

Right-prominent Trisyllabic Tone Sandhi in Taifeng Chinese

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Abstract

Previous studies on tone sandhi in the Wu dialect of Taifeng have revealed distinct patterns for verb-object (VO) and modifier-noun (MN) structures in right-prominent disyllabic prosodic words. VO sandhi shows tonal neutralization in the initial syllable and preservation in the final syllable, while MN sandhi involves tonal alternation on both syllables. This study further investigates tone sandhi in trisyllabic words from the perspective of their temporal structure and pitch contours. Results indicate that trisyllabic words, regardless of their metrical and morphosyntactic structures, exhibit a rightward prominence, with final syllables having markedly greater duration and broad pitch excursions than non-final syllables, being dominantly featured in a neutralized mid (M) tone across the first two syllables. However, distinct patterns emerge in the 1+2 metrical structure when the latter disyllables undergo either disyllabic VO or MN tone sandhi, depending on their internal composition. When the disyllabic MN tone sandhi occurs, the middle syllable is lengthened to accommodate the altered tonal contour. Similar variations are exhibited in the 2+1 metrical structure when disyllabic premodifiers vary in tone sandhi patterns. Trisyllabic tone sandhi in Taifeng Chinese showcases complex interactions of lexical tone sandhi and higher-level prosodic constraints. Generation factor is considered but no significant divergence is observed compared to disyllabic tone sandhi.

Index Terms — Taifeng Chinese, Trisyllabic tone sandhi, prosody, prominence, neutralization

1. Introduction

Taifeng is located in the northern Nanling county of Anhui province and belongs to the Tongjing subgroup of Xuanzhou Wu dialects. Taifeng Chinese is predominantly spoken in rural areas and within families, and it is considered a critically endangered dialect due to a dwindling population and the lack of transmission to the youngest generation [1].

Taifeng Chinese retains four contrastive lexical tones (M, R, L, and checked tone ?H) [2], the fewest among Wu dialects. Regional and generational tonal differences divide speakers into three groups, particularly regarding the historically voiced-obstruent Ping (T2). To reflect this, voiced-obstruent Ping (T2) and voiced-sonorant Ping (T3) were separated, yielding a total of nine original tones based on the Middle Chinese (MC) eight tones, named T1 to T9 in turn. Tonal mapping details for the three groups are depicted in Figure 1. Group 1 (speakers from outside Zhengtan Village) merges T2 with voiced-sonorant Ping (T3); Group 3 (middle-aged and young speakers from Zhengtan Village) merges T2 with voiceless Shǎng (T4); and Group 2 (elder speakers from Zhengtan Village) merges T2 with both depending on the lexical item. All groups share the identical lexical tone inventory. M is a mid-level tone, either a

low tone in high register or a high tone in low register. R is a low-register rising tone. L is a low-register low tone, and the checked tone ?H is a high-register high tone with shorter tonal duration. The checked tone ?H differs from the three non-checked tones (M, R, L) not only in terms of pitch contour but also in tonal duration.

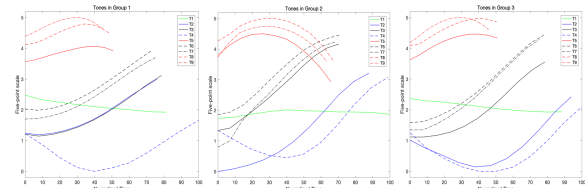


Figure 1: Tone inventory of three groups in Taifeng Chinese

Previous research [3,4] shows that disyllabic tone sandhi in Taifeng Chinese is sensitive to morphosyntactic structures, especially between verb-object (VO) and modifier-noun (MN) structures, despite both being metrically right-prominent. In VO structure, the word-final syllable is prominent and retains its citation tone including tonal category, contour, and register, while the initial syllable which is non-prominent undergoes tonal compression and shortening. In MN structure, prominent syllable is also involved in tone sandhi. Specifically, four distinct tone sandhi patterns are observed: (1) ?H-pattern: ?H+M/R/L>?H+?H; (2) L-pattern: M/R/L/?H+M/R/?H>M+L; (3) FR-pattern: M/R/L/?H+ M/R/L/?H>F+R (the first syllable changes to a falling tone labeled as F, and the second syllable manifests as R, so that the two syllables form a tonal contour similar to the lexical L tone); (4) Neutralized pattern: the word-final syllable loses its prominent position and become neutralized. This pattern is excluded from this paper due to complexity. This tone sandhi behavior contrasts with Northern Wu dialects like Shanghai Chinese, where metrical prominence is more closely tied to morphosyntactic structures [5].

Given the endangered status and unique tonal features of Taifeng Chinese, expanding the study to trisyllabic tone sandhi is typologically significant for understanding prosodic complexity and systematic rules. This paper addresses three key questions: (1) What is the phonetic realization of trisyllabic tone sandhi in Taifeng Chinese; (2) How is it manipulated by phonological operations; (3) Are there generational differences.

2. Method

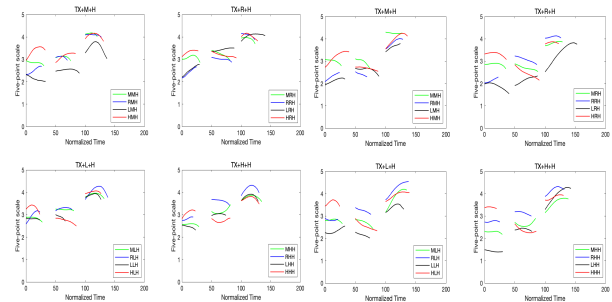
2.1. Materials

Based on previous disyllabic tone sandhi studies [3, 4], we find little correlation between surface realization of the tone sandhi patterns and underlying form of MC, except for T2 in Group 2. Therefore, this study focuses on the current tonal inventory (M, R, L, and ?H) for trisyllabic tone sandhi, yielding $4 \times 4 \times 4 = 64$ possible tonal combinations. In addition, considering the

Prominence in language, typically realized through pitch, duration, or intensity, is often linked to stressed syllables [11,12,13]. The distribution of tonal duration supports our observation that metrical prominence in Taifeng Chinese trisyllabic words is on the rightmost syllable, with the initial and middle syllables being non-prominent. As noted in Section 1, disyllabic tone sandhi neutralizes the left-hand (non-prominent) syllables, causing pitch range and contour differences between initial and final syllables. The following examination will explore how this right-prominent metrical structure affects the phonetic specification of trisyllabic tonal combinations.

Figure 5 gives the f0 patterns for elder speakers of the 1(V)+2(O) structure when the initial syllables are L tone (left panels) or the final syllables are L tone (right panels). The left panels indicates that the initial L tone invariably loses its citation form becoming a short flat tone which can be characterized as M-tone insertion [13], while the right panels showing a tone retention of the final L tone. Almost all middle syllables, regardless of citation forms, adopt a shortened M tone insertion as well, except for LRM where the middle syllable become a falling tone and the final syllable become R tone (i.e. ‘FR’ pattern sandhi. we will return to this later). It’s apparent that tone sandhi occur in these tonal combinations and the predominant tone sandhi pattern can be best characterized as M-M-TX. For example, all trisyllabic tonal combinations surface as M-M-L in the right panels of Figure 5, i.e., the initial and middle syllables are completely neutralized in tonal categories and the final syllables retain their citation form.

The M-M-TX tone sandhi pattern also applies to the other morphosyntactic and metrical structures. As Figure 7 shows, both the initial and middle syllables becoming a shortened M tone, while the final syllables retain their citation form ?H in the 1(M)+2(N) metrical structure. All tonal combinations realize as M-M-?H.



All analyses above indicate that under the 1+2 metrical structure in trisyllabic words, the right-prominent structure in Taifeng Chinese has similar regulation and constraints on the phonetic surface representation as found in disyllabic words. In this domain, the final syllable, in the prominent position, retains the citation form unchanged, while the initial and middle syllables, in the non-prominent position, have a highly compressed pitch range and mostly neutralize to an M tone with shortened tonal duration. Special tone sandhi patterns involving the final syllable adjust within the tone inventory of citation forms. Thus, the trisyllabic tone sandhi patterns are predominantly realized as M-M-TX, with M as a short flat tone, consistent among speaker groups. Only one exception occurs when the last two syllables undergo the 'FR' tone sandhi, in which the middle syllable surfaces as a falling tone (F). However, when the metrical structure is 2+1, the situation is slightly different.

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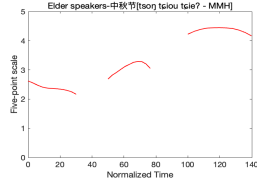


Figure 8: *Realization of 中秋节 (tsɔŋ tɕiəu tɕiəʔ - MMʔH) in elder speakers, 2(M)+1(N)*

3.3. Special tone sandhi patterns related to morphosyntactic structures revealed the underlying phonological hierarchy

M-M-TX is the absolutely predominant trisyllabic tone sandhi pattern in Taifeng Chinese under the right-prominent metrical structure. This results in a very high degree of merger in phonetic realization, blurring the mapping from underlying phonology to the phonetic surface. However, special tone sandhi scenarios such as the LRM and LʔHR tonal combinations in Figure 5 and LRM, LRʔH and LʔHR in Figure 6 presented, as described in section 3.2, provide insights into the interaction between phonology, phonetics, morphosyntax, and prosody.

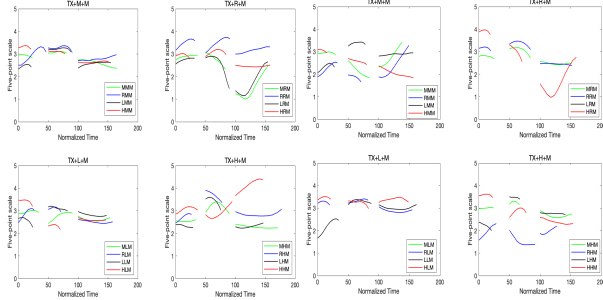


Figure 9: *Realization of tone M as last syllable in trisyllabic words, elder speakers, 1(V)+2(O) and 1(M)+2(N)*

Figure 9 shows the f0 patterns of the final M tone in the 1(V)+2(O) structure (left) and the 1(M)+2(N) structure (right). Focusing on the ʔHʔHM tonal combination under the 1(V)+2(O) structure (left panel) first, the final M undergoes ‘ʔH pattern’ tone sandhi and is significantly higher in register than the middle syllable, while the middle ʔH is not higher than the initial syllable. Given that ʔH is the highest tone in tonal inventory and always higher in the final position of a prosodic word domain [2], it indicates that the middle and final syllables form the tone sandhi domain, namely a prosodic word, where special tone sandhi occurs. Then, the initial syllable and the following tone sandhi domain form a larger prosodic unit. Under the constraint of right-prominent metrical structure, the non-prominent initial syllable undergoes neutralization. Therefore, there are two levels of phonetic specification from the bottom to the surface: first, tone sandhi occurs at the level where the smallest unit is a disyllabic prosodic word, influenced by the morphosyntactic structure and phonological features, and governed by the right-prominent metrical structure; second, a larger tone sandhi unit consist of a prosodic phrase formed by the whole trisyllabic word, which is again regulated by the right-prominent metrical structure. This hierarchical nature of trisyllabic tone sandhi is thus reflected. The RʔHM tonal combination under the 1(M)+2(N) structure in the right panel of Figure 9 provides a better illustration of the division of prosodic units. Here, the middle and final syllables also undergo ‘ʔH pattern’ sandhi with the final syllable changing to ʔH tone from M tone. Following the sandhi, the final ʔH is higher than

the weakened and neutralized middle ʔH tone, but it’s not higher than the non-prominent initial ʔH tone, indicating that the final and initial syllables do not belong to the same prosodic word.

The MRM and RRM tonal combinations in the left panels of Figure 9, where the middle R both realizes as a falling tone F, and the final syllables change to a rising tone R. It is evident that the latter two syllables consist of a prosodic word, forming the least tone sandhi domain and undergo an ‘FR-pattern’ tone sandhi. Such realization of the tonal contour requires sufficient duration support, hence we can observe that the tonal duration of middle syllables in the aforementioned tone sandhi patterns are relatively elongated compared to other middle syllables in order to achieve the falling (F) tonal target (except for the RMM [大西瓜 rɦa fɦ kua] tonal combination in the right panel of Figure 9, where the phonological structure of the intermediate syllable is a frictive vowel, resulting in shorter duration).

The observations are consistent in middle-aged speakers, thus repetition is unnecessary. In addition, in 2(M)+1(N) structures, the monosyllabic head noun (N) always retains its citation tone regardless of the internal composition of the disyllabic premodifier (M). This further confirms the way prosodic units are constructed. That is, the initial disyllabic word forms a prosodic word, and then with the final monosyllabic syllable, constitutes a prosodic phrase. Both units are regulated by the right-prominent metrical structure. Only the word-final syllable occupies the prominent position and retains the citation form while the initial and middle syllables undergo neutralization and changed their tonal categories. This pattern is consistent across elder and middle-aged speakers.

4. Conclusions

Trisyllabic words in Taifeng Chinese consistently exhibit right-prominence, irrespective of their metrical and morphosyntactic structures, with the word-final syllable maintaining the tonal category, pitch contour, register and tonal duration features of the citation form, while the initial and middle syllables are often neutralized to a mid (M) tone with reduced tonal duration. This creates a predominant M-M-TX tone sandhi pattern, which obscures the link between phonological rules and surface phonetic forms. Certain tone sandhi patterns in the trisyllabic MN words reveal that trisyllabic tone sandhi operates on two levels: the disyllabic prosodic word and the trisyllabic prosodic phrase. Right-prominent metrical structure is crucial for regulating tone sandhi on both levels by assigning appropriate features based on syllable position. Morphosyntactic and tonal phonological features also contribute to trisyllabic tone sandhi patterns, with consistency observed across both elder and middle-aged speakers. It is notable that the M-M-TX pattern is phonologically abstract, with the neutralized M tone influenced by coarticulation with the following syllable, resulting in minor tonal variations in its phonetic realization. Simple perception tests confirm this pattern, though further rigorous procedures and meticulous analyses are needed.

5. Acknowledgements

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