

The Articulation-induced Change of Non-high Level Tone

The study argues for an articulation-based account of the ongoing sound change of non-high level tone in three Chinese languages: Cantonese, Hakka, and Taiwanese. The non-high level tone is found to gradually become low-falling in young speakers' natural speech, as illustrated in (1). In investigating the tonal change, Mok and Wong (2010 a,b), Yeh and Lu (2012), and Yeh and Tu (2012) show that (i) the non-high level tone tends to be mispronounced as a low-falling tone, but misperceived as a high level tone, (ii) young speakers misrecognize words with a non-high level tone as those with a high level tone, and (iii) the speakers who use the languages under study less frequently are more likely to exhibit the tonal change. These studies suggest that low use frequency may have activated the tonal change in these languages, but the perception-production asymmetry indicates that a post-lexical mechanism, mainly the motor system for phonetic implementation, is responsible for the direction and outcome of the tonal change, i.e. non-high level tone → low-falling tone. These Chinese data seem to challenge those approaches that appeal mainly to auditory processing for inducing sound change, regardless of the optimizing (Hayes 1999, Steriade 2001) or the non-optimizing accounts (Ohala 1993, Blevins 2004).

- (1) a. In Cantonese: low level tone (22)→ low-falling tone (21)/ among young speakers
- b. In Hakka: low level tone (22)→ low-falling tone (31) / among young speakers
- c. In Taiwanese: mid level tone (33)→ low-falling tone (21) / among young speakers

The perception-based approaches are challenged by the sound change of non-high level tone for two reasons. First, the direction and outcome of the tonal change are seldom found in the perception data, including discrimination, identification, and lexical results. The participants mostly misperceive a non-high level tone as a high level tone. The perceptual confusion appears to be predicted by the phonetic similarity between these two categories: the non-high level tone is similar to the high level tone in pitch contour. However, a non-high level tone is also phonetically similar to a low-rising and a low-falling tone in pitch height, and yet the perceptual confusion rarely occurs because of such pitch height similarity. Second, the participants hardly ever commit auditory errors in discrimination tasks, regardless of the AX or AXB format. Their discrimination accuracy is mostly higher than 95%, and even English-speaking participants can reach 90% accuracy. The auditory breakdown is, therefore, less likely to be the cause.

On the other hand, the sound change of non-high level tone falls out nicely from the empirical studies on tonal articulation, such as Erickson et al (1995), Erickson et al (2004), and Hu (2004). These studies suggest that producing a low-falling tone takes fewer supralaryngeal and laryngeal efforts than producing a non-high level tone. Therefore, this tonal change can be attributed to ease of articulation. In addition, the articulation-based

account is supported by an ongoing change of Taiwanese rising tone sandhi documented in Chang (2012). In Taiwanese tone sandhi, rising tone becomes mid level tone in non-final position, as illustrated in (2a). However, Chang (2012) shows that the rising tone tends to be produced as low-falling in the sandhi condition, as illustrated in (2b). The change that occurs during rising tone sandhi can be demonstrated in a series of deviations as in (2c). Taiwanese speakers thus change both the underlying and the ‘surface’ sandhi non-high level tone in exactly the same way. This finding of changing from the ‘surface’ sandhi non-high level tone to the low-falling tone suggests that this tonal change occurs at the post-lexical stage, especially in speech production.

- (2) a. rising tone (24) → mid level tone (33)/ in non-final position
b. rising tone (24) → low-falling tone (21)/ in non-final position
c. rising tone (24) → mid level tone (33) → low-falling tone (21)/ in non-final position

Based on the previous findings and the asymmetry between the perception and production results, we propose that frequency-related factors, i.e. use frequency and lexical frequency, activate tonal change that leads to a mismatch among different levels of representations. The mismatch is more likely to occur at the post-lexical stage, and the direction and outcome of the change are determined by articulatory reasons. This study, therefore, supports an articulation-induced model in accounting for at least some particular types of sound change, and points to further investigation of the division of labor and the interaction between articulation-induced and perception-induced sound change more generally.

Selected References:

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