

# The neural bases and distributional factors underlying learning and generalization of morphological inflections

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We examined the neurocognitive basis of distributional factors underlying learning and generalization of affixal inflectional morphology in a novel language. Our behavioral study examined effects of three factors in adults acquiring plural suffixation in an artificial language, over six sessions: affix type frequency (number of words receiving an affix), phonological predictability (degree that phonological cues predict an affix), and affixal phonological diversity (number of different rime cues predicting the affix). Our results suggest that all three factors contributed to both learning and generalization, though with different time courses. Notably, both higher affix type frequency and higher affixal diversity led to default-like affixation of untrained words without phonological cues, explaining emergence of minority default inflections.

In our fMRI study adults were trained on the same artificial language for three sessions, and scanned after the first and last sessions while inflecting trained and untrained words. Inflecting trained items yielded activation in the caudate head bilaterally, only in the first session, consistent with a role for procedural memory in learning grammatical regularities. Untrained words yielded more activation than trained words in medial frontal (including preSMA) and left inferior frontal cortices, previously implicated in compositional grammatical processing. A reliance on phonological cues for untrained word inflection correlated positively with preSMA activation, but negatively with activation in pars triangularis, suggesting these regions underlie alternative linguistic processes. Activation in these regions was also affected by affix type frequency in trained items, with the weakest activation for trained items with high frequency affixes. This suggests less involvement of compositional processes for inflecting trained items, in particular those with high frequency affixes, consistent with storage of such forms.

Overall, these findings elucidate the role of domain general distributional factors (frequency, predictability, diversity) and procedural learning mechanisms underlying learning and generalization of morphological knowledge in a novel language.

**Primary author:** NEVAT, Michael (Language and Brain Plasticity lab, University of Haifa)

**Co-authors:** ULLMAN, Michael T (Department of Neuroscience, Georgetown University); BITAN, Tali (Department of Psychology, IIPDM, University of Haifa; Department of Speech Pathology, University of Toronto); EVI-ATAR, Zohar (Department of Psychology, IIPDM, University of Haifa)

**Presenter:** BITAN, Tali (Department of Psychology, IIPDM, University of Haifa; Department of Speech Pathology, University of Toronto)

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