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Building Blocks of Recursive Pattern Processing in Human Adults

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Abstract

The capacity to generate recursive sequences is argued to be a behavioral marker of rich, algorithmic cognition, like that found perhaps distinctively in humans. However, the precise mechanisms underlying recursive sequence generation remain mysterious. We investigate three potential building blocks of recursive pattern processing: hierarchical reasoning, ordinal reasoning, and associative chaining. We develop a Bayesian mixture model to quantify the extent to which these three cognitive mechanisms contribute to a center-embedded sequence generation task. We further test whether recursive rule discovery depends upon relational information (either perceptual or conceptual) present in the task stimuli. The presence of relational information facilitates hierarchical reasoning that drives the generation of recursive sequences across various depths of center-embedding. Without relational information, the use of ordinal reasoning predominates. Our results suggest that hierarchical reasoning is an important building block of recursive pattern processing and can be deployed across embedding depths and relational domains.

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