Table 2. Heshun dialect disyllable tone mode table

Back Front	T1(51)	T2(42)	T3(55)	T4(242)	T5(ʔ32)
T1(51)	24+51	42+21	42+33	42+21	42+ <u>21</u>
T2(42)	33+31	33+31	33+33	33+22	33+ <u>31</u>
T3(55)	34+41	34+41	51+33	34+21	34+ <u>41</u>
T4(242)	24+51	24+51	24+35	24+33	24+ <u>41</u>
T5(ʔ32)	<u>33</u> +31	<u>33</u> +31	<u>22</u> +33	<u>43</u> +21	33+ <u>31</u>

In this experiment, using the method of experimental phonetics and listening perception, we can sum up the types and forms of the disyllable tones in Heshun dialect. When each tone is used as the front words, the appropriate coordination adjustment will be made according to the latter words; When each tone is used as the latter words, the original type of tone is basically maintained, except that the T4 has the types of falling tone and level tone. This experiment has initially analyzed the forms of disyllable tones in Heshun dialect, and there are twenty kinds of them, which will be further explored in the future.

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## References

- [1]. Hou Jingyi. Research on Modern Jin Language [M]. The Commercial Press, 1999.
- [2]. Liu Yuanyuan. A study of the pronunciation of Heshun dialect in Shanxi [D]. Shanxi University, 2014.
- [3]. Li Xi. Research on the Tone of Shanxi Dialect [D]. Shaanxi Normal University, 2014.
- [4]. Shi Feng. Tone analysis of double-syllable groups in Tianjin dialect [J]. Language research, 1986 (01): 77-90.
- [5]. Song Yidan. Experimental study on the tone of Nanjing dialect [D]. Nanjing Normal University, 2006.