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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 47(0)

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Publication Date

2025

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Peer reviewed

Wild Possibilities: Evidence of Modal Cognition in Free-Ranging Rhesus Macaques (*Macaca mulatta*)

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Abstract

Modal cognition is foundational to human reasoning, enabling us to construct and narrow a rich space of hypotheses about the world. While this faculty has often been considered uniquely human, its evolutionary roots remained uncertain. Nonhuman primates, lacking a natural language modal lexicon, provide a crucial test case for whether modal reasoning depends on linguistic expression. Prior research has cast doubt on primates' ability to contrast mutually exclusive possibilities, with subjects failing tasks that require reasoning about uncertain outcomes. Across four experiments, we show that rhesus macaques can reliably distinguish between certain and possible rewards, exhibiting unprecedented success on a 3-cup task. Primates' previous failures may stem not from an inability to reason modally but from the burden of representing absence as a possible alternative. By alleviating this burden, we uncover an early evolutionary footprint of modal reasoning that extends beyond humans and reveals an ancient, language-independent logical framework.