Learning complex sequences of tones is related to syntactic processing of natural language.

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Introduction Sequential learning (SL) is a cognitive process allowing people to perceive and learn environmental patterns. We have previously shown that SL of simple sequences of 2 items (a predictor and a target) is related to syntactic processing of natural language (Singh et al., 2014). The aim of the present research is to extend this finding to more complex sequences.

Method We explored this relationship with a visual and an auditory SL task wherein a sequence of two items (instead of only one in Singh et al., 2014) predicted the probability of occurrence of a target. These SL tasks were presented to 13 adults (11 females, 18-40 years), who also completed a measure of syntactic processing of natural language: the Grammaticality Judgment subtest of the Comprehensive Assessment of Spoken Language (CASL). We performed mixed-measures ANOVAs on individual mean response times (RT) as well as single-trial analyses using a correlational approach and a linear mixed model.

Results showed an interaction between target predictability (high vs. low, indicating SL), Grammaticality (high vs low performers), and Modality (Visual vs. Auditory) [Mixed-measure ANOVAs: $F(1,11)=7.69$, $p = .018$; Linear mixed model: $F(4,2102)=36.0$, $p < .001$]. Sidak corrected pairwise comparisons indicated a significant predictability effect in the group of low performers with the auditory SL task only [Mixed-measure ANOVAs: $p = .071$; Linear mixed model: $p = .011$]. RT effects (RT to low minus high predictability conditions) were correlated with the raw score of Grammaticality [$Spearman’s \rho = .171$, $p = .007$, $N=247$, two-tailed].

Conclusion The consistency of these results together with Singh et al. (2014) indicate a robust relationship between syntactic processing of natural language and SL independently of sequence complexity.


Keyword implicit learning; statistical learning; grammar, syntax, melody