Learning Biases for Vowel Height Harmony*

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We test the role of phonetic grounding and typological tendencies on learning biases for vowel height harmony, a phonological process in which vowels within a word are required to share phonological features for height. Several height harmony languages are constrained such that vowels ([i, e]) undergo harmony following both front and back vowels, while back vowels ([u, o]) tend to only undergo harmony following other (often identical) back vowels. In Experiment 1, participants were trained on a height harmony pattern with either front vowel suffixes or back vowel suffixes. Participants reliably displayed harmonic responses only when the suffixes contained a front vowel, despite exposure to back vowel suffixes. Experiment 2 tested for generalization to novel vowel harmony triggers, exposing learners to tense front and back vowel stems or front vowel stems, with a front vowel suffix alternation. Participants generalized to front lax vowels but did not generalize to tense back vowels, suggesting a bias for height harmony languages in which the trigger and target share the same value for backness.

Key words: artificial grammar learning, vowel harmony, phonetic naturalness

*Acknowledgments: The authors would like to thank Ariel Goldberg, Paul Smolensky, Colin Wilson, Neil Bardhan, Mohinish Shukla, Patricia Reeder, the audiences at the 2008 Laboratory Phonology Meeting, and several anonymous reviewers. This research was supported in part by NIH grant DC00167 to E. Newport, HD37082 to R. Aslin & E. Newport, and NIH training grant T32DC000035, as well as an NSF IGERT grant to P. Smolensky and a Jacob Javits Fellowship to S. Finley.

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In this paper, we explore the hypothesis that learners are biased to the same phonological patterns that are preferred across languages of the world (Cristia & Seidl, 2008; Finley & Badecker, in press; Moreton, 2008; Wilson, 2006). Specifically, we explore typological variation in vowel height harmony, a phonological process whereby adjacent vowels in a word are required to share a common feature value for vowel height. We show that learners of a miniature, artificial height harmony language are biased towards the same height harmony patterns that are typologically frequent.

Understanding the nature of learning biases is an important endeavor for cognitive science. Because language is one of the fundamental systems that all human beings must learn, learning biases for linguistic processes are particularly important. Three related questions arise in the study of language learning. First, to what extent is the learning process driven by constraints specific to language, as opposed to domain general constraints? Second, to what extent does innate or pre-existing knowledge interact with the patterns that must be inferred from the language input? Third, to what extent can we explain the typological distribution of patterns of language in the world in terms of constraints on learning? In order to begin to answer any of these three questions, we must first understand more about the learning process, specifically the nature of biases that learners bring to the learning process. For example, some studies have suggested that learners use domain general heuristics to learn novel patterns (Christiansen & Chater, 2008; Finley & Christiansen, 2011). Other studies have shown learning biases that make use of language-specific patterns (Culbertson & Smolensky, 2010; Finley, in press; Finley & Badecker, 2008; Moreton, 2008). For example, Finley (in press) found differences in learning round vowel harmony patterns that differed only in terms of vowel height (i.e., high vs. mid). Because vowel height is a linguistic feature, any explanation for the differences in learning must be couched in terms of language. However, within phonological theory, there is debate as to whether learning biases are based on abstract structural properties, or gradient phonetic variables (Moreton, 2008). The existence of both domain general and language specific learning biases suggest that the question for linguistic theory (and cognitive science) is not whether language learning is domain specific or domain general, but the extent to which language specific and domain general constraints interact.