Developmental Review xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Developmental Review

journal homepage: www.elsevier.com/locate/dr

Post hoc versus predictive accounts of children's theory of mind: A reply to Ruffman

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ARTICLE INFO

Article history:
Received 2 May 2014
Available online xxxx

Keywords:
False belief
Theory of mind
Mentalism
Minimalism

ABSTRACT

Ruffman (in press) argues for a minimalist account of infants' performance on theory of mind tasks. This commentary argues that because Ruffman's minimalist account is post hoc, it neither generates testable predictions about how infants will respond in new situations, nor does it offer a coherent explanation for existing false-belief findings. An alternative, mentalist account is presented. This account integrates infancy findings with prior theory of mind literature and generates novel predictions about children's false belief performance.

Over the past two decades, numerous studies have presented evidence that infants can attribute goals, perceptions, and beliefs to agents (e.g., Gergely, Nádasdy, Csibra, & Bíró, 1995; Onishi & Baillargeon, 2005; Woodward, 1998; see Baillargeon et al., 2014, for a review). These findings have led many investigators to adopt a *mentalist* account that assumes mental-state reasoning is present in infancy. Ruffman (in press) challenges this conclusion, offering an alternative *minimalist* account of these findings. According to this account, infants' statistical learning abilities allow them to learn how agents tend to behave in particular situations. Together with a capacity to track an agent's perceptual access to events, these learned patterns of behavior (i.e. behavioral rules) allow infants to interpret and predict intentional actions without any understanding of the agent's mental states.

Two central issues arise from Ruffman's review: the post hoc nature of the minimalist account, and the importance of integrating infancy research with the broader literature on theory of mind.

More than intuition: Evidence that the minimalist account is post hoc

The primary flaw of Ruffman's minimalist account is that, despite his assertions to the contrary, it is post hoc. Ruffman carefully examines existing findings and for each experimental condition derives a

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http://dx.doi.org/10.1016/j.dr.2014.05.001
0273-2297/

Please cite this article in press as: Scott, R. M. Post hoc versus predictive accounts of children's theory of mind: A reply to Ruffman. *Developmental Review* (2014), http://dx.doi.org/10.1016/j.dr.2014.05.001

behavioral pattern or rule that could have generated the infants' responses. However, in any given situation there are many statistical patterns available that could influence infants' responses. This is true even if one assumes that infants are biased to attend to and learn statistical patterns that involve agent–object relations. Ruffman offers no *a priori* explanation for why infants' responses in a particular situation would be guided by one statistical pattern over another. As a result, Ruffman's account neither generates specific predictions about how infants will respond in novel situations (rendering the account unfalsifiable), nor does it offer a coherent explanation for the results from prior infant false-belief tasks.

To illustrate, consider the findings of Experiment 1 in Scott and Baillargeon (2009). This experiment involved two toy penguins that were identical except that one could come apart (2-piece penguin) and one could not (1-piece penguin). In each familiarization trial, while a female agent watched, an experimenter's hands placed the 1-piece penguin and the two pieces of the disassembled 2-piece penguin on platforms or in shallow containers. The agent then placed a key in the bottom piece of the 2-piece penguin and stacked the two pieces; the two penguins were then indistinguishable. During the test trials of the false-belief condition, the agent was initially absent. The experimenter assembled the 2-piece penguin, covered it with a transparent cover, and then covered the 1-piece penguin with an opaque cover. The agent then returned with her key and reached for one of the two covers. Infants looked reliably longer when the agent reached for the transparent cover. This suggests that they expected her to falsely assume that the penguin under the transparent cover was the 1-piece penguin, and hence have a false belief that the disassembled 2-piece penguin was under the opaque cover. In the true-belief condition, the agent was present throughout the test trials; in this case, infants looked longer when the agent reached for the opaque cover, suggesting they expected her to reach for the transparent cover because she had just seen the 2-piece penguin hidden there.

Ruffman (in press) argues that infants could succeed in this task by reasoning solely about the agent's behavior rather than her mental states. He claims that in the true-belief condition, infants expected the agent to reach for the transparent cover because (1) she had always reached for the 2-piece penguin before and (2) she had perceptual access when the experimenter placed the 2-piece penguin under the transparent cover. For the false-belief condition, he states that infants looked longer when the agent reached for the transparent cover because (1) the penguin under the cover was an "intact" penguin and (2) the infants had never seen the agent reach for an intact penguin before so (3) they looked longer in order to encode this novel agent–object relation. Infants in this condition looked less when the agent reached for the opaque cover because she reached away from the intact penguin, as she had done in the past.

Ruffman thus invokes two statistical patterns to explain infants' responses: (1) the agent had always reached for a 2-piece penguin and (2) the agent had never reached towards a 1-piece or intact penguin. While infants could have learned both of these statistical patterns over the course of the experiment, they could have learned others as well. For instance, the agent always reached for a visible penguin. Detecting this pattern would have lead infants in both conditions to expect the agent to reach for the transparent cover in the test trial. Similarly, infants likely learned that the agent always reached for a penguin of some kind, and that she never reached for the various platforms and containers that the penguins rested on during the familiarization trials. This pattern should have led infants in both conditions to look longer when the agent reached for the opaque cover rather than the visible penguin, as this novel agent–object relation was inconsistent with those they had observed in the past. If the infants were responding to statistical patterns in the agent's behavior, it is unclear why the infants' responses were not influenced by these other statistical patterns that consistently occurred during the experiment.

Even if one assumes that infants only learned the two statistical patterns that Ruffman appeals to in his explanations, it is unclear why infants should respond to *different* statistical patterns in the two conditions. The final displays of each event were visually identical across conditions, and thus any response that was based on the perceptual properties of the display should have occurred in both conditions. If infants needed to encode a novel agent–object relation when the agent reached towards an intact penguin, then this should have been true in both conditions. Yet when the agent witnessed the hiding event, infants did not exhibit increased attention when she reached for the transparent cover.

Please cite this article in press as: Scott, R. M. Post hoc versus predictive accounts of children's theory of mind: A reply to Ruffman. *Developmental Review* (2014), http://dx.doi.org/10.1016/j.dr.2014.05.001