9.85 Cognition in Infancy and Early Childhood

Lecture 11: Recognizing Agents

Discussion: Agents v. objects

- Four groups
- List everything you can think of that distinguishes animate things from inanimate things …
- Now highlight those things on your list that you think you might have access to in the first year of life …
- Pick one of these features and figure out how you could tell if babies were sensitive to it or not.

Discussion: Agents v. objects

- If infants did make those distinctions (e.g., between things that moved by themselves and things that did not)
  - would you be satisfied that they had made a distinction between agents and objects? Why or why not?
  - If infants recognize things that are animate, does it follow that they recognize things that are agents? Why or why not?

Why care about distinguishing agents and objects?

- “P., a music teacher, whose associates have questioned his perception, is referred by his ophthalmologist to the neurologist Oliver Sacks. During the first office visit, Sacks notices that P. faces him with his ears, not his eyes. His gaze seems unnatural, darting and fixating on the doctor's features one at a time. At the end of the interview, at which his wife is present, P. appears to grasp his wife's head and try to lift it off and put it on his own head. "He had . . . mistaken his wife for a hat!" (Sacks, The Man Who Mistook his Wife for a Hat”)

Why care about distinguishing agents from objects?

- "… what we really see are bags of skin stuffed into pieces of cloth and draped over chairs. There are small restless black spots that move at the top of the bags of skin, and a hole underneath that irregularly makes noises. The bags move in unpredictable ways, and sometimes one of them will touch us. The holes change shape, and occasionally salty liquid pours from the two spots." (Gopnik, Scientist in the Crib)

Agents and objects

- Basic ontological distinction.
- One of the first to appear (at least in some forms as we'll discus)
- One of the last to go (Alzheimer's patients distinguish dogs from planes even after they fail to distinguish dogs from cats).
- How do we do it?

What agents and objects share

- Size
- Shape
- Color
- Subject to occlusion, displacement, etc. -- “Spelke” object status.

What might distinguish agents from objects

1. Onset of motion
2. Movement type and trajectory
3. Causal relations
4. Contingent v. non-contingent interactions
5. Intentions, goals and mental states
6. Morphological cues (eyes, faces)

What might distinguish agents from objects

1. **Onset of motion**
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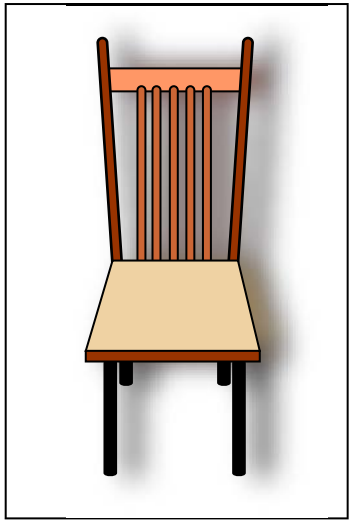
4. **Contingent v. non-contingent interactions**
5. Intentions, goals and mental states
6. Morphological cues (eyes, faces)

1. Onset of motion

- Spontaneous movement = animate agent
- Perceptual triggering (Premack).

Movement onset

- Are infants sensitive to agent/object distinctions in movement onset? No …
- Chair pushes man v. man pushes chair.



Illustrations courtesy of MIT OCW.

- 15-month and 18-month olds were indifferent

1. Movement onset

- Are infants sensitive to distinctions in movement onset? Yes …
- Moving robot v. moving stranger.
- Both strange …
- But 9 and 12-month-old babies were upset by the moving robot and not the moving stranger.

1. Movement onset

- In Michottean launching events

http://pantheon.yale.edu/~bs265/demos/causality.html

  - Object started movement off-screen and launch occurred behind an occluder.
  - 7-month-olds were surprised if there was no-contact behind the occluder for objects.
  - But not people.

1. Movement onset

- Infants do seem to expect that people can move by themselves
- Not clear if they extend this to all agents (cats, birds, etc.)
- And self-initiated movement does not seem to be a **sufficient** reason for babies to treat an object as an agent.

1. Movement onset

Figure removed due to copyright restrictions. Please see:
Fig 3. in Johnson, S. C. "Detecting agents."
Philos Trans R Soc Lond B Biol Sci. 358, no. 1431
(March 29, 2003): 549-59.

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Fig 1. in Johnson, S. C. "Detecting agents."
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2. Movement type and trajectory

- Babies are sensitive to characteristics of biological motion and distinguish biological from non-biological motion.
- 3-month-old babies prefer to look at walking movements to incoherent movements.
- And distinguish a right-side-walker and an upside-down walker (Bertenthal)
- http://www.michaelbach.de/ot/mot_biomot/index.html
- http://www.ccp.uchicago.edu/~bbertent/palab/images/invertedPointLight.mpeg

2. Movement type and trajectory

- Moreover, 3-month-olds distinguish a right-side-up walker form an upside-down walker and from a random display.
- 5 and 7-month-olds made no distinction between upside-down and random.

2. Movement type and trajectory

- Suggests that by 5-months, babies prior knowledge about biomechanical movements affects their interpretation of the display.
- Research on adults suggests that we are very sensitive to nuances of biomechanical movement …walking, dancing, sit-ups and …
- http://www.ccp.uchicago.edu/~bbertent/palab/images/invertedPointLight.mpeg

2. Movement type and trajectory

- Movement trajectory …
- Objects (with a few recent exceptions -- smart vacuum cleaners, smart missiles) don’t adapt to their environment.
- Infants might distinguish animates from inanimates on the basis of
  - Changes in trajectory
  - Sudden starts and stops
  - Adjusting to barriers

2. Movement type and trajectory

- http://cogweb.ucla.edu/Discourse/Narrative/heider-simmel-demo.swf (Heider & Simmel)
- What do you see?
- “Perceptual animacy”
- Do babies have it?

2. Movement type and trajectory

- http://www.cbcd.bbk.ac.uk/research/object-perception/jump/ Gergeley Csibra

2. Movement type and trajectory

- Rich interpretation:
- Babies understand that the red ball **wants** to go to the blue ball. Babies understand that the red ball will take the shortest path to its **goal**.

2. Movement type and trajectory

- Weak interpretation:
- Babies understand a relationship between actions, obstacles and end states.
- They expect that actions will move towards end-states and will avoid obstacles.
- (In control, “taught” the babies that these assumpions were violated.)

2. Movement type and trajectory

- Factors affecting perception of animacy
  - A = symmetric circle changes direction and speed.
  - B= rectangle changes direction, speed and orientation.
  - C= rectangle changes direction and speed but not orientation.

2. Movement type and trajectory

- Factors affecting perception of animacy
  - A = symmetric circle changes direction and speed.
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3. Causal relations

- Two perceptual “illusions” available to infants.
- Perceptual causality
- Perceptual animacy

3. Causal relations

- How do we know babies perceive causality?

Figure removed due to copyright restrictions. Please see:
Leslie A. M., and S. Keeble. "Do six-month-old infants perceive causality?" *Cognition* 25, no. 3 (April 1987): 265-88.

3. Causal relations

- As discussed in role of self-generated movement …
  - Babies expect objects to contact each other in launching paradigm
  - But do not expect that of people.

3. Causal relations

- Additionally, babies will treat actions that look (to adults) like psychological action-at-a-distance as causal.
  - Red square moved (non-rigidly, like a caterpillar) towards a green square -- and stopped before it hit the green square.
  - Green square either moved before the red square stopped (reaction) or after (pause).
  - 9-month-olds dishabituated to a reversal of the reaction event but not the pause event.

3. Causal relations

- If babies don’t think objects can move themselves …
- Do they infer the presence of an agent when they see an object move spontaneously?

3. Causal relations

- 12-month-old babies expected the hand to emerge from the far side of the wall; looked longer to near-side.
- But were indifferent to the train.

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3. Causal relations

- And if an “agent” jumped over the wall babies no longer had an expectation about where the hand would come from.

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Fig 1 e in Saxe R, J. B. Tenenbaum, and S. Carey. "Secret agents: inferences about hidden causes by 10- and 12-month-old infants." *Psychol Sci* 16, no. 12 (December 2005): 995-1001.