

Analytic Biases for Vowel Harmony Languages

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We present the results of an artificial grammar learning experiment exploring the nature of phonological representations in vowel harmony. Our results support a theory of analytically biased learning in which learners form hypotheses about novel phonological processes based on their knowledge of grammatical principles. Learners in our experiment formed generalizations based on the properties of typologically valid harmony systems. Specifically, learners naturally infer directionality as the source of spreading over the typologically implausible ‘majority-rules’ strategy.

The present experiment tests for learning biases using the poverty of the stimulus paradigm (Wilson 2006), in which performance on items that fall outside the training space is used to measure learning biases. In the present experiment, we use the poverty of the stimulus paradigm to uncover learning biases for inferring the source of spreading in vowel harmony. Cross-linguistically, the source of spreading for vowel harmony is determined by the morphology (e.g., the stem spreads [+F]) or directionality (e.g., spread [+F] leftwards). However, no language uses a ‘majority rules’ strategy in which the source of spreading is determined by the majority feature value in the input (e.g., /+ – –/ → [– – –]; /+ + –/ → [+ + +]). This has particular implications for Optimality Theory (OT) (Prince and Smolensky 1993/2004) because the markedness/faithfulness interaction makes such a language easy to predict (harmony with the fewest faithfulness violations).

In the present experiment, adult native speakers of English were trained on a back/round vowel harmony language that was ambiguous between ‘majority rules’ and right-to-left spreading (or, in a separate condition, left-to-right spreading). Participants in the right-to-left training condition were exposed to pseudo morphophonological alternations with three-syllable words in which the leftmost vowel conformed to the feature value of the rightmost two vowels. The alternations contained a disharmonic word followed by its harmonic counterpart: /– + +/ → [+ + +] (e.g., [gipomu, gupomu]) and /+ – –/ → [– – –] (e.g., [pudege, pidege]). All alternations involved changing a single vowel, and were therefore ambiguous between ‘majority rules’ and right-to-left spreading.

Learning was evaluated with a forced choice task, between a left-to-right alternation and a right-to-left alternation (e.g., [mepenu, mepeni] vs. [mepenu moponu]). Learning was measured in terms of the percentage of ‘majority’ choices (e.g., [mepeni]) compared to a control condition. Critical test items contained items where ‘majority rules’ harmony would induce spreading in the opposite direction that the participant was trained on (New Direction). If participants learned the right-to-left harmony pattern (and likewise for left-to-right), they should prefer alternations such as /+ + –/ → [– – –] in which the minority vowel feature spreads as opposed to alternations such as /+ + –/ → [+++] in which the majority feature value spreads but in the opposite direction. Our results show a strong directionality preference (see (1)), both for right-to-left training and left-to-right training. Participants preferred the ‘majority rules’ alternation only when it was consistent with the direction of spreading that they were trained on.

Our results support the existence of analytic learning biases that lead learners to infer unmarked phonological processes. Such biases prevent learners (in our experiments, and otherwise) from inferring ‘majority rules’ harmony, explaining why such patterns are not found cross-linguistically.

(1) Data from Majority Rules Experiment

