

07: Three Questions about Mindreading

s.butterfill@warwick.ac.uk

1. Nonhuman Mindreading

Many animals including scrub jays (Clayton et al. 2007), ravens (Bugnyar et al. 2016), goats (Kaminski et al. 2006), dogs (Kaminski et al. 2009), ringtailed lemurs (Sandel et al. 2011), monkeys (Burkart & Heschl 2007; Hattori et al. 2009) and chimpanzees (Melis et al. 2006; Karg et al. 2015; Krupenye et al. 2016) reliably vary their actions in ways that are appropriate given facts about another’s mental states. What could underpin such abilities to track others’ mental states?

Example 1: ‘In informed trials dominant individuals witnessed the experimenter hiding food behind one of the occluders whereas in uninformed trials they could not see the baiting procedure. In misinformed trials, dominants witnessed the experimenter hiding food behind one of the occluders, and once the dominant’s visual access was blocked, the experimenter switched the food from its original location to the other occluder’ (Hare et al. 2001).

Example 2: ‘the jays were much more likely to re-cache if they had been observed by a conspecific while they were caching than when they had cached in private. By re-caching items that

the observer had seen them cache, the cachers significantly reduce the chance of cache theft, as observers would be unable to rely on memory to facilitate accurate cache theft’ (Clayton et al. 2007, p. 516).

Example 3: ‘ravens can transfer knowledge from their own experience in a novel context—using peepholes to look into an adjacent room—to a caching situation in which they can hear but not see a conspecific in that room’ (Bugnyar et al. 2016).

2. Question 1: Tracking to Representing

How do observations about tracking support conclusions about representing?

‘Comparative psychologists test for *mindreading* in non-human animals by determining whether they *detect* the presence and absence of particular cognitive states in a wide variety of circumstances. They eliminate potential confounding variables by ensuring that there is no one observable state to which subjects might be responding’ (Halina 2015, p. 487).

For you to *track* someone’s mental state (such as a belief that there is food behind that rock) is for there to be a process in you which nonaccidentally depends in some way on whether she has that mental state.

‘chimpanzees understand ... intentions ... per-

ception and knowledge,’ but ‘chimpanzees probably do not understand others in terms of a fully human-like belief–desire psychology’ Call & Tomasello (2008, p. 191).

‘the core theoretical problem in contemporary research on animal mindreading is that the bar—the conception of mindreading that dominates the field—is too low, or more specifically, that it is too underspecified to allow effective communication among researchers, and reliable identification of evolutionary precursors of human mindreading through observation and experiment’ (Heyes 2015, p. 318)

3. Question 2: Dissociations

Why are there dissociations in nonhuman apes’, human infants’ and human adults’ performance on belief-tracking tasks?

study	type	success?
Call et al, 1999	object choice (coop)	fail
Krachun et al, 2009	‘chimp chess’ (competitive, action)	fail
Krachun et al, 2009	‘chimp chess’ (competitive, gaze)	pass A, fail B
Krachun et al, 2010	change of contents	fail
Krupenye et al, 2017	anticipatory looking (2 scenarios)	pass both

‘the present evidence may constitute an implicit understanding of belief’ (Krupenye et al. 2016, p. 113)

4. Question 3: Automaticity

Are human adults' abilities to track others' beliefs automatic?

For our purposes, a process is *automatic* to the degree that whether it occurs is independent of its relevance to the particulars of the subject's task, motives and aims. *automatic mindreading* is mindreading that is a consequence of automatic processes only.

There is evidence that some mindreading in human adults is automatic (e.g. Kovács et al. 2010; Schneider et al. 2012; van der Wel et al. 2014) and that not all mindreading in human adults is (Apperly et al. 2008, 2010b; van der Wel et al. 2014). 'Participants never reported belief tracking when questioned in an open format after the experiment ("What do you think this experiment was about?"). Furthermore, this verbal debriefing about the experiment's purpose never triggered participants to indicate that they followed the actor's belief state' (Schneider et al. 2012, p. 2). (Note that there are relevant failures to replicated this paradigm.)

For adults (and children who can do this), representing perceptions and beliefs as such—and even merely holding in mind what another believes, where no inference is required—involves a measurable processing cost (Apperly et al. 2008, 2010a), consumes attention and working memory in fully competent adults Apperly et al. 2009; Lin et al. 2010; McKinnon & Moscovitch

2007, may require inhibition (Bull et al. 2008) and makes demands on executive function (Apperly et al. 2004; Samson et al. 2005).

Q3b: How could belief-tracking ever be automatic if it significantly depends on working memory and consumes attention?

References

Apperly, I. A., Back, E., Samson, D., & France, L. (2008). The cost of thinking about false beliefs: Evidence from adults' performance on a non-inferential theory of mind task. *Cognition*, 106(3), 1093–1108.

Apperly, I. A., Carroll, D., Samson, D., Humphreys, G., Qureshi, A., & Moffitt, G. (2010a). Why are there limits on theory of mind use? evidence from adults' ability to follow instructions from an ignorant speaker. *The Quarterly Journal of Experimental Psychology*, 63(6), 1201–1217.

Apperly, I. A., Carroll, D. J., Samson, D., Humphreys, G. W., Qureshi, A., & Moffitt, G. (2010b). Why are there limits on theory of mind use? evidence from adults' ability to follow instructions from an ignorant speaker. *The Quarterly Journal of Experimental Psychology*, 63, 1201–1217.

Apperly, I. A., Samson, D., Chiavarino, C., & Humphreys, G. (2004). Frontal and temporo-parietal lobe contributions to theory of mind: Neuropsychological evidence from a false-belief task with reduced language and executive demands. *Journal of Cognitive Neuroscience*, 16(10), 1773–1784.

Apperly, I. A., Samson, D., & Humphreys, G. W. (2009). Studies of adults can inform accounts of theory of mind development. *Developmental Psychology*, 45(1), 190–201.

Bugnyar, T., Reber, S. A., & Buckner, C. (2016). Ravens attribute visual access to unseen competitors. *Nature Communications*, 7, 10506.

Bull, R., Phillips, L., & Conway, C. (2008). The role of control functions in mentalizing: Dual-task studies of theory of mind and executive function. *Cognition*, 107(2), 663–672.

Burkart, J. M. & Heschl, A. (2007). Understanding visual access in common marmosets, *Callithrix jacchus*: perspective taking or behaviour reading? *Animal Behaviour*, 73(3), 457–469.

Call, J. & Tomasello, M. (2008). Does the chimpanzee have a theory of mind? 30 years later. *Trends in Cognitive Sciences*, 12(5), 187–192.

Clayton, N. S., Dally, J. M., & Emery, N. J. (2007). Social cognition by food-caching corvids. the western scrub-jay as a natural psychologist. *Philosophical Transactions of the Royal Society B*, 362, 507–552.

Halina, M. (2015). There Is No Special Problem of Mindreading in Nonhuman Animals. *Philosophy of Science*, 82(3), 473–490.

Hare, B., Call, J., & Tomasello, M. (2001). Do chimpanzees know what conspecifics know? *Animal Behaviour*, 61(1), 139–151.

Hattori, Y., Kuroshima, H., & Fujita, K. (2009). Tufted capuchin monkeys (*Cebus apella*). *Animal Cognition*, 13(1), 87–92.

Heyes, C. (2015). Animal mindreading: what's the problem? *Psychonomic Bulletin & Review*, 22(2), 313–327.

Kaminski, J., Bräuer, J., Call, J., & Tomasello, M. (2009). Domestic dogs are sensitive to a human's perspective. *Behaviour*, 146(7), 979–998.

Kaminski, J., Call, J., & Tomasello, M. (2006). Goats' behaviour in a competitive food paradigm: Evidence for perspective taking? *Behaviour*, *143*, 1341–1356.

Karg, K., Schmelz, M., Call, J., & Tomasello, M. (2015). Chimpanzees strategically manipulate what others can see. *Animal Cognition*, *18*(5), 1069–1076.

Kovács, Á. M., Téglás, E., & Endress, A. D. (2010). The social sense: Susceptibility to others' beliefs in human infants and adults. *Science*, *330*(6012), 1830–1834.

Krupenye, C., Kano, F., Hirata, S., Call, J., & Tomasello, M. (2016). Great apes anticipate that other individuals will act according to false beliefs. *Science*, *354*(6308), 110–114.

Lin, S., Keysar, B., & Epley, N. (2010). Reflexively mind-blind: Using theory of mind to interpret behavior requires effortful attention. *Journal of Experimental Social Psychology*, *46*(3), 551–556.

McKinnon, M. C. & Moscovitch, M. (2007). Domain-general contributions to social reasoning: Theory of mind and deontic reasoning re-explored. *Cognition*, *102*(2), 179–218.

Melis, A. P., Call, J., & Tomasello, M. (2006). Chimpanzees (Pan troglodytes) conceal visual and auditory information from others. *Journal of Comparative Psychology*, *120*(2), 154–162.

Samson, D., Apperly, I. A., Kathirgamanathan, U., & Humphreys, G. W. (2005). Seeing it my way: a case of a selective deficit in inhibiting self-perspective. *Brain*, *128*(5), 1102–1111.

Sandel, A. A., MacLean, E. L., & Hare, B. (2011). Evidence from four lemur species that ringtailed lemur social cognition converges with that of haplorhine primates. *Animal Behaviour*, *81*(5), 925–931.

Schneider, D., Bayliss, A. P., Becker, S. I., & Dux, P. E. (2012). Eye movements reveal sustained implicit processing of others' mental states. *Journal of Experimental Psychology: General*, *141*(3), 433–438.

van der Wel, R. P. R. D., Sebanz, N., & Knoblich, G. (2014). Do people automatically track others' beliefs? evidence from a continuous measure. *Cognition*, *130*(1), 128–133.