

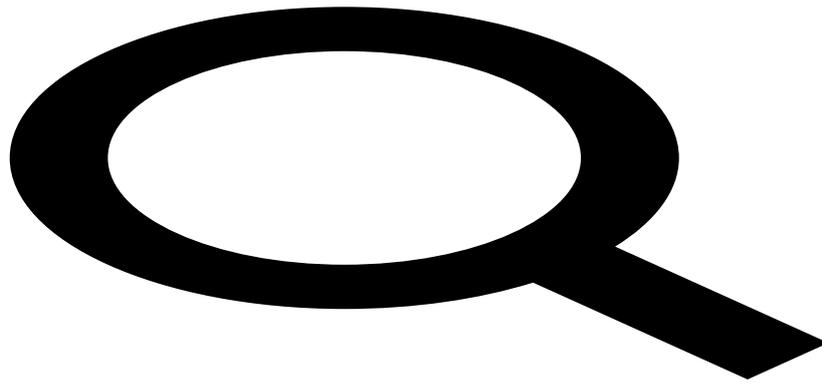
This is the first post in a series of two installments by Pierre Jacob, dwelling on Gergely and Csibra's work on human communication.

According to Csibra and Gergely's (2009) so-called "natural pedagogical" approach to the psychological bases of human culture, human infants are innately predisposed to automatically interpret what Sperber and Wilson (1986) call an agent's "ostensive" behavioral stimuli as cues that the agent intends to make manifest to the child some relevant novel information. Thus, the natural pedagogical approach takes for granted Sperber and Wilson's (1986) relevance-based concept of "ostensive-inferential communicative behavior", which is defined as a (behavioral) stimulus produced by an agent whereby she makes it manifest to her audience that she intends, by means of this stimulus, to make manifest (or more manifest) to her audience a set of assumptions. Sperber and Wilson (1986) draw a basic distinction between an agent's informative intention (to make some assumptions manifest to her audience) and an agent's communicative intention to make her informative intention manifest. So on relevance-theoretic grounds, a communicative intention is itself a second-order informative intention: it is the intention to make manifest one's first-order intention. Arguably, for someone to entertain a communicative intention is to intend another to represent one's own informative intention. If so, then entertaining a communicative intention requires the ability to form a third-order meta-representation. In which case, representing another's communicative intention requires the ability to form a fourth-order meta-representation.

Two outstanding open empirical issues generated by Sperber and Wilson's (1986) relevance framework are: (i) to what extent is it psychologically plausible to credit young human infants with the ability to interpret another's ostensive-inferential communicative behavior and ascribe to an agent, in accordance with relevance theory, a communicative intention? (ii) To what extent is ostensive-inferential communicative behavior specific to human cognition? Arguably, Csibra and Gergely's natural pedagogy theory offers interesting new empirical insights into these two questions. In this post, I tackle the first question (that of communicative competence in infants). The second post will deal with the issue of human specificity.

1. Crediting human infants with the ability to represent another's communicative intention

In a seminal experiment reported several years ago, Meltzoff (1988) showed 14-month-old human infants a model perform an odd head-action whereby she illuminated a light-box by leaning forwards and touching it with her forehead. Meltzoff (1988) reported that one week later, two-thirds of the children re-enacted the odd head-action to achieve the same outcome, although none of the control group did it spontaneously. In a more recent experiment, Gergely, Bekkering and Király (2002) adapted Meltzoff's (1988) paradigm: before performing the odd head-action, Gergely et al. (2002) had the model address the child in infant-directed speech, pretend to be cold and then wrap a blanket around her shoulders before performing the head-action. Then Gergely et al. (2002) divided the 14-month-old human infants into two conditions: in the hands-occupied condition, the model performed the odd head-action while using her hands to hold the blanket around her shoulders. In the hands-free condition, the model performed the head-action with her free hands clearly visible on the table, as you can see here:



Gergely et al. (2002) found that 69% of the infants in the hands-free condition imitated the head-action (replicating the Meltzoff findings), whereas only 21% of the infants reproduced the head-action in the hands-occupied condition (Figure 1c).

Gergely and Csibra (2005) went one step further and compared the infants' propensity to reproduce the model's head-action in either the hands-free or in the hands-occupied condition, in two different pragmatic contexts: in an ostensive communicative cueing context and in a non-ostensive cueing context. In the former context, the model looked at the child, smiled and addressed him in infant-directed speech. In the latter context, the model did not even look at the child, let alone speak to him. In the ostensive-communicative cueing context, Gergely and Csibra (2005) replicated Gergely et al.'s (2002) previous findings. But in the non-ostensive cueing context, the asymmetry between the 69% reproduction of the head-action in the hands-free condition and the 21% reproduction of the head-action in the hands-occupied condition collapsed. The question is: why does the presence of ostensive-communicative cues bias human children towards replicating the odd head-action in the hands-free condition significantly more than in the hands-occupied condition? The question is made more pressing by the fact that the agent's head-action is teleologically far more puzzling and opaque in the hands-free condition than in the hands-occupied condition: in the latter, the model can be interpreted as using her head because her hands are occupied. But in the former, it is puzzling why the model does not use her free hands.

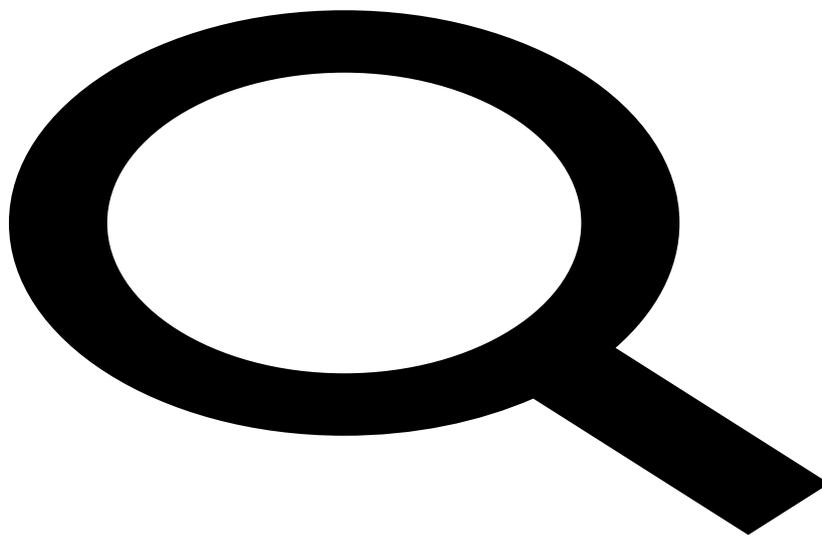
On Csibra and Gergely's (2005) natural pedagogy account, what the presence of ostensive-communicative cues does is to automatically trigger in the human child the assumption that the model intends to make some novel information manifest to the child. So the question is: which novel information does the agent's head-action make manifest in respectively the hands-occupied and the hands-free conditions? (The information made manifest by the agent's action should be construed by the child as "novel" relative to older information already available to the child immediately prior to the agent's action, i.e. in the context created by the agent's ostensive behavior.) In the former condition, prior to seeing the model's head-action, the child knows that the model's hands are occupied. So what the model's head-action makes manifest to the child is the relevance of turning on the light by using whatever bodily effector is available. But in the latter condition, prior to seeing the agent's head-action, the child knows that the model's hands are free. So what the model's head-action makes manifest to the child is the relevance of turning on the light by applying her head.

In a short paper, Topál, Gergely, Miklósi, Erdőhegyi and Csibra (2008) have applied natural pedagogy theory to a notorious Piagetian finding: the perseverative tendency of young human infants (approximately one-year-old) to commit the so-called "A-not-B error" in search tasks. In such tasks, the child is presented with two opaque containers, A and B. She sees a demonstrator repeatedly hide a toy under A. After each hiding event, the child is allowed to retrieve the object, which she does successfully. But if now the demonstrator switches from hiding the object under A to hiding it under B, then the child will keep searching for the object under A, not under B — in spite of

her having just seen the demonstrator hide the object at a new location. The question is: Why? Some have hypothesized that the child fails to inhibit an attentional bias towards the location repeatedly demonstrated. Others speculate that mirror neuron activity in infants leads them to reproduce the action repeatedly exhibited by the agent.

Topál et al. (2008) make two basic assumptions. First, they assume that the A-not-B task presents the human child with the following cognitive dilemma: the demonstrator's repeated action of hiding the object under A must convey either episodic (non-generic) or semantic (i.e. generic or generalizable) information about the relationship between the hidden object and the container. If the former, then the demonstrator's action informs the child that the object now happens to be under container A. If the latter, then the demonstrator's action informs the child that objects of kind K are to be found under container A. Secondly, in accordance with Csibra and Gergely's pedagogical stance approach, they assume that the presence of ostensive-communicative cues biases an infant's interpretation of an agent's action towards the semantic (generic) information interpretation.

Topál et al. (2008) presented 10-month-old infants with an A-not-B task in three distinct conditions: an ostensive-communication condition, a non-communicative condition and a non-social condition. In the first condition (A), the demonstrator established eye-contact with the child, smiled at her and addressed her in infant-directed speech before repeatedly hiding the object under A. In the second condition (B), the demonstrator did not look at the infant and her head and torso were not facing the infant. In the third condition (C), the demonstrator was hidden behind a curtain and only the object's motion was visible to the infant. Topál et al. (2008) found that in the first condition, 86% infants displayed the perseverative error. But in the second and third conditions, only 43% and 36% did.



Thus, the natural pedagogy account breaks down infants' putative ability to represent an agent's communicative intention into a sub-set of rather simple cognitive abilities. First of all, the natural pedagogical account of either the selective imitation of a teleologically opaque head-action by 14-month-old infants or the perseverative errors in the A-not-B search task by 10-month-olds assumes that the infants' imitative or perseverative behavior is governed by infants' pragmatic assumptions — both the imitative and the perseverative behaviors are conceptualized as a piece of human ostensive-communicative behavior, in which the infant plays the role of the model's addressee. Secondly, the natural pedagogical account of either infants' selective imitation or perseverative errors attributes to the infant a predisposition to automatically interpret the adult's ostensive-communicative behavior as cues of the adult's intention to make some relevant information manifest

to the infant. Thirdly, the natural pedagogical account of the infants' selective imitative behavior attributes to the infant the ability to parse the model's overall action as an ordered sequence of constituent acts whereby (i) the model first displays her hands as being either occupied or free and (ii) the model executes a head-action whose relevance is interpreted by the infant as novel relative to (i). The natural pedagogical account of the A-not-B perseverative errors made by 10-month-old human children assumes that an agent's ostensive communicative behavior biases human infants towards interpreting the agent's hiding behavior as making manifest generic or semantic (as opposed to episodic) information about the relationship between an object and a container.

The next and last post in the series will investigate the human uniqueness of pedagogy. Stay tuned!

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