# Consonant and lexical tone interaction: Evidence from two Chinese dialects

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# English Summary

This dissertation investigates the interaction of consonant and lexical tone (C-T interaction hereafter) in two Chinese dialects, namely Lili Wu and Shuangfeng Xiang Chinese. It has long been known that initial consonant and fundamental frequency (*f*0) interact irrespective of whether *f*0 distinction is phonologized. In tonal languages, a high tone (having a higher *f*0 onset) usually co-occurs with a voiceless consonant, and a low tone (having a lower *f*0 onset) usually co-occurs with a voiced consonant ([voiceless/H]-[voiced/L] pattern hereafter). However, this [voiceless/H]-[voiced/L] pattern has been challenged by data from some Chinese dialects.

A comprehensive phonetic description of the sound system of each of the two dialects is given before presenting the two case studies. In doing so, certain background information, terms, or phenomena, which require an elaborate motivation and explanation, can be introduced to readers as early as possible.

**Chapter 1** introduces the research topic of this dissertation, namely C-T interaction in two Chinese dialects (i.e., Lili Wu and Shuangfeng Xiang). Particularly, this study follows a property-based approach and aims to overcome the two biases (i.e., typological and methodological) observed in the existing literature of C-T interaction.

**Chapter 2** presents a comprehensive description of the sound system of Lili Wu Chinese. A number of methodological/analytical innovations and new perspectives with regard to not only lexical tones but also segmental features are proposed. First, there are eight lexical tones in Lili Wu Chinese. The instrumental analyses show a clear *f*0 lowering effect in syllables with voiceless aspirated onsets in certain tonal contexts (i.e., non-*Ping* Middle Chinese [MC] tonal categories). This lowering effect, seemingly a split of the same tone into two as a function of voiceless unaspirated vs. aspirated onsets, is known as the 'aspiration-induced tonal split' (ATS) phenomenon. The [voiceless/H]-[voiced/L] co-occurrence pattern commonly observed in most Northern Wu dialects, falls apart in Lili Wu Chinese where voiceless aspirated onsets can co-occur with low tones. Second, voicing contrasts in fricatives, such as /f/ vs. /v/, can be signaled via their durational differences. The percentage of the frication duration of voiceless onsets is significantly higher than that of their voiced counterparts.

Third, the two high front vowels are proposed to be better transcribed as /i/ (e.g., /ti$^{3}$/ 'dot') and /i̪/ (e.g., /ti̪$^{3}$/ 'bottom'), with more anterior constriction for /i̪/. Fourth, there are two syllabic approximants in Lili Wu Chinese. /ɹ̩̪/, as in /sɹ̩̪$^{1}$/ 'book', is produced with a more laminal articulation combined with a lip rounding gesture in contrast to /ɹ̩/, as in /sɹ̩$^{1}$/ 'silk'.

**Chapter 3** focuses on the issue of C-T interaction in Lili Wu Chinese. Controlled experiments were designed to examine two long-standing debates on ATS in previous literature. They are i) Is ATS an on-going change (e.g., Shi, 1992) or a completed change (Shen, 1994)? and ii) Is aspiration (e.g., Chao, 1928) or breathiness (e.g., Zhu & Xu, 2009) synchronically related to ATS? The present results suggest that ATS in Lili Wu Chinese is a completed sound change but conditioned by certain tonal contexts (i.e., MC tonal categories). This pattern is quite consistent across generations. Regarding the second debate, the results suggest neither aspiration nor breathiness is synchronically related to ATS. One ongoing sound change observed is that the breathiness of vowels after voiced onsets is disappearing among the younger generation of Lili Wu speakers. This is probably due to its superfluous role in cueing the three-way laryngeal contrast and it is therefore not a robust cue for the laryngeal contrast in Lili Wu Chinese.

**Chapter 4** provides a comprehensive description of the sound system of Shuangfeng Xiang Chinese. There are four main findings. First, the voiced consonant has multiple laryngeal realizations: modal voiced, voiceless unaspirated, and implosive. Second, /n/ and /l/ contrast only before three high segments (i.e., /i ʏ j/) and are neutralized before the other segments. Third, Shuangfeng Xiang Chinese has an interesting and rarely observed three-way contrast in high back vowels, as exemplified by the triplet of /bo$^{2}$/ 'to climb' vs. /bu$^{2}$/ 'old woman' vs. /bu̟$^{2}$/ 'calamus'. In addition to their formant differences, the three back vowels can be distinguished via strong visual cues, namely their distinct lip gestures. Both /o/ and /u/ differ from /u̟/ in having more rounding and protruding lip constriction, whereas /u̟/ is produced with greater lip compression and less lip protuberance than /o/ and /u/ are. Fourth, relative to the sonorant baseline, *f*0 is lowered after voiced and voiceless aspirated onsets but is unaffected (or minimally affected) after voiceless unaspirated onsets. This pattern seems to be consistent across all tonal contexts.

**Chapter 5** focuses on C-T interaction in Shuangfeng Xiang Chinese. The question concerns the phonetic properties shared by voiced and voiceless (i.e.,

unaspirated and aspirated) onsets that condition the low-rising *f0* contours. In the existing literature, *f0* contours after different onsets are treated as an identical low-rising tone (i.e., T2) which is associated with syllables with laryngeal contrast in voicing (e.g., Chao, 1935 [Yang, 1974]). This phenomenon is termed 'initial-associated tonal merger' (ITM). However, Zhu and Zou (2017) argue for a two-way phonatory distinction of the laryngeal contrast which co-occurs with two separate low-rising tones (i.e., modal – /24/ vs. breathy – /13/). The results show that neither voicing contrast nor phonation contrast can explain all findings. Furthermore, the phonetic properties that condition the low-rising *f0* contours have been undergoing changes. Specifically, there seems to be a trading relationship between voice onset time (VOT) and contact quotient (CQ) across generations. When a low-rising-contour-carrying syllable has a voiced onset, the old-generation speakers produce predominately negative VOTs without significant breathiness (indicated by CQ) in the following vowel. The young-generation Shuangfeng Xiang speakers, however, produce fewer negative-VOT tokens as well as shorter negative VOTs. However, in contrast to the old-generation speakers, they enhance breathiness over the following vowel (over the first half).

**Chapter 6** first concludes the main findings reported in previous chapters. Furthermore, the typological significance of the results obtained from Lili Wu Chinese and Shuangfeng Xiang Chinese is discussed. In general, voiceless aspirated onsets can co-occur with low tones. Breathiness transition, together with aperiodic noise of aspiration, provides a possible pivot for linking onset aspiration to *f0* lowering. This finding is antagonistic to the [voiceless/H]-[voiced/L] pattern which posits that only contrastively voiced onsets can be in favor of low tones. It suggests that neither the phonological [voice] category nor phonetic voicing should be inextricably or exclusively correlated with the low tone/tonal depression. Additionally, a tentative comparison between the ATS observed in Lili Wu Chinese and that reported in other languages (Kra-Dai languages and Gan Chinese) is made. After the discussion of the typological significance, the relationship between the Wu and Old Xiang dialect groups is revisited from the perspective of C-T interaction. It is reasonable to argue that both Wu (e.g., Lili) and Old Xiang (e.g., Shuangfeng) dialect groups have inherited the phonological trait of the three-way laryngeal contrast of obstruents from MC. However, in terms of the development of the three-way-contrast

system, no shared innovation can be identified. Currently, there is no obvious evidence to lend support to the 'Unicity of Wu–Xiang' assumption (Hashimoto, 1978). At last, the different trading relationships between laryngeal timing (in terms of VOT) and phonatory state (in terms of CQ) to signal voicing contrast in the two Chinese dialects are discussed. The results of this study highlight different possible pathways for changes of cue weighting in the phonetic implementation of laryngeal contrasts in Asian tonal languages.