

Weekly Summary – Part A

Name: *****

Article: Scott, R. M., & Baillargeon, R. (2009). Which penguin is this? Attributing false beliefs about object identity at 18 months. *Child development*, 80(4), 1172-1196.

a) Review of the main points of the paper (2-3 sentences):

Scott and Baillargeon (2009) expanded previous theory of mind research by investigating whether 18 month olds can attribute false beliefs to the identity of objects. They suggest that theory of mind development breaks down into two subsystems: SS1 provides infants the ability to understand goals and motivation, whereas SS2 is involved in understanding another's beliefs and internal states. By 2 years of age, infants demonstrated recruitment of SS2 in their understanding of an agent's false belief that they are facing a one piece toy rather than a two piece toy.

b) Two strengths of the research (and explain why):

1) I liked that the authors included previous research involving neuroimaging into their framework. Associating the ACC and PFC, and particularly the TPJ-R, with SS2 strengthened their argument by providing neurological evidence for separate cognitive capacities such as SS1 and SS2. Furthermore, it provides possibilities for future research as to what brain regions are involved in individuals with theory of mind deficits, whether these brain regions become more active over time as thus correlate with improvements in theory of mind, etc.

2) I liked that the authors addressed an alternative explanation for their results, the idea that ignorance leads to error. This error interpretation suggests that the SS1 alone could explain the infant's responses, such that the infant was expecting the agent to look in the wrong location rather than a location based on their false-belief. This allows for future research to expand on their findings and eliminate any alternative explanations for why 15 month olds are demonstrating an apparent false-belief.

c) Two weaknesses of the research (and explain why):

1) I didn't like that the authors only considered theory of mind acquisition in terms of developmental continuity, focusing on the idea that SS2 gradually coming online in later development to work alongside SS1. This left me wondering whether or not their results could be explained by theory of mind developing discontinuously. Rather than there being two processes that each develop continuously, what if conceptual change processes reorganize SS1 into SS2 around 1.5-2 years of age?

2) I didn't like that the authors included the psychological-reasoning system based account in their theory but did not fully explain some of its characteristics. For example, they state that when pursuing a goal, agents are expected to select causally appropriate and reasonably efficient actions, but they do not further explain what these might be. They also state that this framework is not restricted to human agents, a claim that doesn't further strengthen their argument as it is not applicable to their exact methods. I wonder if there is a better suited theoretical framework for their methods or if this one just needs to be explained more fully.

d) One quiz question that you might pose to your classmates with the correct answer:

Q: What is the mechanism that is used to represent an agent's false beliefs?

A: A decoupling mechanism, present in SS2, allows infants to hold in mind two distinct versions of a scene: one that corresponds to reality (where the ball really is), and one that incorporates the agent's false or pretend beliefs (where the agent believes the ball to be).

e) One research question to pursue in the future (and explain why):

What brain regions are recruited when children with autism perform theory of mind tasks? If the ACC, PFC, and TPJ-R are recruited when typically developing children perform these tasks, do children with autism use the same brain regions to a different extent? Or do they use completely different brain regions all together? This research may contribute to understanding autism spectrum disorder, as well as theory of mind impairments. Obvious limitations involve use of fMRI and children with autism, and a carefully constructed research plan would need to be put in place to make this possible.

Weekly Summary – Part B

Name: *****

Article: Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand falsebeliefs? *Science*, 308(5719), 255-258.

Question 1: The authors suggest that theory of mind is broken down into two parts, a nonrepresentational and a representational component. They further suggest that the latter part may develop earlier than expected. Is it possible that the development of theory of mind is not a qualitative shift from a rudimentary belief concept to a fully developed belief concept at a specific age? Could it be possible that the development of theory of mind is continuous, thus present in infants younger than three years of age but not fully developed, and reaches its full strength at four years of age?

Question 2: Onishi and Baillargeon (2005) state that “the results make clear the infants did not simply become confused when the actor held a false belief and expected her to repeat whatever action she had last performed”. This statement has no further explanation, and I am confused as to how their results eliminate this possibility. What indicated that the infants were not expecting the actor to just repeat their previous action? Is it not more parsimonious to assume that the infants expected the actor to reach for the location they were familiarized too, rather than assuming the infant was reasoning about false-beliefs?

Question 3: Onishi and Baillargeon (2005) suggest that performing nonverbal theory of mind tasks with children with autism and nonhuman primates may reveal that both of these groups perform better on theory of mind tasks. What about deaf children, who also show poor performance on theory of mind tasks? Would replicating this study to this population also reveal that removing linguistic demands improves their performance?

Article: Perner, J., & Ruffman, T. (2005). Infants’ insight into the mind: How deep? *Science*, 308(5719), 214-216.

Question 1: What do Perner and Ruffman (2005) mean when they say “false belief at 4 years of age suggests that this ability may be constructed in a cultural process tied to language acquisition, but competence at 15 months suggests that this ability is part of our purely biological inheritance.” I am confused as to why they make this sharp contrast. Is it not possible that theory of mind acquisition at age four is still rooted in biology and evolution? Can competence at 15 months still be indicative of cultural language acquisition, as demonstrated by Daheane et al.’s (2002) fMRI study of language-related brain activity in 3 month olds? If theory of mind in 15 month olds is evidence for biological underpinnings as they claim, why is it that animal studies of nonhuman primates have not shown primates are capable of theory of mind?

Question 2: Is eye gaze truly indicative of understanding false beliefs? When an infant looks longer at a particular event, does that mean they are surprised it occurred or simply because it is a new event? How can we be sure that looking time demonstrates an infant’s understanding of mental states, and not simply curiosity for something they have never seen before? The authors state that “three-year olds look to the correct, initial location when anticipating Max’s return, even when they explicitly make the incorrect claim that Max will go to the second location, this early indication is implicit because children at this age show no knowledge of this earlier understanding.” Is it possible that this initial eye gaze is simply the child reconfirming that the toy is not in its original location, thus further solidifying their decision to pick the new location? Why should we assume that a child’s looking pattern is implicit knowledge about false beliefs?

Question 3: Since Perner and Ruffman (2005) propose that linguistic and pragmatic constraints on theory of mind tasks are responsible for poor performance in children under age four, does language acquisition contribute to the development of theory of mind? Children with autism show deficits in theory of mind as well as language and communication skills, so is it possible that other groups of individuals with language deficits will also show impaired belief concepts? What about children with Williams syndrome, who have exceptional language skills, is their theory of mind capacity also more advanced? Is language the reason that nonhuman primates cannot demonstrate theory of mind the same way humans can?

Article: Southgate, V., Senju, A., & Csibra, G. (2007). Action anticipation through attribution of false belief by 2-year-olds. *Psychological Science*, 18(7), 587-592.

Question 1: Southgate et al. (2007) chose to have the actor wear a visor to prevent the infants from trying to use gaze as a cue to where she would search, therefore the infants' responses were believed to be based only on their belief of what the actor would do. However, can't gaze be considered an aspect of theory of mind? In the Charlie Task, autistic children can correctly answer which candy Charlie is looking at, but fail to associate this looking pattern with the belief that Charlie wants the candy they are looking at. Understanding gaze then, may be a part of understanding and reasoning about one's beliefs. How would removing the visor from the actor and using gaze as a variable in the experiment change results? Would infants perform better or worse?

Question 2: Southgate et al. (2007) consider removing the ball from location B to be a control condition, such that infants who gazed in anticipation at location A expected the actor to act on their false-belief. How can we confidently attribute this behaviour to an understanding of false-belief? Since infants looked longer at location A, is it possible that they were surprised the agent looked there, rather than anticipating the agent was going to look there? Could the infant still be remembering the last location of the ball, and are thus looking more at location A because it is an incongruent event, and they actually expected the agent to look at the location the ball was last at?

Question 3: What do Southgate and colleagues mean when they say, "when attributing ignorance to an agent, young children expect the person to get the answer wrong, rather than perform at chance". If the infant is assuming the actor doesn't know where the ball is, why would they assume they would always get it wrong? If they are attributing ignorance to the agent, they should have no expectations of their behaviour because this would signal a theory of mind. Expecting them to get it wrong is still demonstrating that they are reasoning about the agent's beliefs. Shouldn't infants be unsurprised if the agent gets the task right or wrong based on ignorance, simply because they are picking one of the two randomly, not based on their beliefs of where the ball should be?

Article: Scott, R. M., & Baillargeon, R. (2009). Which penguin is this? Attributing false beliefs about object identity at 18 months. *Child development*, 80(4), 1172-1196.

Question 1: What do the authors mean by "the principle of rationality: when pursuing a goal, agents are expected to select actions that are not only causally appropriate but also reasonably efficient?" What is an example of a causally appropriate versus causally inappropriate action? What deems an action reasonably efficient, and how are they using efficient compared to inefficient in this context?

Question 2: What do the authors mean when they say "In spontaneous-response tasks, the SS2 false-belief-representation process is activated when children realize that the agent holds a false belief; the children often spontaneously reveal their understanding of this false belief in their reactions to the unfolding events". What do they mean by they spontaneously reveal their understanding? What reactions do the infants show that demonstrates they have a belief concept?

Question 3: Scott and Baillargeon (2009) state that the ACC and PFC are active in the internal selection of actions. These brain regions also play a role in cognitive control and have showed to be protracted in development. If these brain regions are involved in theory of mind tasks, and active in infants, is this evidence that the PFC and ACC are active earlier than anticipated? As stated, the SS2 may already be operational by the 2nd year of life, pointing to the early maturation of at least some of the brain regions associated with SS2. Is it possible that the late maturation of these regions are responsible for better performance on theory of mind tasks as children develop? Could autistic children who perform poorly on these tasks actually be demonstrating deficits in cognitive control, not deficits in theory of mind?

References

Dehaene-Lambertz, G., Dehaene, S., & Hertz-Pannier, L. (2002). Functional neuroimaging of speech perception in infants. *Science*, 298(5600), 2013-2015.