



Shifting “goals”: Clarifying some misconceptions about the teleological stance in young infants[☆]

1. Introduction

In their commentary Heineman-Pieper and Woodward (2003, HPW) formulate a number of theoretical criticisms and methodological worries concerning our paper. Since we feel that their theoretical disagreements are inherently related to their often shifting and at points mistaken interpretations of our theory of the infant’s teleological stance (TS), we shall try to answer them by pointing out the nature of the misconceptions on which they are based. Then we shall reply to their methodological objections arguing that HPW’s worries are unfounded.

2. Confusing action interpretation and production systems

TS is a model of *action interpretation and goal attribution in infancy* (Csibra & Gergely, 1998; Gergely & Csibra, 1997, 2003). HPW, however, treat TS as if it were a production system when they claim that it provides “a faulty analysis of teleological causation” and “recommend an alternative analysis” of “purposeful behaviour” that “demonstrates how a purpose can achieve...causal force through the operation of selection processes.” HPW then claim that the difficulty with our model is that it analyses “teleology in terms of *rationality* rather than...*selection processes*.”

2.1. *The role of the rationality principle in guiding selection processes in production systems*

Treating processes of action interpretation isomorphic to those of action production is only feasible in a fully simulationist framework (which TS is not, see Gergely & Csibra, 2003; Gergely, 2002). However, even a simulationist model has to account for what factors guide agents in selecting “one of several possible ways to achieve the goal.” The assumption that agents apply some principle of optimality (such as rationality or efficiency) to guide action selection at least offers such a hypothetical explanatory account. For HPW “it seems unlikely” that Mother Nature would have selected for such a principle to guide and constrain action selection (though they do not specify why). Nevertheless, many others (Dennett, 1987; Gergely & Csibra, 2003; Searle, 2001;

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Tomasello, 1999) find it at least a plausible hypothesis to explore. In contrast, HPW's emphasis on "selection processes" does not provide a viable explanatory alternative to the rationality principle as it fails to suggest any account of what factors constrain selection among action alternatives.

2.2. *The role of the rationality assumption and selection processes in action interpretation systems*

Note that HPW's preference for "selection processes" over the rationality assumption faces similar problems even when they consider TS as an action interpretation system. In fact, the notion of "selection processes" is not missing from TS, but is built into the assumption of rational action on the basis of which infants expect agents to select "the most efficient (rational) means available to them within the constraints of the situation" (p. 4). In contrast, HPW propose that "people can consider multiple bases on which an agent might choose a particular course," and can do so "by means of a variety of experiences, including their own" which all contribute "to infants' informed interpretations." We feel however, that HPW's suggestions do not provide an adequate explanatory alternative as they again fail to specify what factors may guide and constrain the observer's "informed interpretations" when identifying which particular course of action the agent will select to achieve the goal.

3. **Confusing the non-mentalistic, reality-based TS of the infant with the mentalistic theory-of-mind of the adult**

HPW also misconstrue our model when they describe the TS as a theory about "infants' understanding of intentions" that "specifies cues" that should "reflect the flexible and nuanced ways adults (sic!) construe the purposes guiding behaviour." In fact, Gergely and Csibra (2003; Csibra & Gergely, 1998) have explicitly proposed that the explanatory elements of the TS are restricted to the interpreting infant's *own* representations of current and future reality states that are not yet attributed to the actor as causal intentional mental states such as beliefs or purposes. In particular, TS applies an externalist, non-mentalistic concept of 'goal' defined as a future state of physical reality that the action brings about. As a consequence, TS can represent as goal-directed only a *subset of all intentional actions*: it is 'blind' to those whose goals involve invisible changes in another person's *mental* states and is unable to represent actions based on false beliefs or pretence as these *mental* states represent fictional realities that don't correspond to actual reality (as perceived and represented by the infant). As a further consequence, the *cues* specified by the core assumptions of the TS can *identify only a subset of intentional actions* (those that exhibit equifinal variation of action and a visible action-effect). These cues, however, provide a powerful bootstrapping mechanism for young infants to correctly identify (an initial subset of) intentional actions around them.

Consider now HPW's criticism that TS "systematically distorts what counts as intentional—for theorists, lay adults, and infants alike" or that "infants would be significantly misled by relying on necessary and sufficient cues for identifying intentional action." If these points refer to the system's inability to represent intentional actions based on mental representations of fictional states or involving goals of changing invisible mind states, then the criticism is misdirected as it has never been proposed that TS can represent such mental states. If, however, the criticism is meant

to suggest that the cues specified by TS pick out behavioural events that—in spite of exhibiting the cues—do not correspond to well-formed intentional actions, then we challenge HPW to provide us with actual examples of this.

4. Methodological objections

We believe that HPW's worries that lacking proper controls we “run the risk of treating a single condition as a measure of goal-attribution in infants” is largely unfounded. In fact, we summarize and discuss a series of controls that we ran to clarify our results with 6-month-olds and to control for the ‘new-goal/newly mobile’ confound. In Jovanovic et al. (submitted) we report the details of these studies in which we tested 6-month-olds (a) on the *familiar* grasping-action with *salient action-effect* (object-transport), (b) on the *unfamiliar* ‘back-of-hand’ action with *salient action-effect* (object-dislocation) using *more discriminable objects* than in our present study, and (c) on the action of an *unfamiliar, non-human agent* (claw) with *salient action-effect* (object-transport). Our *positive* results in the ‘grasping’ and the new ‘back-of-hand’ conditions confirmed our hypothesis concerning the importance of a salient change of state as a cue supporting goal-attribution already in 6-month-olds. Our *negative* results in the ‘claw’ condition together with the *positive* result of the new ‘back-of-hand’ condition allowed us to reject the lower-level interpretation that was inherent in the ‘new-goal/newly mobile’ confound. Finally, the *positive* results of the new ‘back-of-hand’ condition using objects *discriminable along a bundle of features* (rather than just one), confirmed our hypothesis that 6-month-olds failed in our current study because of their difficulty in maintaining object identity based on a single feature (and *not* because of their inability to attribute goal to an unfamiliar action).

5. Conclusion

We agree with HPW that it is important to bear in mind the different levels of interpretations in looking-time studies, and accordingly we have used a *constellation of conditions and controls* as the source for our conclusions. However, we also believe that when so many relevant new findings emerge, it is important to develop new theoretical models that suggest integrative *explanatory frameworks* for the phenomena uncovered. It is for this reason that we have outlined a candidate theoretical frame specifying the complex design of an “innate algorithm”—indeed, a ‘teleology-meter,’ if you will, though we prefer to call it “well-formedness conditions”—for interpreting goal-directedness. We do believe that Mother Nature may have equipped infants with such a bootstrapping mechanism to get them started on the long road leading to an eventual understanding of intentional minds and actions. We also hope that developing such integrative theoretical models may help scientists to understand how infants achieve this remarkable developmental feat.

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