The Interlanguage Phonology of Mandarin Learners of English and the Gradual Learning Algorithm
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**Model:** This paper reports on an attempt to model the longitudinal development of Mandarin Chinese speakers learning English and variation in their production patterns using the Gradual Learning Algorithm (GLA) of Boersma & Hayes (2001). I assume that the learning process begins with the native language grammar, which changes in response to the target language input. The GLA predicts that the ways in which the grammar changes are directly determined by the frequency of various structures in the target language input. Additionally, the GLA relies on stochastic rankings of constraints allowing us to model a speaker’s output variation.

**Experimental data:** I first carried out an experimental investigation of native Mandarin speakers pronouncing English words containing final obstruents and labial nasals, none of which occur in Mandarin codas. The experiment revealed that each subject employed different strategies in producing word-final obstruents and labial nasals. For example, the strategies in producing final voiced obstruents (e.g., [??]) include consonant deletion (e.g., [??]), vowel epenthesis (e.g., [??]), final devoicing (e.g., [??]), and correct pronunciation (e.g., [??]). The strategies in producing word-final [?] (e.g., [??]) include consonant deletion (e.g., [??]) and correct pronunciation (e.g., [??]).

However, certain generalizations emerged. First, all 8 subjects correctly pronounced more word-final voiceless obstruents than word-final voiced obstruents. Second, seven of the eight subjects correctly pronounced more word-final [?] than word-final voiced obstruents. And third, there was a rough correlation between experience in English and error patterns, with consonant deletion and vowel epenthesis decreasing and final devoicing increasing with longer EFL experience.

**Simulation results:** I compared the Mandarin learners’ production patterns with the GLA simulation results. The GLA correctly predicts the development of coda obstruents, predicting an initial stage in which voiced and voiceless coda obstruents are deleted or become onsets through vowel epenthesis, followed by a stage in which voiceless obstruents are more often correctly produced than voiced ones. Additionally, the GLA correctly predicts that devoicing of final voiced obstruents becomes more frequent and vowel epenthesis after final voiced obstruents and deletion of final voiced obstruents become less frequent as a Mandarin speaker’s EFL experience increases. Furthermore, the GLA correctly models the variation seen in the data between correct production, vowel epenthesis after final consonants, deletion of final consonants, and devoicing of final voiced obstruents.

However, the GLA did not correctly model the relative order of acquisition of obstruents and labial nasals. The GLA predicts that Mandarin learners of English will correctly produce more word-final voiced obstruents than [?], for word-final voiced obstruents are more abundant than coda labials in the English input, which should cause the markedness constraints on word-final voiced obstruents to be demoted more quickly than the markedness constraints on word-final labials. However, speakers made many fewer errors with final labial nasals than with final voiced obstruents. This suggests that other factors such as perception may also affect the L2
acquisition process and that the current GLA model needs improvement to incorporate these factors.