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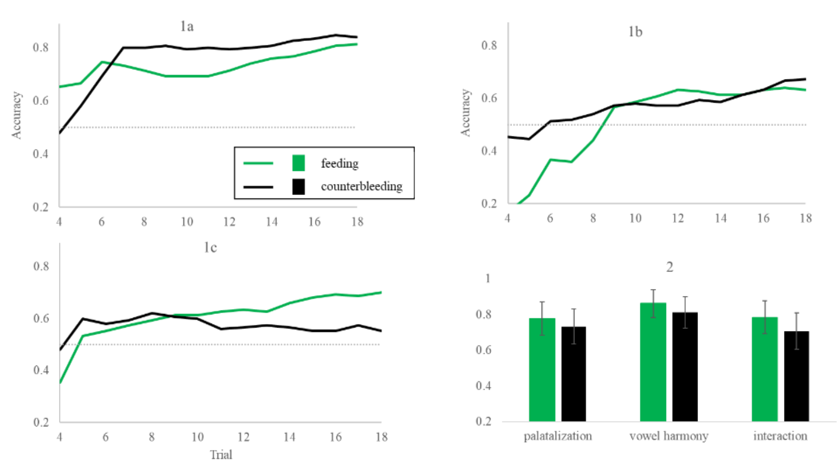
The learning trajectory of phonological opacity

A number of studies in recent years have attempted to identify and test the biases that influence learning of phonological interactions like feeding, bleeding, counterfeeding, and counterbleeding (e.g., Bermúdez-Otero, 2003; Brooks, Pajak, & Baković, 2013; Ettlinger, 2008; Nazarov & Pater, 2017; Rasin et al., 2017). In particular, artificial grammar and computational modeling studies have found support for learning biases in favour of transparent interactions (feeding/bleeding) and in favour of maximal utilization (feeding/counterbleeding), frequently using the interactions of palatalization and vowel deletion as the test case (Jarosz, 2016; Kim, 2012; Prickett, 2019). However, the deletion process can result in loss of contrastive information and result in homophonous forms, which may detract from learning (Hin & White, 2018; Mazzocco, 1997). The current study uses a different rule interaction to test the transparency bias and examines not only the outcome but also the trajectory of learning.

In a design replicating Prickett (2019), 20 participants (of a variety of L1s) were trained in an artificial language experiment in which a palatalization rule ([s/z] palatalize before [i]) interacted with a backness harmony rule (mid or high vowels assimilate in backness and roundness to a following vowel). In the feeding condition (10 participants), vowel harmony created the context for palatalization to apply. In the counterbleeding condition (10 participants), vowel harmony altered the vowel that had triggered palatalization, making it appear as though palatalization had applied before [u], an ineligible environment. Participants were then tested on new words to determine if they had generalized the processes. Data collection is ongoing.

We examined preliminary training and testing data to compare the learning trajectory and outcomes in the transparent vs. opaque wordforms. Both the feeding and counterbleeding groups learned the vowel harmony process fairly quickly and maintained high levels of accuracy (Fig. 1a). The palatalization process was not learned as quickly, but both groups learned the process about halfway through the training (Fig. 1b). When the two processes interacted, though, the feeding participants showed an advantage: their accuracy continued to increase over the course of the experiment, while the participants in the counterbleeding trials stagnated at near-chance levels (Fig. 1c). For the test portion of the experiment, we used a logistic mixed-effects model to compare the impact of language type, palatalization, and vowel harmony on accuracy, with random effects of participant and item. Results (Fig. 2) indicate that participants who learned the feeding interaction were marginally more accurate on words with the interaction than those that had learned the counterbleeding language (z = 1.806, p = .071). Moreover, they were also significantly more accurate on words that contained palatalization (z = 2.653, p = .008) or vowel harmony (z = 3.082, p = .002). Taken together, these results confirm and extend previous findings that learners have a bias to learn transparent interactions, and that bias appears early in the learning process.



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