

Joint Action & the Emergence of Mindreading

Lecture 2: Minimal Theory of Mind

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1. Infant false-belief tracking abilities

One-year-old children predict actions of agents with false beliefs about the locations of objects^{7,21,25} and about the contents of containers,¹² taking into account verbal communication.^{23,22} They will also choose ways of helping³ and communicating^{14,24} 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.¹⁵

2. Three-year-olds fail false belief tasks

Three-year-olds systematically fail to predict actions²⁸ and desires¹ based on false beliefs; they similarly fail to retrodict beliefs²⁷ and to select arguments suitable for agents with false beliefs.² They fail some nonverbal false belief tasks;^{4,18} they fail whether the question concerns others' or their own (past) false beliefs;¹⁰ and they fail whether they are interacting or observing.⁵

The pattern of failure indicates a single developmental transition.²⁶

3. Puzzle

1. There are subjects who can pass A-tasks but cannot pass B-tasks.
2. These subjects' success on A-tasks is explained by the fact that they can represent (false) beliefs
3. These subjects' failure on B-tasks is explained by the fact that they cannot represent (false) beliefs

4. Question

What could two-year-olds, scrub-jays, chimpanzees and human adults under load represent that would enable them, within limits, to track others' propositional attitudes?

5. The construction

An agent's *field* is a set of objects related to the agent by proximity, orientation, lighting and other factors.

An agent *encounters* an object just if it is in her field.

A *goal* is an outcome to which one or more actions are, or might be, directed. A *goal-state* is an intention or other state of an agent linking an action to a particular goal to which it is directed.

A *goal-directed action* is a sequence of object-directed actions, which (1) has an outcome that is an outcome of the whole sequence and not any of its constituents, and (2) occurs in order to bring about this outcome.

Principle 3: one can't goal-directedly act on an object unless one has encountered it.

Application: subordinate chimps retrieve food when a dominant is not informed of its location.¹¹

Application: when observed scrub-jays prefer to cache in shady, distant and occluded locations.^{8,6}

An agent *registers* an object at a location [first approximation] just if she most recently encountered the object at that location.

A registration is *correct* just if the object is at the location it is registered at.

Principle 4: correct registration is a condition of successful action.

Applications: 12-month-olds point to inform depending on their informants' goals and ignorance;¹⁷ chimps retrieve food when a dominant is misinformed about its location;¹¹ scrub-jays observed caching food by a competitor later re-cache in private.^{6,9}

Principle 5: when an agent performs a goal-directed action and the goal specifies an object, the agent will act as if the object were actually in the location she registers it at.

Applications: false belief tasks^{21,25,3}

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