A production-internal learning bias against large changes to the base
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Paradigm uniformity refers to the force militating against stem changes, or, in other words, against having multiple forms of the same stem. Especially abhorrent to paradigm uniformity are cases in which the allomorphs of the stem are phonologically dissimilar. Previous explanations for paradigm uniformity have invoked perceptual similarity: lack of perceptual similarity among allomorphs has been claimed to impair lexical access for the listener (Kenstowicz 1996), to allow the listener to detect an innovating speaker’s departure from established speech norms (Steriade 2009) and to prevent the language learner from categorizing the allomorphs together (Moreton & Pater 2012).

In this paper, we propose a novel explanation that instead relies on articulatory similarity. Classic work in associative learning suggests that associations between dissimilar stimuli are harder to learn than associations between similar stimuli (Rescorla & Furrow 1977, Rescorla 1986). Recently, this idea has been extended to dissimilar representations (Kapatsinski 2011, Moreton 2008, Warker & Dell 2006). We argue that learning to produce an alternation between X and Y involves learning associations between production representations of X and Y: X→Y and Y→X. Once the associations are built up, a wug test participant can be given a form containing X and generate from it a form containing Y, and vice versa. Without the associations, the presented form is simply copied into the speaker’s output.

The proposed theory predicts that the primary difficulty in acquiring an alternation is learning to change the segments that should be changed in production, and that a hard-to-produce stem change may nonetheless be perceived as acceptable.

We present evidence for this prediction from miniature artificial language learning of palatalization. In two experiments, participants were exposed to either labial, coronal, or velar palatalization (p→tʃ, t→tʃ or k→tʃ) before a plural suffix. In one experiment, palatalization occurred before the suffix –i (a natural context for palatalization) but not before –a. In another experiment, it occurred before –a (an unnatural context) but not before -i. Participants in all conditions went through the same number of training trials. Articulatorily, [p] is very different from [tʃ] with respect to the active articulators involved, whereas [t] and [tʃ] share the tongue blade articulator, while [k] and [tʃ] share the tongue body (Yun 2006). Labial palatalization is very rare in natural language (Bateman 2007, Kochetov 2011), which is consistent with the possibility that it might be hard to learn (for us, hard to learn to produce).

In both experiments, participants were tested using elicited production (say the plural form when presented with the singular) and judgment (judge if this plural form is the right one for this singular). The same subjects thus participated in both tasks. We reasoned that the two tasks may dissociate: when a stem change is hard to produce, it may nonetheless be judged acceptable (see Zuraw 2000 for a natural-language example). When the participant judges a word pair featuring an alternation, the change is performed for the participant, reducing any influence of production difficulty, while the output of the change accords with the participant’s linguistic experience.

As illustrated in Fig. 1, the expected dissociation between production and judgment was observed following training on labial palatalization. Compare the light bars in the two panels of Fig. 1. Participants exposed to labial palatalization rarely produced palatalization but usually accepted palatalization. The same subjects thus participated in both tasks. We reasoned that the two tasks may dissociate: when a stem change is hard to produce, it may nonetheless be judged acceptable (see Zuraw 2000 for a natural-language example). When the participant judges a word pair featuring an alternation, the change is performed for the participant, reducing any influence of production difficulty, while the output of the change accords with the participant’s linguistic experience.

As illustrated in Fig. 1, the expected dissociation between production and judgment was observed following training on labial palatalization. Compare the light bars in the two panels of Fig. 1. Participants exposed to labial palatalization rarely produced palatalization but usually accepted palatalization. They failed to learn to palatalize labials more than non-labials. In contrast, when trained on lingual palatalization, participants produced palatalization of the to-be-palatalized consonants at about the same rate as they accepted it. There were no differences in judgments of faithful mappings across conditions. When the palatalizing suffix was –a (not shown in Fig. 1), palatalization rates decreased (see also Mitrovic 2012 and Wilson 2006) but the same pattern of differences between conditions was found: labial palatalization was hard to produce but judged acceptable, even in an unnatural context, suggesting that we are indeed observing a bias against large changes (see also Skoruppa et al. 2011), and that the locus of this bias is in production.
The results are thus in accordance with a bias against producing (and learning to produce) large stem changes. In contrast, the results are not explainable by Steriade’s (2009) P-Map Theory: the participants avoided stem changes that were perceived to be in accordance with the speech norms. They are also problematic for Moreton & Pater’s (2012) categorization account, which predicts that the primary difficulty faced by the learners should be avoiding palatalizing non-labials when exposed to labial palatalization. Here, participants palatalize the wrong thing at similar rates across conditions. What they have trouble with in the labial condition is palatalizing what they should palatalize.

Figure 1. Palatalization rates in production (left) and acceptability judgments for singular-plural pairs with palatalization (right) when the palatalizing suffix is -i. Error bars are 95% confidence intervals. Palatalization rates of to-be-palatalized consonants (light bars in the left panel) are higher if those consonants are lingual than if they are labial. Palatalization rates of not-to-be-palatalized consonants (dark bars on the left) are similar across conditions. Labial palatalization is accepted more often than rejected (right panel), and accepted as often as velar palatalization and only slightly less often than alveolar palatalization.