

Rhoticity in Mandarin Chinese: an articulatory study

Introduction Rhotic sounds show multidimensional variability, and Mandarin Chinese is no exception in this respect, with known patterns of coda-onset allophony. The coda /r/ in Mandarin is reported to be either a retroflex or a bunched approximant (Chen, et al, 2017). The word-initial /r/ is a post-alveolar consonant according to Chen, et al (2017) and Lee (2008), whereas Zhu (2007) argues that it is an approximant with little frication. This study presents new articulatory data on the realisation of /r/ in Mandarin, which show additional aspects of /r/-allophony conditioned by prosodic position and segmental context.

Methodology The test items included /r/ in both word-initial and word medial position, the latter derived through compounding. The word-initial /r/ was followed by the vowels /i/, /u/, /ə/, /au/ and /əu/. The word-medial /r/ were set in three contexts: canonical onset (V.rV), canonical coda (Vr.CV), and fake geminate /r/ (Vr.rV). The preceding and following vowels as well as their tones were strictly controlled. The following onset in Vr.CV context was /t^h/ or /ʃ/. One male and one female speaking Beijing dialect participated in the ultrasound recording and read six repetitions of nine items. The midsagittal tongue contours were automatically tracked throughout with hand correction as necessary. The analysis below focuses on ultrasonic corresponding to the maximum constriction of /r/.

Result and discussion The data reveal a variety of allophonic patterns of Mandarin /r/. The coda /r/ is typically retroflex in both speaker's production, while the realisation of onset /r/ varies. The consonantal /r/ has two types of realisation --- postalveolar fricative and retroflex approximant, and both types of /r/ realisations show approximation of F2 and F3 in gradient vowel-/r/ and /r/-vowel transition. Generally, the consonantal /r/ is a postalveolar fricative in word-initial position, except when followed by the vowel /au/ ("ao" in Pinyin). For both speakers, the tongue tip was notably raised in "rao", compared to any other segmental contexts, suggesting a retroflex approximant realisation. This is consistent with the lack of friction in the acoustic data. The realisation of onset /r/ tokens are also affected by its position in the word. The word-medial onset /r/ presented a third distinct option of rhotic realisation. It was characterised by no frication or little frication, as shown in Figure 1. Articulatorily, it was a retroflex approximant for speaker F01, whereas speaker M01 showed a blending feature of retroflex and postalveolar (Figure 2).

In addition to the variation induced by the vocalic context, further variation is noticed when onset /r/ is preceded by another rhotics ('fake geminate' context). In this type of context, we see no frication, but rather an enhanced retroflex gesture that extends through the entire /Vr/ sequence. Furthermore, the tongue configuration in fake geminates is distinct from the word-medial rhotics occupying either a canonical onset or a canonical coda position. More data will be collected get a full-fledged picture of the variation of Mandarin rhotics.

Conclusion The present data reveal that the Mandarin /r/ variation is conditioned not only by syllable structure, but also by prosodic segmental context. I discuss this variation in the context of the theoretical debate concerning defining rhotics as a natural class (Lindau 1985, Ladefoged & Maddieson 1996).

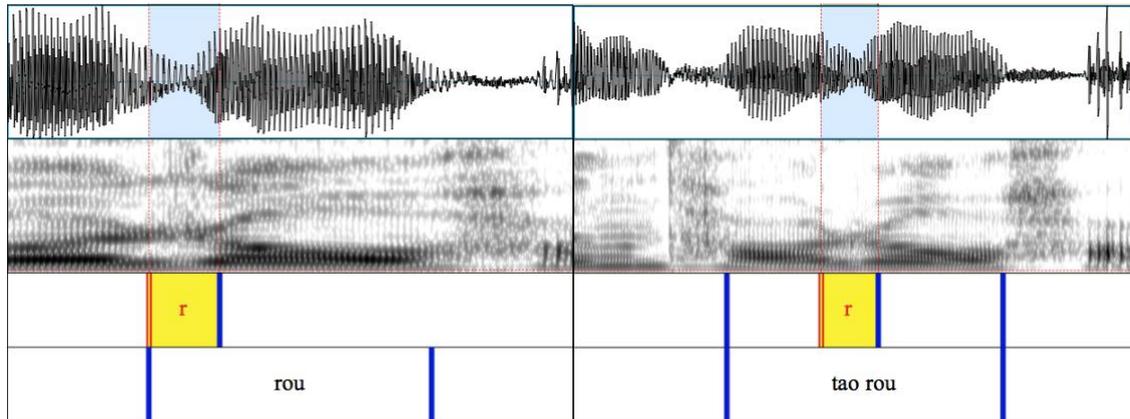


Figure 1. Screenshots of canonical onset /r/ in word-initial(left) and word-medial position(right).

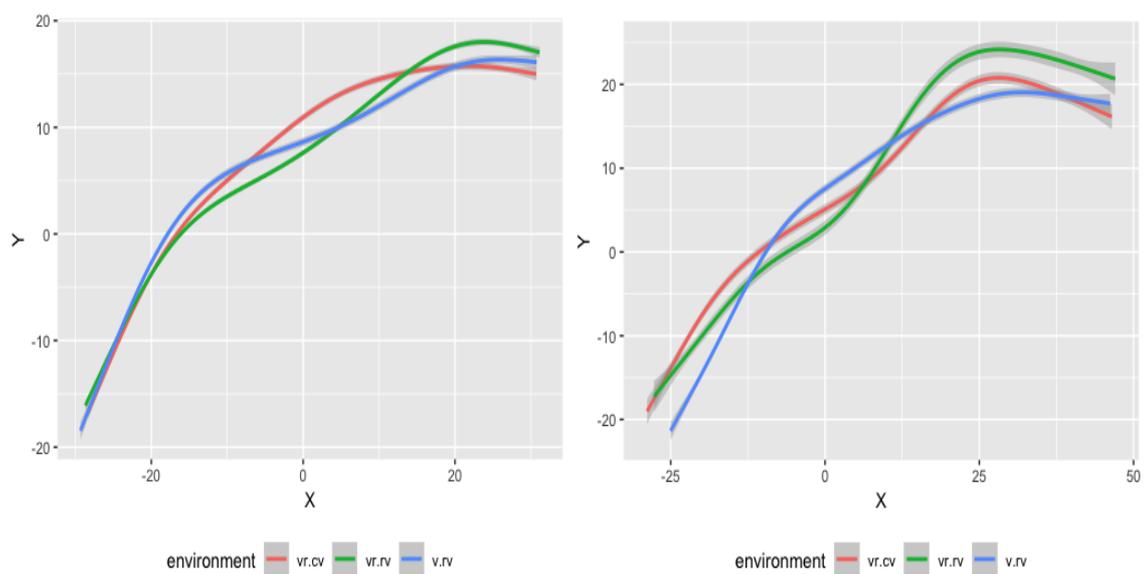


Figure 2. Tongue shapes of fake geminates by contexts for F01(left) and M01(right).

Reference

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