

Effects of orthographic input on L2 production: the case of Korean-speaking learners of Mandarin Chinese

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Of the many factors affecting the acquisition of second language (L2) phonology, the role of orthographic input has only recently been considered. Despite some empirical findings demonstrating a positive role of orthographic input in L2 phonological acquisition [1, 8], other experimental results have suggested a negative influence [2, 5]. When orthographic input is not entirely consistent with corresponding phonetic forms, in particular, phonological developments may be significantly hindered. The present study is primarily concerned with L2 production to shed light on the role of orthographic input in the development of the fine-grained sub-phonemic features of non-native sounds. Specifically, we explored the development of stop categories and lexical tones in Mandarin by native speakers of Seoul Korean. The learners' development was closely tracked in a longitudinal study.

Fourteen Seoul Korean speakers with no prior experience with tone languages participated in the production study. They were randomly divided into two groups based on the type of stimuli presented in the experiment: orthographic ("Pinyin group", 5F, 3M) or audio ("Audio group", 2F, 4M). For the Pinyin group, stimuli were presented orthographically without auditory stimuli whereas participants in the audio group were presented with auditory stimuli produced by a female native speaker of Mandarin. Participants were college students ($M(\text{age}) = 25.8$) in Korea who had registered for Elementary Chinese courses. The courses took place in a formal class setting four hours a week, including three hours of lectures taught in Korean by a Korean instructor and a one-hour practicum taught in Mandarin by a Chinese assistant. The stimuli were monosyllabic words consisting of Mandarin voiceless stops contrasting in aspiration (e.g., unaspirated: <bā bá bǎ bà> vs. aspirated: <pā pá pǎ pà>). A total of 24 stimuli (3(unasp, asp, nasal) x 2(lab, cor) x 4(tones)) were repeated three times in each task, and the same materials were used throughout the longitudinal study testing the same participants three times over a semester: Phase 1 (after one week of Mandarin exposure), Phase 2 (after 8 weeks), and Phase 3 (after 15 weeks).

The results of stop VOT analyses showed that while all participants correctly produced long VOTs for the aspirated stops, four out of the eight speakers in the Pinyin group produced inordinately long VOTs for the unaspirated stops (Figure 1), especially in the earlier stages of learning. The four other learners in the Pinyin group produced correct VOT targets for the unaspirated stops, so did all six learners in the audio group. Importantly, a clear correlation was observed between the erroneous patterns in VOT and in f_0 of Tone 1 (X^{55} , high-level) production: those learners with overestimated VOTs for the unaspirated stops produced the stops with lower f_0 (Figure 2). In contrast, those who produced accurate stop VOTs showed no such separation in T1 f_0 trajectories between aspirated and unaspirated stops, nor did any of the participants in the audio group. This result highlights the negative influence of orthographic input on the production of L2 sounds. Korean learners of English have been reported to map English voiced stops <b, d> onto Korean lenis stops more so than onto fortis stops [6, 7]. As all Korean participants in the present study were familiar with the English alphabet, Pinyin orthography (e.g., <b d>) may trigger a mapping onto Korean lenis stops [Long VOT–Low f_0], overriding actual acoustic-phonetic input of Mandarin unaspirated stops [Short VOT–High f_0 (T1)].

As for the tone production, T2 (X^{35} , <bá>) – T3 ($X^{21(4)}$, <bǎ>) contrasts presented a particular challenge, consistent with previous studies showing non-native listeners' difficulty to perceive the difference between these two tones (Huang & Johnson 2010). In particular, the learners' T2 and T3 f_0 trajectories tended to be more similar, unlike native Mandarin speakers' production wherein T2 and T3 f_0 trajectories diverge to a greater extent toward the end of a syllable [4]. More

interestingly, many learners' ability to accurately produce T2 and T3 diminished over time, rather than improving. Figure 3 illustrates some representative cases. This pattern is likely driven by non-phonetic factors. The Pinyin tone diacritic denoting T3 (<bǎ>) implies that the ending of the tone should be high rather than low. Moreover, the Tone 3 sandhi rule (/T3/→[T2]/_T3) may also contribute to the perceptual assimilation of the two tones. Beginner learners are introduced to this rule quite early due to common expressions such as /ni²¹⁴hao²¹⁴/ ([ni³⁵hao²¹⁽⁴⁾]) *you-good* 'hello'. Along with the Pinyin T3 diacritic, the T2-T3 phonological alternation may mistakenly lead learners to assume that the *f0* rise at the end of T3 is indeed an indispensable part of this tone, which may make T2 and T3 even more perceptually similar than they actually are.

Taken together, the results of the study show that novice learners' difficulty with L2 contrasts arises from various L2 experiences including orthographic input, not solely from the acoustic properties of sounds.

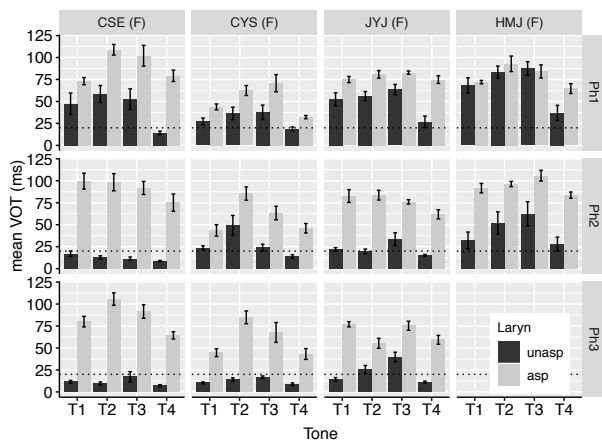


Fig. 1. Pinyin-based learners showing inordinately long VOTs for the Mandarin unaspirated stops.

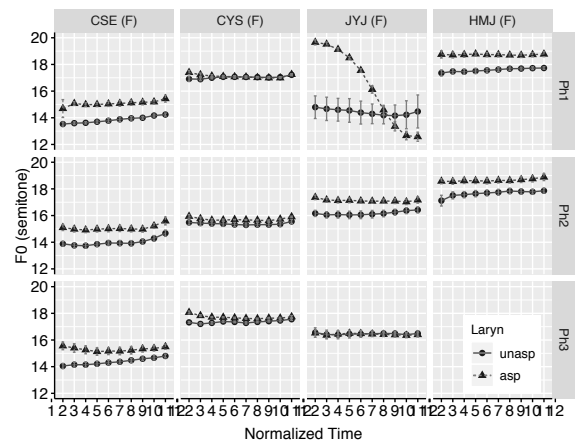
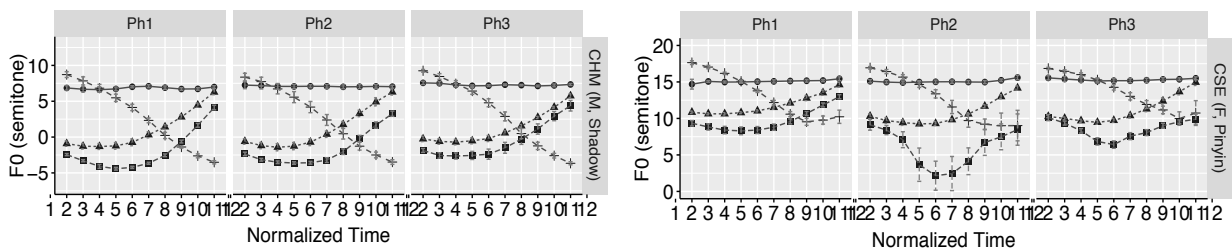


Fig. 2. Mean *f0* trajectories of T1 for Pinyin-based individual speakers with VOT overestimation for the Mandarin unaspirated stops.

Fig. 3: Mean *f0* trajectories of four lexical tones following the aspirated stops. Representative cases illustrating the (partially) diminishing T2-T3 contrasts.



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