Lecture 03 : Theory of Mind – The Puzzle : Origins of Mind

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Contents

1.   Knowledge of Mind

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The challenge is to explain the emergence of awareness of others' mental states; here we focus on awareness of others' beliefs.

1.1.   Our Question

How do humans first come to know facts about others' mental states? How, for instance, do they come to know that Ayesha believes, falsely, that she and Beatrice will still be able to catch a bus home even if they delay leaving the party?

1.2.   Mindreading

Mindreading is the process of identifying a mental state as a mental state that some particular individual, another or yourself, has. To say someone has a *theory of mind* is another way of saying that she is capable of mindreading.[1]

1.3.   False Belief Tasks

Wimmer & Perner (1983) set out to determine when humans can know facts about others' beliefs. They told children a story like this:

> 'Maxi puts his chocolate in the BLUE box and leaves the room to play. While he is away (and cannot see), his mother moves the chocolate from the BLUE box to the GREEN box. Later Maxi returns. He wants his chocolate.'

They then asked the children, 'Where will Maxi look for his chocolate?'

The core feature of a standard *false belief task* is this:

> '[t]he subject is aware that he/she and another person [Maxi] witness a certain state of affairs x. Then, in the absence of the other person the subject witnesses an unexpected change in the state of affairs from x to y' (Wimmer & Perner 1983, p. 106).

The task is designed to measure the subject's sensitivity to the probability that Maxi will falsely believe x to obtain.

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[1]   According to an influential definition offered by Premack & Woodruff (1978, p. 515), for an individual to have a theory of mind its for her to 'impute mental states to himself *and* to others' (my italics). I have slightly relaxed their definition by changing their 'and' to 'or' in order to allow for the possibility that there are mindreaders who can identify others' but not their own mental states.

1.4.　Models of Minds and Actions

A *model* is a way the world could logically be, or a set of ways the world could logically be.

We can contrast a *fact model* of minds and actions with a *belief model.*

On the fact model, it is facts about where things are which explain an agents' actions.

On the belief model, it is an agents' beliefs about where things are which explain her actions.

False belief tasks can be used to distinguish the hypothesis that a subject is using a fact model from the hypothesis that she is using a belief model of minds and actions.

1.5.　Findings

Three-year-olds systematically fail to predict actions (Wimmer & Perner 1983) and desires (Astington & Gopnik 1991) based on false beliefs; they similarly fail to retrodict beliefs (Wimmer & Mayringer 1998) and to select arguments suitable for agents with false beliefs (Bartsch & London 2000). They fail some low-verbal and nonverbal false belief tasks Call & Tomasello 1999; Low 2010; Krachun et al. 2009, 2010; they fail whether the question concerns others' or their own (past) false beliefs (Gopnik & Slaughter 1991); and they fail whether they are interacting or observing (Chandler et al. 1989).

2.　Infants Track False Beliefs

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Many behaviours exhibited by infants, including anticipatory looking, looking time, pointing and helping activities, show sensitivity to what others believe even when their beliefs are false.

For a process to *track* someone's belief that p is for it to nonaccidentally depend in some way on whether she believes that p. For *someone to track beliefs* is for there to be processes in her which track some beliefs.

One-year-old children predict actions of agents with false beliefs about the locations of objects (Clements & Perner 1994; Onishi & Baillargeon 2005; Southgate et al. 2007),[2] and about the contents of containers (He et al. 2011),

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[2]　Some of these studies have proven difficult to replicate, or have been challenged in other ways. For example, Kampis et al. (2020) failed to replicate Southgate et al. (2007). Kulke et al. (2019, p. 14) suggest that anticipatory looking, may not be reliable indicators of

taking into account verbal communication (Song et al. 2008; Scott et al. 2012). They will also choose ways of helping (Buttelmann et al. 2009) and communicating (Knudsen & Liszkowski 2012; Southgate et al. 2010) with others depending on whether their beliefs are true or false. And in much the way that irrelevant facts about the contents of others' beliefs modulate adult subjects' response times, such facts also affect how long 7-month-old infants look at some stimuli (Kovács et al. 2010).

2.1.   Beyond Replication Issues

A surprising number of findings have turned out to be inexplicably hard to replicate, while other findings have been replicated.[3] Even more confusingly, some findings have been both successfully and unsuccessfully replicated (for example, see Kulke & Rakoczy 2018 on Southgate et al. 2007).

Beyond questions of replication, there are two challenges. First, when various tasks are supposed to measure a single ability, we would normally expect to find signs of convergence in performance across the tasks: that is, those and only those subjects who pass one of these tasks will tend to pass other tasks. Kulke et al. (2017, p. 2) observe that whereas performance on false belief tasks used to test older children is convergent in this sense, there is little evidence of convergence for false belief tasks suitable for infants; and Poulin-Dubois & Yott (2017) find evidence for divergence. Second Wellman (2018, p. 741) notes that in tasks typically used with older children, measures of belief tracking are predictive of social skills, whereas there is as yet little evidence that performance on belief tracking tasks used with infants predicts social abilities.

2.2.   My Guess

My guess is that even two- and three-year-olds really can track beliefs. I thought there was already a case for this guess twenty years before this course (Butterfill 2001). And even taking seriously the challenges and the patterns of success and failure in replication studies, on balance the evidence in favour of this guess has grown since then.

Against this Poulin-Dubois et al. (2018) argue that issues with replication prevent us from knowing, at present, whether infants track false beliefs.

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belief tracking at all.

[3]   See, for example, Kulke et al. (2017), Kulke & Rakoczy (2018), Kulke et al. (2018), Powell et al. (2017), Crivello & Poulin-Dubois (2017) and Dörrenberg et al. (2018).

3.   Mindreading: a Developmental Puzzle

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The first puzzle concerns apparently conflicting findings about when and how humans acquire awareness of others' beliefs.

A *model* is a way the world could logically be, or a set of ways the world could logically be.

An *A-Task* is any false belief task that children tend to fail until around three to five years of age.

3.1.   A Puzzle

1. Children fail A-tasks because they rely on a model of minds and actions that does not incorporate beliefs.

2. Children pass non-A-tasks by relying on a model of minds and actions that does incorporate beliefs.

3. At any time, the child has a single model of minds and actions.

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, 2010), 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).

4.   Mindreading Chimpanzees?

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Humans are probably not the only great apes which can track others' beliefs (Krachun et al. 2009; Krupenye et al. 2016; Kano et al. 2019).

'we should be focused not on the yes–no question (do chimpanzees have a theory of mind?), but rather on a whole panoply of more nuanced questions concerning precisely what chimpanzees do and do not know about the psychological functioning of others' (Hare et al. 2001, p. 149)

5.   Conclusion: Two Puzzles

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Any attempt to understand the emergence of mindreading in ontogeny needs to solve two puzzles. First, How do observations about tracking support conclusions about representing? Second, Why are there dissociations in nonhuman apes', human infants' and human adults' performance on belief-tracking tasks?

Two questions:

1. How do observations about tracking support conclusions about models?
2. Why are there dissociations in nonhuman apes', human infants' and human adults' performance on belief-tracking tasks?

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