

TITLE: Go If You Know: Using Actions to Test for Metacognitive Uncertainty

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INTRODUCTION: Humans can understand their own thoughts. They are aware of what they do and do not know. This begs the question of whether nonhuman animals share this ability. The existence of such capacities would inform us about the possible evolution of these processes. Monkeys seemingly understand when they don't know because they will escape difficult trials (for review, Smith et al., 2012). However, this might be conditioned avoidance rather than true uncertainty. Recent research has shown that after a response has been made (but before feedback), chimpanzees are more likely to run to catch a potential reward when their answer is correct than incorrect (Beran et al., 2015). This suggests true uncertainty because it cannot be explained by avoidance.

PURPOSE: The purpose of this study is to design a computer task for macaques that captures the post-response running for a reward paradigm used with chimpanzees, shedding light on whether humans and macaques can show the same unambiguous signs of metacognition.

METHOD: We built a computerized paradigm used first with humans to determine if they expressed clear metacognitive confidence. Pixelated boxes varying across a sparse/dense continuum were presented. The participants had to categorize them, and after making their response, they could move the cursor to catch a coin and receive a reward if correct or slowly move back to the trial start if incorrect. They could also stay stationary to start the next trial more quickly if uncertain. A similar task with slight modifications is being run with monkeys.

RESULTS: Results suggest that humans in this task (like chimpanzees in their task) stay put more when they are uncertain and move when confident. We are currently testing macaques to determine if they also show this metacognitive restraint, or if they fall short in this ability.

CONCLUSION: Mounting evidence suggests that at least chimpanzees share abilities that we initially thought to be uniquely human (Beran et al., 2015). Our current findings with humans show that parallels exist between humans and chimpanzees in their abilities to make confidence movements, and our future research will determine if macaques also share this ability.

KEYWORDS: Metacognition, uncertainty, confidence movements, comparative cognition