

# Lecture 07: Mindreading in Humans

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## 1. Automatic Belief-tracking

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 short for 'mindreading that is a consequence of automatic processes only.'

Southgate et al. (2007) created an anticipatory looking false belief task, originally for use with two-year-olds, which has been adapted to provide evidence for automatic false belief tracking.

There is evidence that some mindreading in human adults is entirely a consequence of relatively automatic processes (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 trig-

gered participants to indicate that they followed the actor's belief state' (Schneider et al. 2012, p. 2)

*Dual Process Theory of Mindreading.* Automatic and nonautomatic mindreading processes are independent in this sense: different conditions influence whether they occur and which ascriptions they generate.

Qureshi et al. (2010) found that automatic and nonautomatic mindreading processes are differently influenced by cognitive load, and Todd et al. (2016) provided evidence that adding time pressure affects nonautomatic but not automatic mindreading processes.

Lin et al. (2010) show that successful visual perspective taking (in the director task) is faster among those with greater working memory capacity (Experiment 1) and slower when cognitive load is imposed (Experiment 2).

## 2. Minimal Theory of Mind

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

First approximation: 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.

**Principle 1:** one can't goal-directedly act on an object unless one has encountered it.

Applications: subordinate chimps retrieve food when a dominant is not informed of its location (Hare et al. 2001); when observed scrub-jays prefer to cache in shady, distant and occluded locations (Dally et al. 2004; Clayton et al. 2007).

First approximation: an agent *registers* an object at a location 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 2:** correct registration is a condition of successful action.

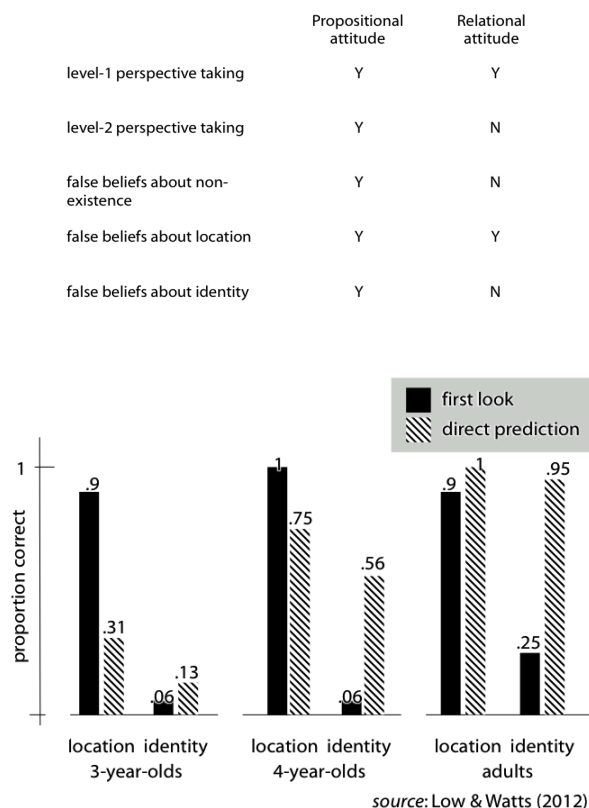
Applications: 12-month-olds point to inform depending on their informants' goals and ignorance (Liszkowski et al. 2008); chimps retrieve food when a dominant is misinformed about its location (Hare et al. 2001); scrub-jays observed caching food by a competitor later re-cache in private (Clayton et al. 2007; Emery & Clayton 2007).

**Principle 3:** 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: some false belief tasks (Onishi & Baillargeon 2005; Southgate et al. 2007; Buttelmann et al. 2009).

### 3. Signature Limits

Automatic belief-tracking in adults and belief-tracking in infants are both subject to signature limits associated with minimal theory of mind (Wang et al. 2015; Low & Watts 2013; Low et al. 2014; Mozuraitis et al. 2015; contrast Scott et al. 2015).



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).

Objection: ‘the theoretical arguments offered [...] are [...] unconvincing, and [...] the data can be explained in other terms’ (Carruthers 2015b; see also Carruthers 2015a).

‘A cooperative multi-system architecture is better able to explain infant belief representation than a parallel architecture, and causal representation, schemas and models provide a more promising basis for flexible belief representation than does a rule-based approach of the kind described by Butterfill and Apperly’ (Christensen & Michael 2016; see also Michael & Christensen 2016; Michael et al. 2013).

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