Neutralization avoidance and naturalness in the learning of palatalization

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Previous researchers have appealed to a neutralization avoidance constraint in analyses of phonological patterns (e.g. Flemming, 2004; Padgett, 2009), raising the possibility that learners are biased against neutralizing alternations. Furthermore, typological studies indicate that there is a cross-linguistic tendency for languages to suppress neutralization, especially when it would increase the level of homophony (e.g. Silverman 2010). We tested whether learners indeed have a bias against neutralization in an artificial language learning task.

Native English speakers (n=30) learned four novel alternations involving palatalization [t, d, s, z] ~ [tʃ, dʒ, ʃ, ʒ] in an artificial language. In the exposure phase, participants heard pairs of singular-plural nonce forms. Each trial consisted of an auditory CVCVC form (accompanied by a singular picture) followed by the corresponding CVCVC-i form (accompanied by a plural picture), e.g. [tusut]…[tusutʃi]. The final C of the singular form was the target sound, and the plural suffix *–i* provided the trigger for the palatalization. For half of the participants (Language A), the exposure also included singular forms with final non-changing [tʃ] and [dʒ], e.g. [tusutʃ]…[tusutʃi], making the [t, d] ~ [tʃ, dʒ] alternations neutralizing. To enhance the neutralizing nature of the alternations, we included cases of singular minimal pairs that became homophonous in the plural (e.g. singular [tusut] and [tusutʃ], both [tusutʃi] in the plural). For the other half of participants (Language B), the exposure instead included singular forms with final non-changing [ʃ] and [ʒ], making the [s, z] ~ [ʃ, ʒ] alternations neutralizing. Thus, all participants learned the same four alternations, [t, d, s, z] ~ [tʃ, dʒ, ʃ, ʒ], but which alternations were neutralizing varied between the two groups. This counterbalancing measure ensured that any differences observed in learning were due to whether the alternations are neutralizing or non-neutralizing, rather than something inherent to the alternations themselves. In all, the exposure consisted of 48 trials (16 alternating [t, d, s, z], 8 non-alternating [tʃ, dʒ] or [ʃ, ʒ] depending on group, and 24 non-alternating fillers ending in [p, b, k, g, f, v]).

In the following test phase, participants completed a forced-choice task consisting of a mix of trained and novel items. After hearing the singular form (e.g. [dazat]), participants were presented with two plural options, a changing option ([dazatʃi]) and a non-changing option ([dazati]). They had to choose the correct plural option by pressing a button.

The results were analysed using a logit mixed model, with fixed effects for Trial Type (Neutralizing vs. Non-neutralizing), Group (Language A vs. Language B), and Training (Old vs. Novel); we used a maximal random effects structure. Crucially, the main effect of Trial Type was significant ($z = 3.25$, $p = .001$): participants had lower accuracy on Neutralizing trials (61.1% correct) compared to Non-neutralizing trials

(71.7% correct), see Figure 1. The Trial Type by Group interaction was non-significant (p = .89) and was not justified in the final model, indicating that accuracy was lower for Neutralizing trials in both exposure groups.

These results show that the very same alternations were harder to learn if they resulted in neutralization compared to when they did not result in neutralization, even though both types of alternations were equally represented in the input. Our findings are consistent with the hypothesis that learners have a universal bias against alternations that neutralize contrasts. Such a bias could play a role in shaping language change.

A second noteworthy aspect of our results is that among the filler sounds, participants were significantly more likely to err in choosing the palatalized option for [k, g] (41.1% [tʃ, dʒ] chosen in error) than for [p, b] (26.4% [tʃ, dʒ] chosen in error), see Figure 2; the effect of Place (Velar vs. Labial) was significant (z = 3.57, p < .001). The fact that participants spontaneously palatalized velars more often than labials (in spite of their training) suggests a naturalness bias (e.g. Wilson 2006). Cross-linguistically, palatalization of velars before high vowels is common (Guion 1998), whereas palatalization of labials is less common.

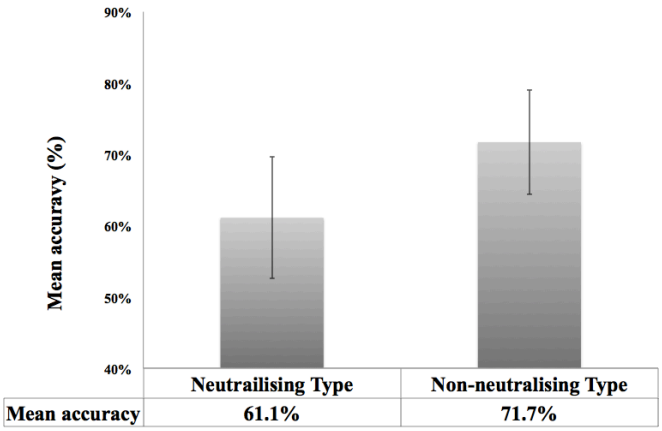

Figure 1. Percentage of test trials in which participants correctly chose the palatalized plural form (+/– 1 SE).

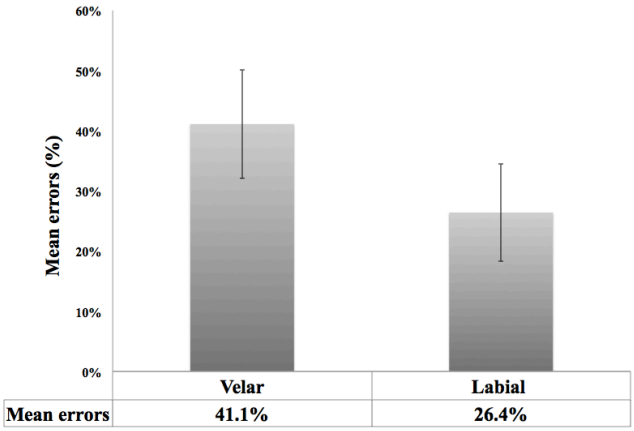

Figure 2. Percentage of filler trials in which participants incorrectly chose the palatalized plural form (+/– 1 SE).

References

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