The Nature of Variation in the Tone Sandhi Patterns of Shanghai Wu
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Modern phonological theory is paying increasingly close attention to variation in phonological patterns. A long line of work has shown that variation is conditioned by both grammatical factors such as the morphosyntactic structure of the unit and usage factors such as word frequency (e.g., Guy, 1991, 1994; Bybee, 2000; Phillips, 2006; Kawahara, 2011; Coetzee & Kawahara, 2012). Most of the findings so far, however, have come from segmental processes. We complement this line of research by providing a comprehensive study on the variation pattern of tone sandhi in the Shanghai Wu dialect of Chinese.

Shanghai disyllables have been reported to have two different tone sandhi patterns: tonal extension and tonal reduction. Some items can only undergo tonal extension, whereby the base tone of the first syllable is spread onto the entire disyllable (e.g., /tei53/ “chicken” + /dr13/ “egg” → [tei55 dr31] “chicken egg”). Some items can only undergo tonal reduction, whereby the first syllable becomes a level tone and the second syllable maintains the base tone (e.g., /tei24/ “to rise” + / fon53/ “wind” → [tei44 fon53] “to be windy”). Some can variably undergo either type of sandhi. For example, /ts5a24/ “to sing” + /ku53/ “song” can be realized with either tonal extension ([ts5a33 ku44]) or tonal reduction ([ts5a44 ku53]).

Previous works have indicated that syntactic structure (modifier-noun vs. verb-noun), semantic transparency (transparent vs. opaque), and lexical frequency (high vs. low) all play a role in the sandhi application. According to Xu et al. (1981), modifier-noun compounds and semantically opaque verb-noun compounds with high lexical frequency can only undergo tonal extension. Verb-noun combinations that are semantically transparent and have low frequency are considered as phrases and can only undergo tonal reduction. The majority of verb-noun combinations can undergo either tonal extension or reduction. However, the exact influence of each factor on the variation pattern or how these factors interact was never made explicit, and the lack of speech corpora in Shanghai makes these claims difficult to evaluate. In this paper, we report a goodness rating experiment for the variant forms with native Shanghai speakers in tandem with semantic transparency and subjective frequency ratings from the same speakers to shed light on the nature of Shanghai tone sandhi variation.

Seventy-one native Shanghai speakers participated in the experiments. The variant forms’ goodness rating experiment asked the participants to rate the goodness of the two auditorily presented tone sandhi forms of one lexical item. In the other two experiments, the participants were asked to rate the subjective frequency and semantic transparency of these items, respectively. The hypotheses were that (a) modifier-noun ([M N]) items undergo tonal extension more often than verb-noun ([V N]); (b) semantically opaque items apply tonal extension more often than semantically transparent items; and (c) lexical frequency of the items positively influences the application of tonal extension. To examine the preference for the tonal extension sandhi form for a particular item of a particular subject, we dummy-coded the item as “1” if the rating for tonal extension is higher than the rating for tonal reduction for that subject and “0” otherwise. The ratings of frequency and semantic transparency were first arcsine-transformed to remove skewness, and then centered to reduce the collinearity of variables. The dummy-coded variable was then modeled with Logit Mixed-Effects models with participant and item as random effects and syntactic structure ([M N], [V N]), subjective frequency ratings, and semantic transparency ratings as fixed effects.

Our results support hypothesis (a): [M N] items prefer to apply tonal extension compared to [V N], as shown in the figures below. [M N] items, represented by the red lines, always have higher logit probabilities of applying tonal extension than [V N] items. Hypothesis (b) finds partial support in our results: there is only an effect of semantic transparency for [V N], in which semantically more opaque [V N] items (lower ratings of semantic transparency) are more likely to undergo tonal extension, as shown in Figure 1a. Hypothesis (c) also only finds partial support: lexical frequency only has a positive effect on the logit probability of applying tonal extension for [M N] items, but a negative effect for [V N] items, as shown in Figure 1b. This indicates
that lexical frequency interacts with syntactic structure in Shanghai tone sandhi application. [M N] items with high lexical frequencies tend to apply tonal extension, while the higher the frequency a [V N] item has, the less likely it will undergo tonal extension. Overall, our results suggest that disyllabic tone sandhi application in Shanghai is primarily determined by syntactic structure, as the robustness of its effect, especially in [M N] compounds, overwhelms any semantic transparency effect. The lexical frequency effect is also only operative insofar as it enhances the prediction of compoundhood: a more frequent [M N] compound is more compound-like and hence has a greater tendency to undergo tonal extension, while a more frequent [V N] is more phrase-like and hence has a stronger tendency for tonal reduction.

(a).

(b).

Figure 1. (a) The logit probability of applying tonal extension conditioned by semantic transparency ratings; (b) The logit probability of applying tonal extension conditioned by lexical frequency ratings.

References

1 Chao’s (1930) system of tone numbers uses ‘1’ to ‘5’ to indicate pitch levels, with ‘1’ as the lowest pitch and ‘5’ the highest pitch.