

TONAL PATTERNS OF SHANDONG DIALECTS

--- a case study of Liaocheng and Tai'an

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ABSTRACT

The present study adopts phonetic experiment to systematically investigate the citation tone and tone sandhi patterns of Liaocheng and Tai'an dialect. It aims to provide empirical data for the theoretical analysis and explore the diversities of tonal phenomenon within Shandong (Hereinafter, as SD) dialect. Results demonstrate that both of these two dialects have four citation tones, i.e., Tone 1(14), Tone2 (51), Tone3 (55), and Tone4 (35) in Liaocheng dialect; Tone 1(14), Tone2 (51), Tone3 (55), and Tone4 (213) in Tai'an dialect. Due to the difference of Tone4 between these two dialects, Tai'an dialect exhibits more kinds of tone sandhi patterns than Liaocheng dialect. This result lies in the devious tone4 in Tai'an dialect which triggers more tonal variations in disyllabic sequences.

Index Terms— SD dialect, Liaocheng dialect, Tai'an dialect, citation tone, Tone sandhi

1. INTRODUCTION

1.1. Literature review and research aim

Shandong Province (SD) is situated on the eastern coast of China in the lower Huanghe River valley. The SD Peninsula in the east protrudes between the Bohai and Huanghai seas from the land mass and faces the Liaodong Peninsula in the north across the Bohai Straits. And, it forms the maritime outpost of the nation's capital, Beijing. It has been reported that the official language of modern China is a standardized language based on Beijing dialect, which is also known as Mandarin. Most linguists divide Mandarin into four subgroups (e.g., Li [1]), specifically, *Northern Mandarin*, which is spoken in the northeast, the Shandong Peninsula, and a wide area around Beijing; the *Northwestern Mandarin* of the loess plateaus; the *Southwestern Mandarin* of Sichuan and neighboring regions; and *Eastern or Lower Yangzi Mandarin*, typified by the dialects around Nanjing. Although SD deserves the feature of Northern Mandarin, i.e., they are for the most part mutually intelligible, given minor adjustment for tones, pronunciation, idioms, and vocabulary, they also present their unique features(Qian[2][3]), e.g., tonal and segmental diversities.

There exists two different opinions on the classification of SD dialect, e.g., Li [1] classifies SD dialect into three parts according to the representation of the entering tone (*Ru Sheng*), i.e., Jilu Mandarin, Zhongyuan Mandarin and Jiaoliao Mandarin. However, Qian [2][3] divides SD dialect into two main parts and four sub-parts according to articulatory regularities in SD dialect, i.e., East Part and West Part, both of which can be further divided into *Donglai*, *Dongwei*, *Xilu* and *Xiqi*. In regard with tones of SD dialect, most areas have four citation tones, while some have three tones. Previous studies on the tones of SD dialect mostly describe its tonal values through perception, e.g., Gao [4] examines the tone and tone sandhi difference of Old and New Mingshui dialect based on perception. The descriptive examination was also conducted on Leling dialect (Cao [5]) and Linyi dialect (Cao [6]). In Qian [2][3], she delineates more than one hundred dialectal regions in SD province, and all these regions with one speaker and one transcriber as the participant. Besides the descriptive study, Zhai [7] analyzes the tone sandhi phenomenon within the OT framework, through the exploration and interpretation of some tone sandhi patterns in SD dialect, the study presents varied conflicting forces as well as constraint rankings for tone sandhi patterning in Chinese dialects.

From the overview of the previous study, it can be obtained that the study of citation and tone sandhi in SD dialect is lack of systematical exploration and empirical examination due to the limitation of the experimental methodology. And, the theoretical analysis is also conducted based on the intuitive data. The present, in this regard, adopts experimental means to investigate the patterns of citation tone and tone sandhi in SD dialect, especially, it focuses on the mono-syllabic and disyllabic tonal patterns of Liaocheng and Tai'an dialect, both of which belong to the four tone region in Xiqi area. Through the examination, the study endeavors to provide the empirical data for theoretical analysis and explore the great intrinsic differences in SD dialect.

1.2. Introduction of Liaocheng and Tai'an

Liaocheng City, situated in the western part of SD Province, is at the juncture of Hebei, Shandong and Henan Provinces. Tai'an is located in the eastern coastal economy belt and the

Economic Zone around the Bohai Sea, lying at the intersection of SD Peninsula and the hinterland. The above two cities connect with each other in distribution, and the following map illustrates the geographical location of them.



Figure 1 Geographical location of Liaocheng and Tai'an in SD Province

Within the figure, the star marked cities are the two dialect regions, i.e., Liaocheng and Tai'an. Specifically, the former one is located in the western part of Jinan city (Capital city in SD) and the latter is seated in the south part of Jinan, it also connects with Liaocheng. Based on the dialectal classifications, both of them belong to the Xiqi region and have four citation tones. The selection of these two cities is to explore the different representation and realization of tones in SD Province.

2. METHODOLOGY

2.1. Materials selection

The mono-syllabic segment was selected from Qian [3], which covers all the initials and rhymes in SD dialect. It is pointed out that both Liaocheng and Tai'an have four citation tones, and the present study selects twenty-five samples for Yinping (tone1), Yangping (tone2), Shangsheng (tone3), and Qusheng (tone4), respectively. Therefore, the study obtained 100 samples for the analysis of citation tone in each dialect region. In regard with the disyllabic constituents, the study selected five samples for each tonal composition. Thus, it got 80 samples for acoustic analysis. All the selected constituents are the commonly used items in SD dialect.

2.2. Recording procedure and data labeling

All the above data were randomly listed in the recording schema. Recording was conducted in the quiet room with the yawp lower than 200db. The "wav" files were obtained from recording software with the microphone of Sennheiser PC166. For the two dialect regions, the study invited two speakers as the participants, i.e., two men participants for

Liaocheng and two women participants for Tai'an. All of these four speakers are post-graduate students in Shandong University of Science and Technology. They were born and brown up in Liaocheng and Tai'an before university.

All the 'wav' files were labeled by auto-segmentation software. 'Textgrid' files and 'Pitchtier' files were further checked by hand to ensure the accuracy of data. The F₀ data was extracted by the praat script with one syllable being selected ten points to normalize the duration.

3. TONAL PATTERNS OF MONO-SYLLABIC CONSTITUENTS

In this part, the study investigates the tonal patterns of mono-syllabic constituents of Liaocheng and Tai'an through which to make comparison of the experimental results in present study with the results of Qian [3].

3.1. Tonal patterns of Liaocheng dialect

The present sub-part is adopted to examine the citation tones of Liaocheng dialect. Previous study has demonstrated that Liaocheng has four citation tones, specifically, the tonal values is *yinping*(tone1) 213, *Yangping* (tone2) 42, *shangsheng* (tone3) 55, *qusheng* (tone4) 313(Qian [3]).

The following graph is the normalized values of the citation tone of Liaocheng dialect. The Y-axis is the five-scale values and the bottom part of the X-axis illustrates the content of the graph. The conversation formula of the pitch values to five-scale value is as:

$$T = [(\lg x - \lg b) / (\lg a - \lg b)] \times 5^1$$

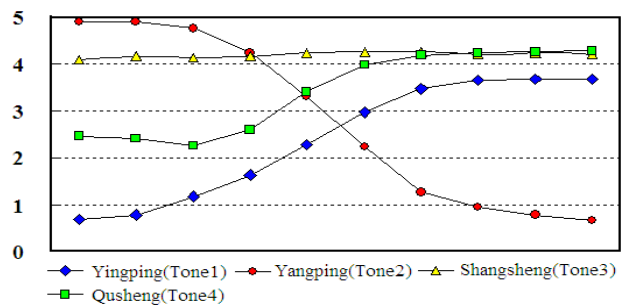


Figure2: Citation tones of Liaocheng dialect

From the above figure, the five-scale for each tone can be seen clearly, for Tone 1, it performs as '14', Tone2 as '51', Tone3 as '55', and Tone4 as '35'. Therefore, results of the acoustic data demonstrate that there are one level tone, one falling tone and two rising tones in Liaocheng dialect. In comparison with Qian [3]'s description, the difference lies in the following aspects: i) there contains no devious tones

¹ Within the formula 'x' is the target pitch value, and 'a' is the maximum pitch value which 'b' is the minimum pitch value in the pitch range.

in the present study, specifically, the corresponding tone1 and tone4 perform as rising tones; ii) specific tonal values of tone2 exhibit different value in the present study.

3.2. Tonal patterns of Tai'an dialect

In this sub-part, the study investigates the tonal patterns of Tai'an dialect. Results of Qian[3] have demonstrated that the tonal value of Tai'an is as: *yinping* (tone1) 213, *Yangping* (tone2) 42, *shangsheng* (tone3) 55, *qusheng* (tone4) 31(Qian[3]). The following Figure3 is the five-scale values in present study. The axes in following part keep identical with Figure2.

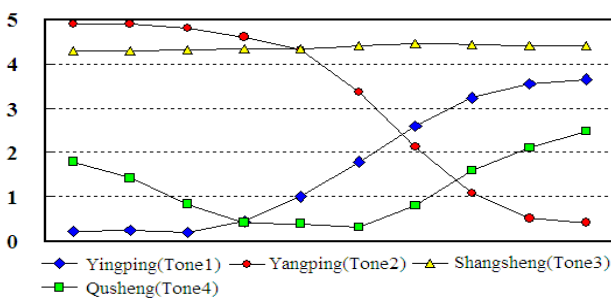


Figure3: Citation tones of Tai'an dialect

The tonal values in the figure show that Yingping (Tone1): 14, Yangping(Tone2): 51, Shangsheng(Tone3): 55, and Qusheng(Tone4): 213. Therefore, the results of present study exhibit differences in comparison with Qian[3]. Specifically, it contains one level tone: tone3, one ring tone: tone1, one falling tone: tone2 and one flexuous tone. Comparing with Qian[3], the difference lies in the following perspectives: i) tone1 in [3] is transcribed as a flexuous tone while it performs as a rising tone in the present study; ii) tone4 is described as a falling tone in [3] while it shows as a flexuous tone in the above figure; iii) tonal values of tone2 exhibits difference, which is written as 24 in [3] and 51 in this sub-part.

4. TONE SANDHI PATTERNS

4.1. Tone sandhi patterns of Liaocheng dialect

In this sub-part, it systematically examines the disyllabic tone sandhi patterns of Liaocheng dialect. Previous study from Qian [3] has demonstrated that among the sixteen tonal combinations, Liaocheng dialect exhibits three kinds of tone sandhi patterns, e.g., $Tone3+Tone3 \rightarrow Tone2+Tone3$, $Tone2+Tone4 \rightarrow Tone3+Tone4$, $Tone4+Tone4 \rightarrow Tone1+Tone4$. The present study adopts acoustic means to further compare the sandhi results from present study with Qian [3].

The following Figure 4 is the tonal patterns of $Tone2+Tone3$, $Tone3+Tone3$, $Tone2+Tone4$ and

$Tone3+Tone4$. This description is listed in the bottom part of X-axis. The Y-axis also illustrates the five-scale values.

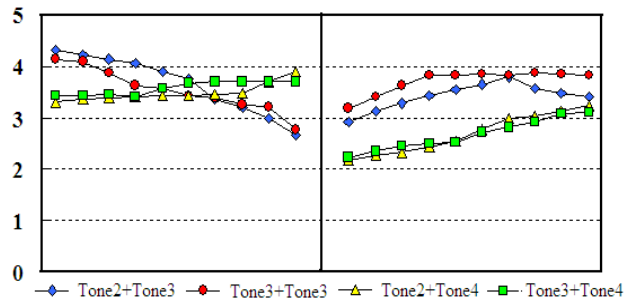


Figure4: Tonal patterns of 'Tone2+Tone3' vs. 'Tone3+Tone3' and 'Tone2+Tone4' vs. 'Tone3+Tone4'

Examination of the above figure exhibits that tonal combinations, i.e., tone2+tone3 and tone3+tone3 show similar tonal patterns. Specifically, the previous syllable performs as a falling tone, i.e., '53'. And, the final syllable as a level tone realizes as '44'. From this observation, it can be seen clearly that when tone3 locates before tone3, it can realize in the similar way with tone2. Thus, the tone3 changes to tone2 when it distributes before tone3, i.e., $Tone3+Tone3 \rightarrow Tone2+Tone3$.

In regard with the tonal combination 'Tone2+Tone4' and 'Tone3+Tone4', the first syllables in these two combinations are in the similitude of citation tone3 with the tonal value as '44'. Further, the second syllables in the above two sequences exhibit tonal value as '34'. It has been proposed in part 3.1 that tone2 is a falling tone in citation form and it performs as a level tone when it locates before tone4 in the above figure. Therefore, when tone2 is assigned before tone4, it changed to tone3, i.e., $Tone2+Tone4 \rightarrow Tone3+Tone4$.

The above two paragraph examine the tone sandhi patterns of Liaocheng dialect. These two sandhi patterns have also been defined as tone sandhi pattern in Qian[3]. However, it also proposed that tone4 processed no tone sandhi phenomenon when it locates before tone4. The following figure is the result from present study.

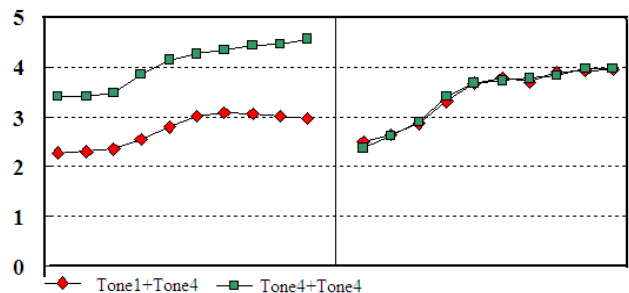


Figure5: Tonal patterns of 'Tone1+Tone4' vs. 'Tone4+Tone4'

As it is known that in the tonal combination of 'Tone1+Tone4' vs. 'Tone4+Tone4', they show identical

tones in the second syllable, what constitutes the difference between them is the tone of the first syllable. It can be obtained from the above figure that tone1 and tone4 exhibit register difference, and specific values show that tone1 observes the tonal value as ‘23’ and tone4 ‘45’. In part 3.1, the study points out that both of tone1 and tone4 are raising tones, the difference lies in pitch register. Tone1 shows lower pitch register than tone1. Here, in this part, tone1 and tone4 keep this pattern of distribution. Thus, when tone4 locates in the proceeding position of tone4, it does not change to tone2.

In this part, it investigates the tone sandhi patterns of Liao Cheng dialect. Results demonstrate that there are two sandhi patterns in sixteen tonal combinations, i.e., $\text{Tone3}+\text{Tone3} \rightarrow \text{Tone2}+\text{Tone3}$ and $\text{Tone2}+\text{Tone4} \rightarrow \text{Tone3}+\text{Tone4}$.

4.2. Tone sandhi patterns of Tai’an dialect

In this sub-part, the study investigates tone sandhi patterns of disyllabic constituents in Tai’an dialect. Previous analysis proposes that there are two kinds of tone sandhi patterns in Liao Cheng dialect, and these results show dissymmetry with Qian [3]. In this part, the study also compares the result from present study with Qian [3]. In [3], it pointed out that there are two kinds of tone sandhi patterns in Tai’an dialect, i.e., $\text{Tone3}+\text{Tone2} \rightarrow \text{Tone1}+\text{Tone2}$ and $\text{Tone3}+\text{Tone3} \rightarrow \text{Tone2}+\text{Tone3}$.

Figure 6 beneath is the tonal pattern of sequences of ‘Tone1+Tone2’, ‘Tone3+Tone2’, ‘Tone2+Tone3’ and ‘Tone3+Tone3’, through which to examine the above mentioned two kinds of tone sandhi patterns.

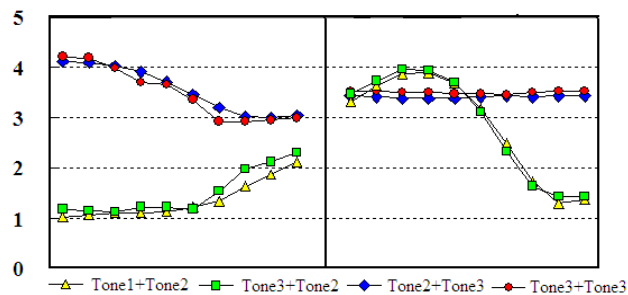


Figure 6: Tonal patterns of ‘Tone1+Tone2’ vs. ‘Tone3+Tone2’ and ‘Tone2+Tone3’ vs. ‘Tone3+Tone3’

Examination of the above figure shows that the tonal sequences ‘Tone1+Tone2’ vs. ‘Tone3+Tone2’ realize similar tonal contours. The first syllable in these two sequences realize as a rising tone while the second syllable as a falling tone. Base on the result from part 3.2, tone1 is a rising tone, tone2 is a falling tone and tone3 is a level tone. From the above figure, it can be attained that when tone3 is designed to locate before tone2, it loses its level tone feature and changes to a rising tone. Therefore, tone3 processes

tone sandhi when it distributes before tone2, i.e., $\text{Tone3}+\text{Tone2} \rightarrow \text{Tone1}+\text{Tone2}$.

As for the tonal sequences of ‘Tone3+Tone3’ vs. ‘Tone2+Tone3’, they show similar tonal patterns, specifically, the first syllable of these two sequences is different from each other, however, they show resemble acoustic performances in the surface form. They realize as falling tones with tonal value as ‘53’. It has been proposed in part 3.2 that tone3 is a level tone while tone2 is falling tone. From this perspective, it can be seen that tone3 processes tone sandhi when it locates before tone3, i.e., $\text{Tone3}+\text{Tone3} \rightarrow \text{Tone2}+\text{Tone3}$.

The following graph is Figure 7 which illustrates tonal patterns of sequences ‘Tone1+Tone2’, ‘Tone1+Tone4’ and ‘Tone2+Tone4’.

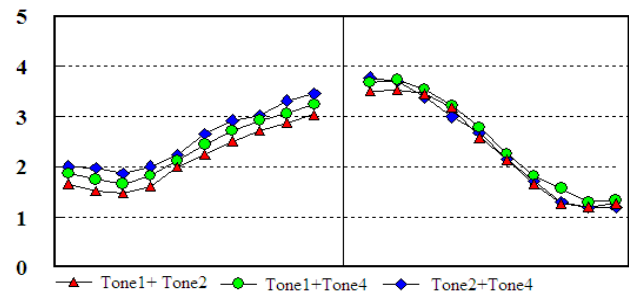


Figure 7: Tonal patterns of ‘Tone1+Tone2’, ‘Tone1+Tone4’ and ‘Tone2+Tone4’

Closer examination of the above figure shows that they perform resembling tonal contours. Concretely, all the first syllables and second syllables in the above sequences are similar with each other. Previous description demonstrates that the first syllables in the above three sequences are tone1, tone1 and tone2, the second syllables are tone2, tone4, and tone4, respectively. It has been reported in part 3.2 that tone1 is a rising tone and tone2 is a falling tone. From the above figure, only the tonal combination of ‘Tone1+Tone2’ keeps its tonal performances as the citation tones. However, as for tonal sequences, i.e., ‘Tone1+Tone4’, the second syllable performs as a falling tone and exhibits similar contour with tone2 in citation form. In regard with ‘Tone2+Tone4’, the first syllable realizes as a rising tone which exhibits as a falling tone in its citation form. Therefore, when tone1 distributes before tone4, the tone4 realizes as tone2 and when tone2 locates in the proceeding position of tone4, it realizes as tone1 and the tone4 performs as tone2. These results can be expressed as: $\text{Tone1}+\text{Tone4} \rightarrow \text{Tone1}+\text{Tone2}$ and $\text{Tone2}+\text{Tone4} \rightarrow \text{Tone1}+\text{Tone2}$.

Figure 8 is the tonal patterns of sequences ‘Tone3+Tone2’, ‘Tone3+Tone4’ and ‘Tone4+Tone4’, through which to examine the tone sandhi patterns of the above combinations.

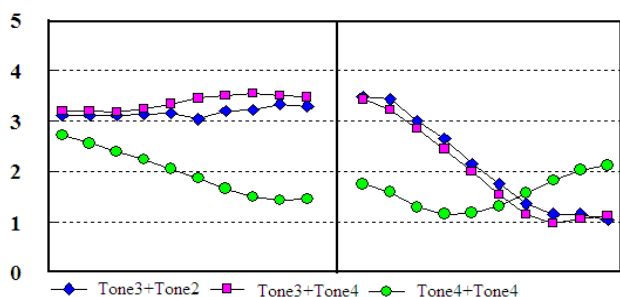


Figure 8: Tonal patterns of 'Tone3+Tone2', 'Tone3+Tone4' and 'Tone4+Tone4'

With regard to the tonal combination of 'Tone3+Tone2', the first syllable is a level tone while the second syllable performs as a falling tone. Part 3.2 demonstrates that tone3 is a level tone and tone2 is a falling tone in its citation form. Thus, tonal combination 'Tone3+Tone2' keeps its original realization. However, as for 'Tone3+Tone4', although the first syllable keeps the level tone feature, the second syllable realizes as a falling tone which is a rising tone in its citation form. In comparison with 'Tone3+Tone2', 'Tone3+Tone4' shows different tonal combinations with it, whereas, they realize similar tonal values in the surface form. Thus, tone4 in 'Tone3+Tone4' changes to tone2. In regard with 'Tone4+Tone4', it shows different tonal performances with the previous tonal combinations in the way that the first syllable realizes as a falling tone and the second syllable as a rising tone. In the citation form, the tone4 is a devious tone, thus, the second syllable remains the original value and the first syllable realizes as semi-tone4 as Mandarin Chinese.

The study in this part investigates tone sandhi patterns of disyllabic constituents in Tai'an dialect. Results demonstrate that there are five kinds of tone sandhi pattern in Tai'an dialect, specifically, $\text{Tone3+Tone2} \rightarrow \text{Tone1+Tone2}$, $\text{Tone3+Tone3} \rightarrow \text{Tone2+Tone3}$, $\text{Tone1+Tone4} \rightarrow \text{Tone1+Tone2}$, $\text{Tone2+Tone4} \rightarrow \text{Tone1+Tone2}$ and $\text{Tone3+Tone4} \rightarrow \text{Tone3+Tone2}$.

5. CONCLUSIONS

The present study adopts acoustic means to systematically investigate the mono-syllabic and disyllabic tonal patterns of Liaocheng and Tai'an dialects. The two dialects belong to Xiqi district in SD Province, and both of them have four citation tones. The study selects these two cities as the target dialects with the aim to explore the diversities of tones in SD Province. Results of the study demonstrate that mono-syllabic and disyllabic constituents of Liaocheng and Tai'an exhibit regional feature. Liaocheng dialect shows the following aspects: i) citation tones, for Tone 1, it performs as '14', Tone2 as '51', Tone3 as '55', and Tone4 as '35'; ii) tone sandhi patterns, a) $\text{Tone3+Tone3} \rightarrow \text{Tone2+Tone3}$; b) $\text{Tone2+Tone4} \rightarrow \text{Tone3+Tone4}$. Although Tai'an dialect shows identical number of citation tones with Liaocheng

dialect, it exhibits more kinds of tone sandhi patterns, specifically, it lies in the following aspects: i) citation tones, Tone1: 14, Tone2: 51, Tone3: 55, and Tone4: 213; ii) tone sandhi patterns, a) $\text{Tone3+Tone2} \rightarrow \text{Tone1+Tone2}$; b) $\text{Tone3+Tone3} \rightarrow \text{Tone2+Tone3}$; c) $\text{Tone1+Tone4} \rightarrow \text{Tone1+Tone2}$; d) $\text{Tone2+Tone4} \rightarrow \text{Tone1+Tone2}$; e) $\text{Tone3+Tone4} \rightarrow \text{Tone3+Tone2}$.

The present study is a preliminary experimental study on the tones of SD dialect. The significance of the study lies in the following aspects: i) it provides experimental means for the analysis of SD dialect; ii) the study of the citation tone and tone sandhi patterns is the base for theoretical analysis; iii) the results can be adopted to examine the transfer of SD dialect on the acquisition of both English and Standard Chinese.

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