

EFFECTS OF TASK-SPECIFIC VARIABLES ON AUDITORY ARTIFICIAL GRAMMAR LEARNING AND GENERALIZATION

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Extraction and generalization of rules from stimuli that share an underlying structure is one of the bedrocks of language acquisition. This rule learning ability has been shown in adults using both simple and complex grammars in the auditory, visual, and tactile domains. Understanding the conditions under which simple rule learning can occur and to what extent learning is implicit or explicit is essential for understanding what the fundamentals of language acquisition are and whether language acquisition may have evolved from simpler pattern-extraction mechanisms. Inconsistency in experimental methodology used to show rule learning indicates that it is of interest to explore the precise conditions influencing how well learners perform in such tasks. To this end, we conducted four auditory artificial grammar learning experiments with 12 conditions (n=192) using XYX and XXY grammars. In Experiments 1-3, ten participant groups received passive familiarization with one of the two grammars and were tested with a yes/no paradigm. In Experiment 4, two groups were exposed to one of the two grammars via reinforced training and were tested in a go-left/go-right task. Across these four experiments, we manipulated the following experimental

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factors: vagueness of instructions, input variety, presence or absence of feedback, and types of testing items.

In Experiment 1, instructions were “undirected,” not directing participants’ attention to the underlying structure. Participants were asked whether the test items are part of the same “language” or “group” as in the listening phase. To study the effect of variety, participants were further divided into groups exposed to either 3 or 15 triplets, for a total of 45 trials in both cases. Test items consisted of a consistent and an inconsistent grammar, each made up of either familiar or novel syllables, constituting “undirected” testing in which test items could not direct participants to what they should be attending to. In Experiment 2, instructions were “directed,” telling participants that the exposure sounds followed a certain “pattern,” and that they should indicate whether test items followed that same pattern. As in Experiment 1, participants either heard 3 or 15 triplets during the familiarization phase, and testing was “undirected,” consisting of both familiar and unfamiliar sounds. In Experiment 3, we again compared the role of instruction and of number of familiarization triplets, but now used “directed” testing, meaning only novel sounds were used (directing participants’ attention away from processing at the sound level). Finally, in Experiment 4, we again varied the number of exposure triplets and used undirected testing, but now exposed participants, without instruction, in a reinforced go-left/go-right task. When they reached criterion, they continued (now without feedback) with the same procedure of categorizing the test items as either a left-side sound or a right-side sound, where each grammar corresponded with one of the sides.

Our results show that participants were able to apply the rule to test items composed of previously heard sounds, independently of our experimental manipulations, discriminating the two grammars significantly above chance in all conditions. However, they were not able to generalize the rule to novel sounds if they were not somehow “directed,” either through directed instruction, directed testing, or feedback training. Notably, variety in number of exposure triplets during familiarization did not affect generalization, with no significant difference in performance between participants exposed to 3 or 15 triplets. It thus seems that in order to generalize simple rules beyond their surface form, participants require their attention to be directed, supporting recent findings in a dual-mechanism account of AGL (Opitz & Hofmann, 2015). These results have implications for the design of future AGL experiments and for theories of implicit vs. explicit AGL. A comprehensive understanding of language learning must integrate the evolution of a primary similarity-detection and an attention-based rule-detection mechanism.

References

- Opitz, B. and Hofmann, J. (2015). Concurrence of rule- and similarity-based mechanisms in artificial grammar learning. *Cognitive Psychology*, 77, 77-99.