

Learning Trajectories and Generalization: Converging markers for Rule- and Similarity-based Processes in Grammar Learning?

Moulshree Rana

Radboud University, Nijmegen, Gelderland, Netherlands

Herbert Schriefers

Radboud University, Nijmegen, Netherlands

Kristin Lemhöfer

Radboud University, Nijmegen, Netherlands

Abstract

In several cognitive tasks involving categorization, function learning, or artificial grammar learning, judgements can be made on the basis of rules, i.e. abstract and general information about structure, or on the similarity of current instances to previously encountered instances. In this paper, we examine two behavioural markers for rule- and similarity-based processes in language learning: learning trajectories and generalisation performance. A rule-based process is expected to generate a sudden increase in performance after the correct rule is acquired. A similarity-based process is expected to generate a gradually increasing trajectory. Generalisation is operationalized as the difference in performance between test items that were encountered in training and new items. Performance under a rule-based process is expected to be the same for both types, as an extracted rule can be applied equally well. Better performance for old instances compared to new implies a similarity based process. We utilise data from a study by Menks et al. (2022) where participants were implicitly exposed to grammatical rules of Icelandic, and perform grammaticality judgement tasks across several sessions. We apply a Bayesian latent mixture model to analyse individual trajectories and classify them as step-wise or gradual. We find individual differences in how performance changes over time, as well as differences in generalisation performance. However, the expected underlying process based on trajectories and generalisation performance for participants do not converge. The form of learning trajectory of an individual was not related to generalisation ability. Future research is required to test if a step-wise or gradual learning trajectory is exclusive to a rule-based or similarity-based process.