Phonological learning is asymmetrical between prefixes and suffixes

Introduction and background: Traditional theories of phonology typically treat prefixes and suffixes as if phonological processes apply uniformly to both. However, previous studies have found clear asymmetries between the behavior of both affixes. Typologically, the majority of the world's languages prefer to use suffixation rather than prefixation (Bybee et al, 1990; Dryer and Haspelmath, 2013; Hyman, 2002). Furthermore, prefixes have been shown to host phonological exceptions more regularly than suffixes, including a lack of vowel harmony triggers, a lack of tonal spreading, and phonotactic patterns which are not tolerated elsewhere in the language (Elkins, 2020; White et al, 2018). I hypothesize that this asymmetry arises due to differences in how phonological processes are learned for each affix type. Specifically, I argue that phonological processes are learned more easily (i.e. with fewer errors), in suffix position rather than prefix position.

Experiment: In order to provide evidence for this hypothesis, an artificial language learning task was used to evaluate whether the learning of a phonological process, namely, vowel harmony, is symmetrical across prefix and suffix position. Participants learned an artificial language consisting of CVCV stems (eg. *bibi, chujo*) and CV affixes (eg. *she-/sho-, -mi/-mu*) which harmonized with one another according to vowel frontness/backness. Participants were exposed to the pattern in a learning phase which contained both prefixes and suffixes, then tested on how well they learned the pattern in a subsequent test phase. Phonological learning was predicted to be asymmetrically facilitated in suffix position over prefix position, therefore results should show more accurate responses to the stimuli which contain stem+suffix combinations, rather than those which contain prefix+stem combinations.

Results: Responses from 41 participants were analyzed, which showed that enough participants successfully learned the harmony pattern (main effect of harmony, $\check{\beta}$= -0.89, SE = 0.30, z = -3.01, p = 0.003). There were also more yes-responses with prefixes than with suffixes (main effect of affix type, $\check{\beta}$ = 0.46, SE = 0.21, z = 2.23, 0 = 0.03). However, the predicted interaction effect between harmony and affix type was not found to be significant.

Although the interaction effect is non-significant, the results do pattern in the direction of the hypothesis - that phonological learning is asymmetrically facilitated in suffix position over prefix position. While not all participants were able to learn the harmony pattern, of those who did, they were more accurate in their responses for suffixed items. The plots in Figure 1 show responses to a subset of the stimuli which specifically require the participant to have learned the harmony pattern correctly. The plot on the left, which contains responses from all participants, shows a slight increase in participants' ability to distinguish harmonic and non-harmonic stem+affix combinations. The plot on the right contains responses from only those participants who showed evidence of having learned the harmony pattern, and they crucially show a much more pronounced increase in accuracy for suffixed items. These results align with the hypothesis, that the learning of phonological processes is facilitated more in suffix position than in prefix position. A follow-up study (in-progress) implementing methodological changes to encourage harmony learning amongst participants is predicted to yield more robust results in the same direction.

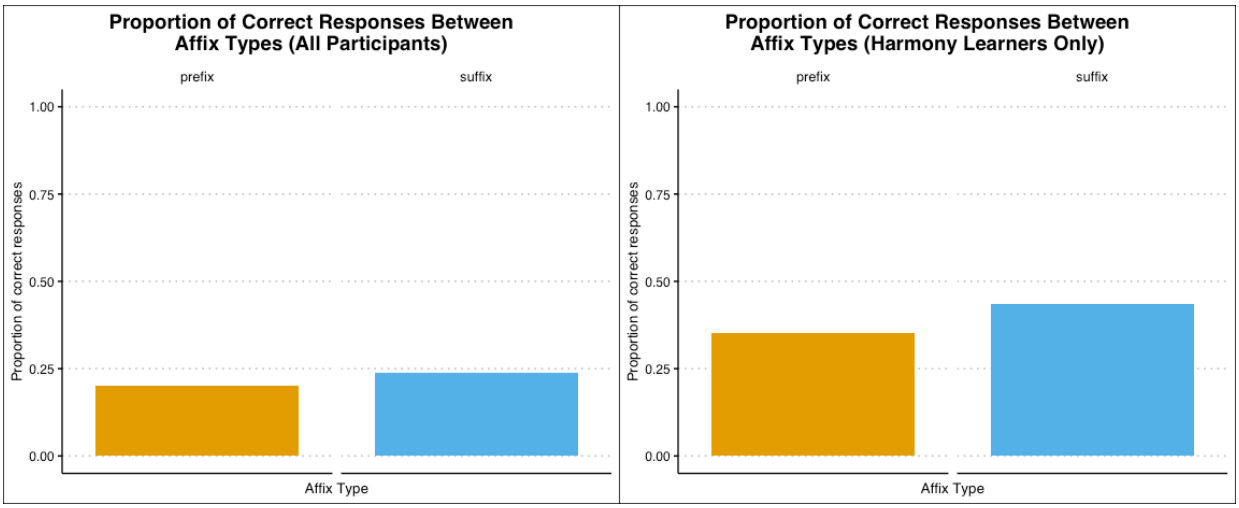

Figure 1: A set of plots which subsets the participant responses to only show trials which specifically elicit responses about the correctness of the vowel harmony pattern. The plot on the left shows the proportion of correct responses for all participants, and the plot on the right shows responses from only those participants that showed evidence of learning the harmony pattern. Both plots show that participants have more correct responses for suffixed items (blue bar) than for prefixed items (yellow bar), which is predicted by the hypothesis.

Discussion: Results show that there do appear to be phonological learning differences between prefixes and suffixes. Though the difference between the accuracy level between affix types here does not reach statistical significance, it patterns in the direction of the hypothesis in this study, prompting a follow-up study (in-progress) predicted to improve harmony learning and produce more robust statistical effects.

This study provides empirical support to the claim that there are inherent differences in how phonological processes are applied to different affix types (White et al, 2018; Wynne et al, 2021). Additionally, these results have implications for how phonological theories might begin to account for the increased tendency toward exceptionality in prefix position, and is a route to establishing a possible connection between that phonological exceptionality and the lack of prefix use cross-linguistically. Lastly, they provide further support for a view that interprets strong cross-linguistic tendencies as the result of a general cognitive mechanism.

References: Bybee, J. L., W. Pagliuca, and R. D. Perkins (1990). On the asymmetries in the affixation of grammatical material. Studies in typology and diachrony: Papers presented to Joseph H. Greenberg on his 75th birthday, 1–42; Dryer, M. S. and M. Haspelmath (2013). The world atlas of language struc- tures online. Leipzig: Max Planck Institute for Evolutionary Anthropology, Available online at http://wals.info, Accessed on 2022–11–15.); Hyman, L. (2008). Directional asymmetries in the morphology and phonology of words, with special reference to bantu. Linguistics 45(2), 309–350; Elkins, N. E. (2020). Prefix independence: typology and theory. Master's thesis, University of California Los Angeles; White, J., R. Kager, T. Linzen, G. Markopoulos, A. Martin, A. Nevins, S. Peperkamp, K. Polgar, N. Topintzi, and R. van de Vijver (2018). Preference for locality is affected by the prefix/suffix asymmetry: Evidence from artificial language learning. 3, 207–220; Wynne, H., S. Schuster, B. Zhou, and A. Lahiri (2021, September). Asymmetries in the processing of affixed words in bengali. Language 97(3), 599–628.