

Dendrophilia versus continuity in hierarchical reasoning

Abhishek Dedhe

Carnegie Mellon University, Pittsburgh, Pennsylvania, United States

Karishma Kulshrestha

Carnegie Mellon University, Pittsburgh, Pennsylvania, United States

Soham Kulkarni

Troy High School, Fullerton, California, United States

Steven Piantadosi

UC Berkeley, Berkeley, California, United States

Jessica Cantlon

Carnegie Mellon, Pittsburgh, Pennsylvania, United States

Abstract

Hierarchical reasoning might be qualitatively unique to humans or alternatively may arise from quantitative differences in cognitive resources. We tested hierarchical reasoning abilities across adults, children, crows, and monkeys, evaluating two hypotheses: the Strong Dendrophilia Hypothesis, which posits human uniqueness, and the Continuity Hypothesis, which attributes differences to variations in information-processing capacity. Using Bayesian modeling, we found that hierarchical reasoning (dendrocapacity) is not exclusive to humans, though the tendency to engage in it (dendroproclivity) varies across age and species. Adults exhibited the strongest dendroproclivity, while children and non-humans showed graded performance influenced by cognitive resource demands and task complexity. Hierarchical mechanisms such as Last-In-First-Out (LIFO) stacks were prevalent across groups. These findings challenge human uniqueness in hierarchical reasoning and suggest its emergence through incremental increases in cognitive capacities across development and evolution.