Distinct Listening Patterns for Cross-Language Listeners in the Perception of Sandhied Tones in the Nanjing Dialect

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Tone sandhi is the phenomenon of underlying lexical tones being modified under tonal context and surfacing with different phonetic forms (Huang & Johnson, 2010). Regarding perception of sandhied tones, it is hypothesized that two listening strategies may apply: (a) the *surface* strategy, which relies on the sandhied tone's phonetic form, and (b) the *underlying* strategy, which uses the mapping between a sandhied tone and its underlying form based on native phonology. In principle, the surface strategy should be available to both natives and non-natives, while the underlying strategy only occurs in natives. For non-native listeners, general knowledge of articulatory naturalness might also bridge the surface and underlying level. This study explores the possible effects of native phonology and phonetic naturalness in sandhied tone perception.

A pair of sandhi rules differing in articulatory naturalness is found in Nanjing. In phonetically natural Sandhi 1 (Fig. 1), the offset of a high-falling T1 approaches the onset of the following T1 and becomes a T4; in non-natural Sandhi 2 (Fig. 2), the offset of a high-level T4 deviates from the subsequent onset of a high-arched T5 and changes to a T1.

The Concept Formation paradigm (Jaeger, 1986) was adopted in the current study. During training, participants listened to (a) target tokens which were disyllabic words beginning with the target tone followed by a variety of tones and (b) non-target tokens beginning with any tone except the target tone as well as receiving feedback. No sandhi was involved in target and non-target tokens. Training was followed by a no-feedback test which included (a) target tokens, (b) non-target tokens and (c) test tokens beginning with a tone that matches both the target tone and its sandhi-related tone. Test tokens were constructed so as to avoid lexical bias. All tokens were spoken by a Nanjing female. Eighty participants were recruited in each of three groups: Dutch(NL), Beijing(BJ) and Nanjing(NJ). Listeners in each group were randomly assigned to Sandhi 1 and Sandhi 2, and further divided into two training conditions: (a) the underlying tone was the target and (b) the surface tone was the target. The judgment (target/non-target) for each test token was the main measurement.

Distinct listening patterns were found in the three groups: (1) NL listeners' results fluctuated around chance level across all conditions. They probably listened to NJ sandhied tones at the surface level and experienced difficulty in phonologizing them; (2) BJ listeners demonstrated a ceiling effect in the surface condition and did the opposite in the underlying condition. They interpreted the surface level of NJ sandhied tones in terms of BJ tones highly successfully but had no access to NJ underlying forms; (3) NJ listeners reached around 75% mapping across all conditions. They are the only group that may be equipped with both listening strategies and it seems that they consistently mixed the two strategies in both training conditions.

The phonetic naturalness of the sandhi rule failed to bridge the underlying and surface levels in this experiment. For the BJ and NJ group, we suggest that their own native phonology about tones outweighs any effect of phonetic naturalness. Regarding NL listeners, the task employed here may have been too cognitively challenging.

Figures:

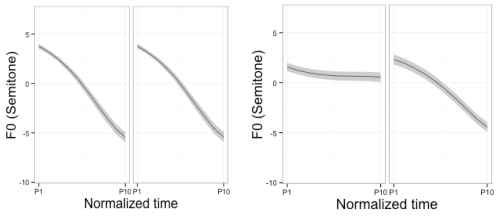

Figure 1: *Lexical T1+T1 (left) & sandhied T1+T1 (right) in the Nanjing dialect. Solid lines indicate mean f_0; gray ribbons stand for ± 1 standard error of mean (also in Figure 2).*

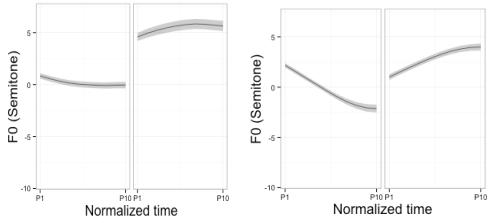

Figure 2: *Lexical T4+T5 (left) & sandhied T4+T5 (right) in the Nanjing dialect.*

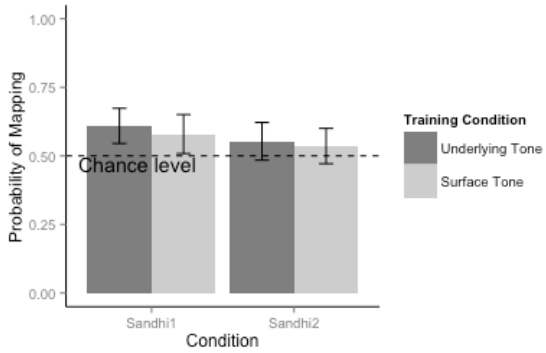

Figure 3: *Probability of mapping across conditions in NL group.*

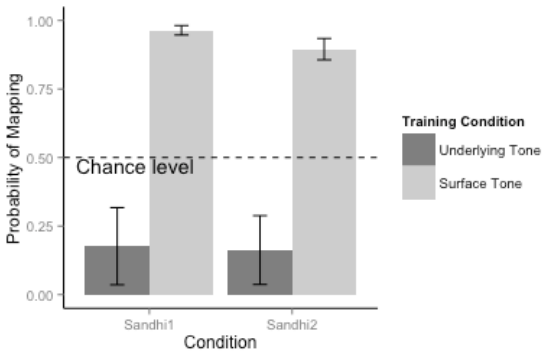

Figure 4: *Probability of mapping across conditions in BJ group.*

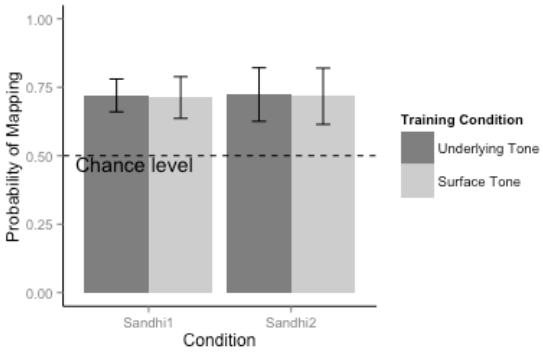

Figure 5: *Probability of mapping across conditions in NJ group.*

References:

Huang, T., & Johnson, K. (2010). Language specificity in speech perception: Perception of Mandarin tones by native and nonnative listeners. *Phonetica, 67*(4), 243-267.

Jaeger, J. J. (1986). Concept formation as a tool for linguistic research. *Experimental phonology*, 211-237.