

Generalization Beyond Similarity: Support for Abstract Phonology

Sara Finley

Pacific Lutheran University

Summary: One of the major questions in phonology is how speakers form representations for novel items. In traditional, generative phonology, rules and constraints govern the formation of novel words. For example, an abstract, general rule of voicing assimilation (e.g., [-Son] → [+Voi] / _ [+Voi]) predicts that speakers will voice any obstruent, as long as it is adjacent to a voiced segment, no matter how ‘different’ the word is from other forms in the language. However, exemplar theories of phonological processing propose that measures of similarity best determine whether a novel form will conform to a phonological pattern; the more similar an item is to known lexical items that conform to the pattern, the more likely it will undergo a phonological pattern (Johnson, 1997). However, it is unclear whether speakers apply similarity when distinguishing between grammatical and ungrammatical items. To tease this apart, learners of a novel vowel harmony language made direct similarity judgments in addition to two-alternative forced choice (2AFC) comparisons directly distinguishing between grammatical and ungrammatical items. In order to test the extent of similarity-based judgments for novel forms, items contained familiar and novel stems as well as novel affixes. Learners used similarity to distinguish grammatical and ungrammatical items for items containing familiar suffixes, but not for items containing novel prefixes. However, learners successfully selected grammatical over ungrammatical items for novel prefix items, supporting abstract models of phonological representations.

Participants: Thirteen speakers, fluent in American English (with no knowledge of vowel harmony), participated in the present experiment for course credit.

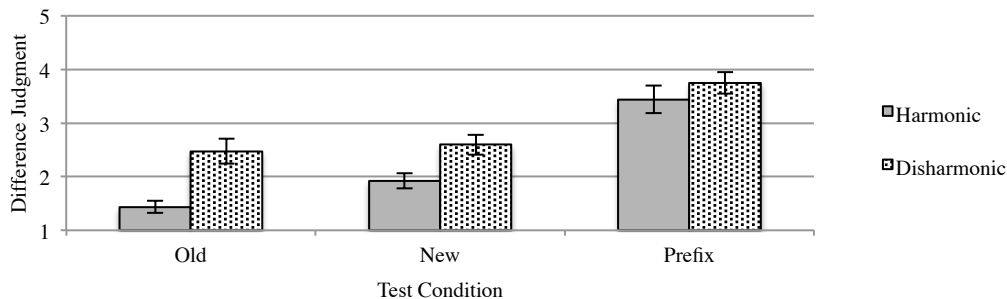
Exposure: Participants were trained on a novel vowel harmony pattern, following the design of Finley and Badecker (2009), who trained English speaking participants on a novel language in which CVCV stems alternated with suffixed CVCV-mi/mu forms, where the suffix [-mi] appeared with stems containing front/unround vowels [i, e], and [-mu] appeared with stems containing back/round vowels [o, u]. The exposure to 24 sets of stem+suffix pairs (e.g., mobo-mobomu, [piki-pikimi]), was repeated five times in a randomized order.

Test: Participants were given two different tests: 2AFC and Distance Judgments. The 2AFC test was identical to the test in Finley and Badecker (2009). Each test item compared a grammatical (harmonic) item to an ungrammatical (disharmonic) item; each item differing only in the affix vowel. Old Items contained stems and affixes that appeared in the exposure phase. New Items contained stems that did not appear in the exposure phase, but the same suffix from the exposure phase. Prefix items contained stems that appeared in the exposure phase, but the affix was a novel prefix that alternated between /gi/ and /gu/ (e.g., *gi-mubu vs. gu-mubu). In the Distance Judgment test, participants were asked to rate, on a scale from 1 to 5, how similar each item was to the items that were heard during the exposure phase, where 1 was

identical, and 5 was extremely different. The same 36 items from the 2AFC test were used for the Difference Judgment task, counterbalanced for order effects.

Results: Overall, participants rated Harmonic items as more similar than Disharmonic items ($\beta=1.04$, $z=6.88$, $p<0.001$), as shown in Figure 1. However, this difference was not significant for Prefix items ($\beta=.31$, $t=1.96$, $p=0.57$), (but significant for New items ($\beta=.71$, $t=4.54$, $p<0.0023$)). This suggests that learners only used similarity as a metric for grammaticality when the structure of the word was similar to trained items. The 2AFC items were compared to 50% chance (via an intercept only mixed effects model), which showed significant effects for New ($M=0.66$, $\beta=.84$, $z=2.19$, $p=0.029$) and Prefix ($M=0.68$, $\beta=.88$, $z=2.24$, $p=0.025$) items, and a marginally significant effect for Old items ($M=0.63$, $\beta=.66$, $z=1.74$, $p=0.087$). This suggests that participants were able to differentiate between grammatical and ungrammatical items, even for items ranked as highly dissimilar to the training items.

Figure 1: Difference Judgment Results (Means and Standard Errors)



Discussion and Conclusions: The present results replicated Finley and Badecker (2009), demonstrating that in a 2AFC task, participants can generalize vowel harmony in a suffixing language to a prefixing language. However, when asked to rate the same items based on similarity, participants rated prefixed items as highly dissimilar, and showed no significant distinction between grammatical and ungrammatical items. This suggests that metrics of similarity, as suggested by exemplar models of phonology, cannot account for the ability to distinguish between grammatical and ungrammatical items when the structure of the novel item differs significantly from familiar items. While metrics of similarity may be useful in determining grammaticality for known and similar novel lexical items, it cannot account for learners' ability to generalize to novel items in an abstract manner, as rule/constraint based models predict. Future research will work to explore the role of similarity in constructing abstract models of phonological processing.

References:

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