

CHILD



Development

John Gabrieli - 9.00



Neotony

- **baby faces are appealing – round head, forehead protruding forward rather than sloping back, large eyes, small jawbone**



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Neotony

- “baby-faced” adults perceived as more naïve, honest, helpless, kind, warm, and also more likely to be found innocent in cases of intentional wrongdoing (no difference for negligence), less likely to receive votes



Photo of Leonardo DiCaprio courtesy of [Ninah Morandini](#) on Flickr.



Photo of Brad Pitt courtesy of [ewanjudocolinchristian](#) on Flickr. CC-BY.

Nature/Nurture

- **Nature/Nativism/Rationalism**
- **some knowledge is innate (Plato, Descartes, Kant)**
- **Nurture/Empiricism**
- **“Nothing is in the intellect which was not first in the senses.” (Aristotle, & Locke, Berkeley)**

Nature/Nurture

- **babies appear to be "blank slates"**
- **"Give me a dozen healthy infants, well formed and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select - doctor, lawyer, artist, merchant-chief and yes, even beggerman and thief..."**
- ***Watson, 1878-1958, Behaviorism***



Imitation in neonates. In a remarkable study, investigators sat face-to-face with infants just a few days old. When the investigators stuck out their tongues, the infants did the same. When the investigators opened their mouths wide, or pursed their lips, the infants did too. The capacity for imitation, it seems, is in place even for very young babies!

READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

- **if infants prefer to look at one thing more than another**
- **preference**
- **discrimination**

READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

- **habituation/familiarization**
- **infant exposed to stimulus until looking time drops 50% or some preset criterion - change stimulus, look for recovery of interest**

READING A BABY'S MIND: LOOKING TIME (PREFERENCE)

what happens when stimulus is changed?



old



new

Photos courtesy of [Chris Nixon](#) on Flickr.

Infant Explorers (18-24 months)

- ***infants look selectively at novel objects***
 - * **investigate what is to be learned**
 - **even at 1 day for two checkerboards with different sizes squares from trial to trial (secs)**

Infant Explorers (18-24 months)

- ***infants seek to control their environment***
 - * **20-month olds prefer mobile that responds to their bodily movements than motor-driven**
 - * **2-month olds – learned to start/stop video of *Sesame Street* by pulling string tied to wrist – showed facial expression of anger when device was disconnected – 4-and 5-month olds remained angry/sad even when video came on as often but without their control (they like the control over the video)**

Infant Explorers (18-24 months)

- ***infants explore increasingly with hands and eyes together***
 - * first 3-4 months, explore with mouths
 - * by 5-6 months, explore with hands and eyes
- ***infants use social cues to guide exploration***
 - * 6-month olds roll or pound ball depending on what mother did
 - * follow eyes of person (joint attention), but not if eyes are closed, covered (not head direction)
 - * helps to learn language – infants who follow gaze better learn language faster
 - * 12-month olds will cross visual cliff if mother smiles, not if mother has fearful expression, avoid new toy if mother exhibits disgust, otherwise played with it

Jean Piaget

At the beginning there was chaos....

Jean Piaget (1896-1980) offered
a theory that tried to reconcile Nativism &
Empiricism

a frame-work for
understanding & charting child development

Jean Piaget

- **child prodigy**
- **trained in biology (mollusks)**
- **early concern whether categories were “out there” or in the mind**
- **brief flirtation with poetry**
- **worked with Binet on intelligence testing**
- **became more interested in patterns of errors than successes**

Jean Piaget

- ***Assimilation***

incorporate new knowledge into existing cognitive structure

- ***Adaptation***

change cognitive structures to accommodate new evidence

Piagetian Stages

| <i>Stage</i> | <i>Age</i> | <i>Mental Life</i> |
|---------------------------|-------------------|--|
| Sensorimotor | 0-2 | perception & physical actions |
| Pre-Operational | 2-7 | egocentric perspective; early symbolic language; poor differentiation of fantasy and reality |
| Concrete | 7-11 | organized logical thought, concrete but not abstract problem solving |
| Formal Operational | 11-adult | less concrete thinking, generate and test multiple hypotheses, consider physically impossible hypotheticals |
| Adult | adult | no new cognitive skills, knowledge gains |

Piaget Stages

Sensorimotor (birth - 2 years)

- **fleeting, disconnected sensory impressions & motor reactions - intelligence centered on action; thought = action**
- **no distinction between stable objects & transient events, no distinction between “me” and “not me”**
- **stage ends with beginning of abstract representations, symbolic thought**



Photo courtesy of [paul goyette](#) on Flickr.

Sensorimotor Object Permanence

- **18-24 months, beginning of abstract, representational thought - respond to mental representation of object, not the percept of the object**

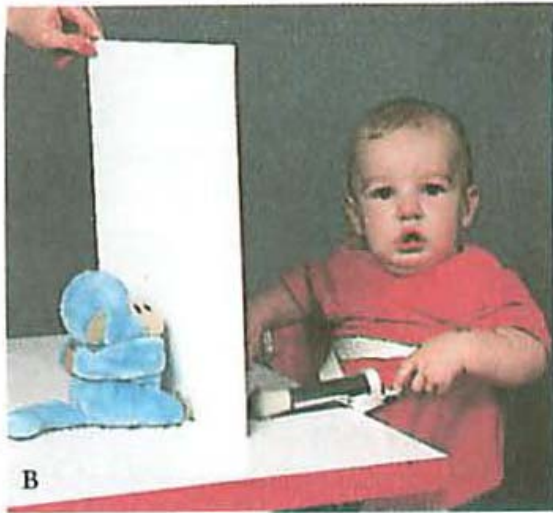
Sensorimotor Object Permanence

- see rattle - rattle there - look away or occlude, rattle no longer exists - “out of sight, out of existence” - not aware that an object exists independent of our sensorimotor interaction with that object
- until 8 months, infant does not search for hidden toy - starts to around 8 months
- hide toy under blanket (location A), child searches there - do that several times - slowly, in view of child, place toy under other blanket (location B) - child still searches under location A - “*A-not-B effect*” - not searching for “toy”, but rather for the “toy-that-I-find-on-the-right”
- appearance vs. principles (ideas)



Photo courtesy of [Zsoltika](#) on Flickr. CC-BY-NC-SA.

OBJECT PERMANENCE



Object permanence (A) A six-month-old looks intently at a toy. (B) But when the toy is hidden from view, the infant does not search for it.

According to Piaget, this is because the infant does not as yet have the concept of object permanence.

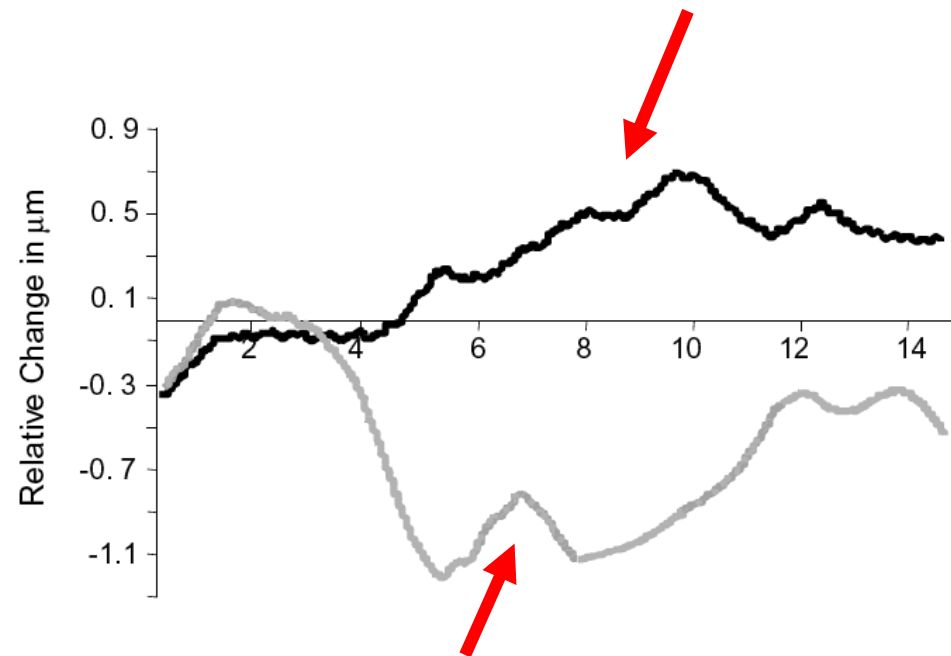
Sensorimotor Object permanence

Object permanence & Frontal Lobe maturation

functional Near Infrared Spectroscopy (Baird et al.)

Blood flow to frontal lobe
when child reaches for hidden object

Object permanence achieved



Blood flow to frontal lobe
when child fails to reach for hidden object
before object permanence

Object Permanence 2

Video “Object Permanence 2” removed due to copyright restrictions.

Infant Development

What do infants know about events & objects?

Renee Baillergon's Magical Events

Method: Preferential looking

Long looking time =
infant perceives “novelty”

Piaget Stages

Preoperational (2-7)

Capabilities

pretend play

symbolic representations

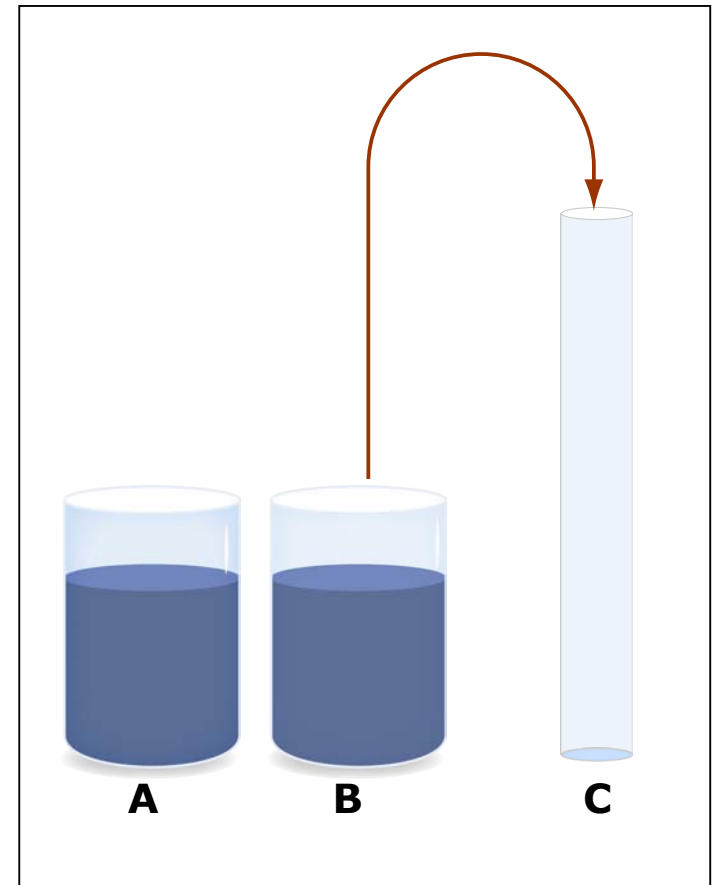
imitation

Limitations

representing operations that respect logical transformations (perspective taking, part-whole relations, conservation, causal relations)

Preoperational Stage Conservation of Liquid Quantity

Which glass has more water?



Conservacoes

Video “Piaget – Conservacoes” removed due to copyright restrictions.

CONSERVATION OF LIQUID QUANTITY



Conservation of liquid quantity. (A) A child is asked by the experimenter, “Do we both have the same amount of juice to drink?” the child says yes. (B) The experimenter pours the juice from one of the beakers into a new, wider beaker. When now asked, “Which glass has more juice?” the child points to the thinner one.



CONSERVATION OF MASS & NUMBER



Conservation of mass: Preschoolers also fail to conserve mass. This child is shown two clay balls which he adjusts until he is satisfied that there is the same amount of clay in both. The experimenter takes one of the balls and rolls it into a “hot dog.” When now asked which has more clay, the child points to the hot dog.



Conservation of number: When the two rows of coins are evenly spaced, the child correctly says that both rows contain the same number of coins. When one row is spaced more widely, the child says that it has more coins.

Preoperational Stage

Taking Perspectives

- difficulty taking another person's perspective
- think their thoughts and perceptions are transparent to others

Beyond Piaget

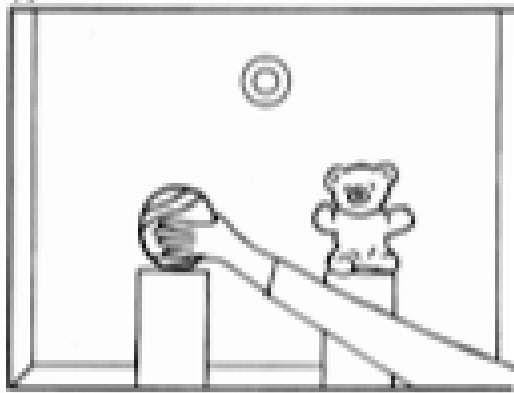
Theory of Mind

Ability to understand another person's mental state
(another person's beliefs, desires, feelings)

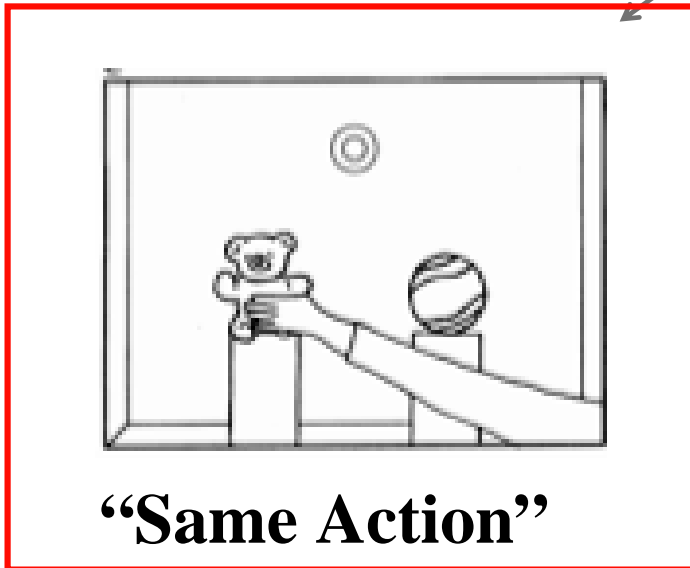
Intro to Theory of Mind

Body Motions -> Reaching actions at 6 months (versus 3 months)

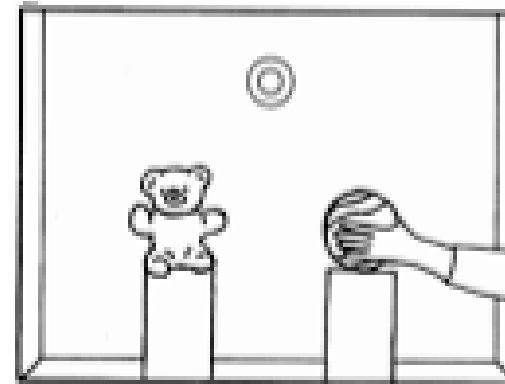
“Habituatation”



“Test”



“Same Action”



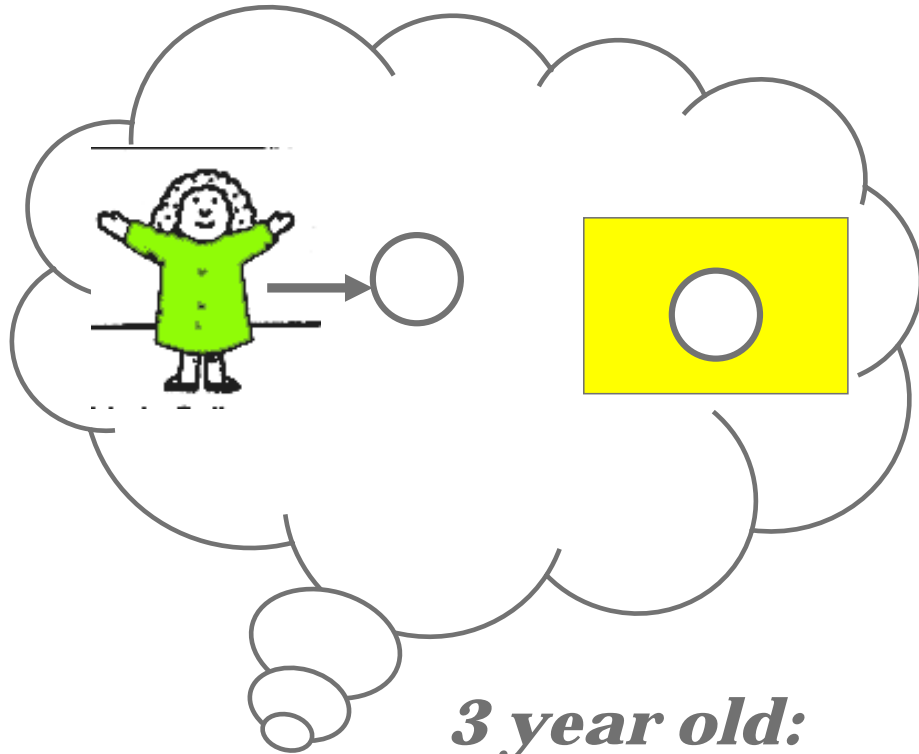
“Same Object”

6- & 9-month olds look longer - *intentions*

3-month olds look longer - *actions*

Intro to Theory of Mind

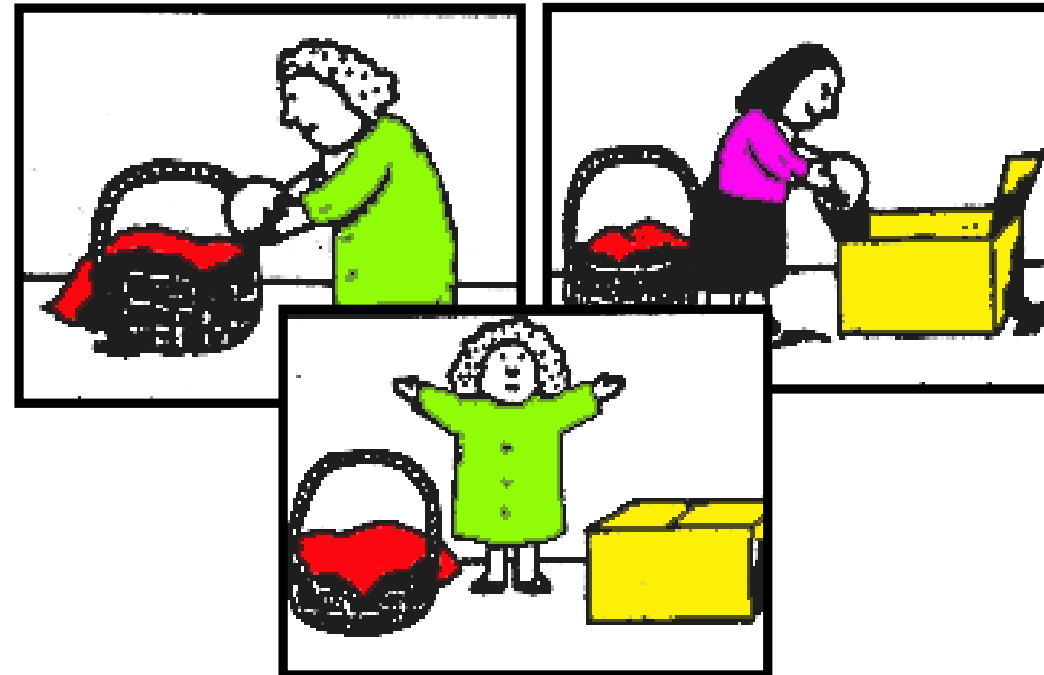
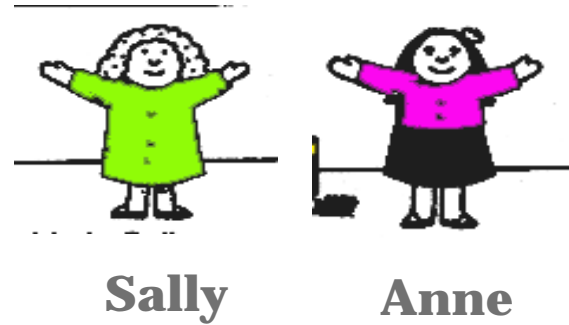
Action prediction based on false belief is *different* from the prediction based on reality.



3 year old:
“In the box.”

**Where will Sally
look for her ball?**

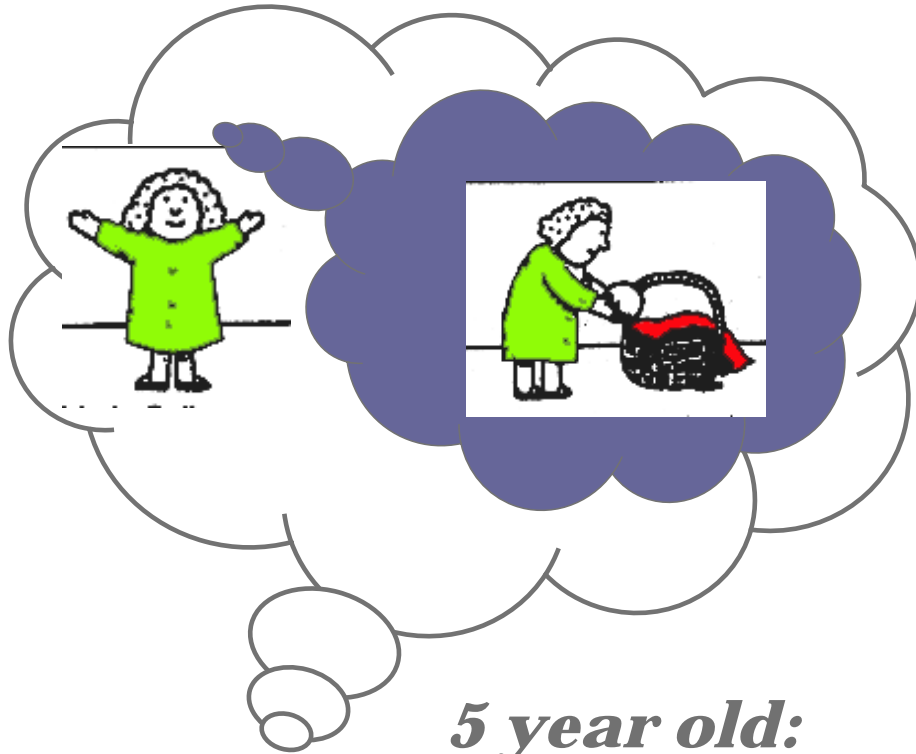
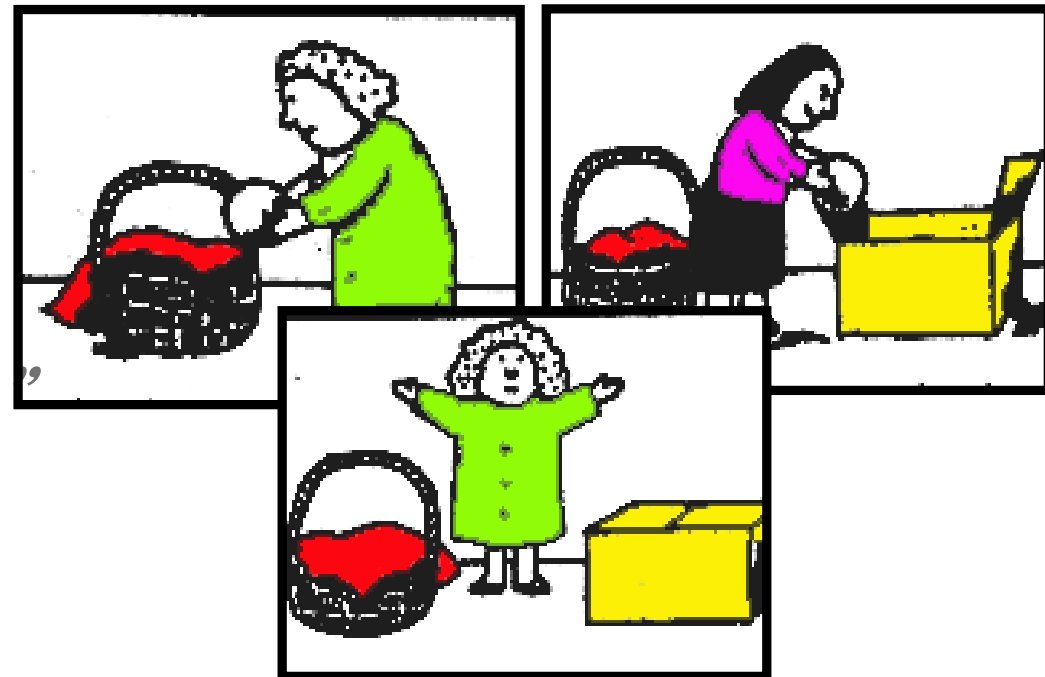
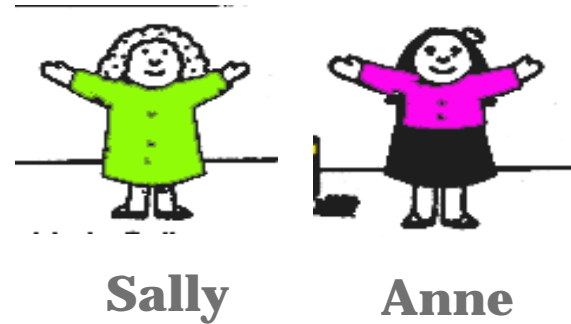
The Sally-Anne problem



Intro to Theory of Mind

Action prediction based on false belief is *different* from the prediction based on reality.

The Sally-Anne problem



Where will Sally look for her ball?

Autism



Social Interaction

Repetitive Behaviors

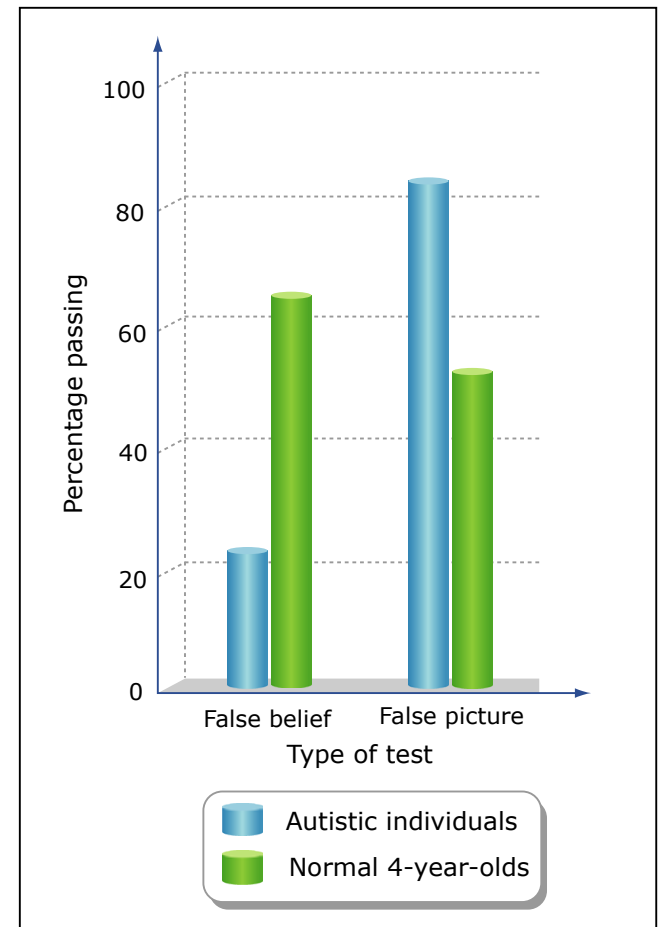
Communication

Prevalence: 1/140

Male/female ratio 4:1-10:1

Autism: Theory of Mind Deficit

- typical 4 year olds
- IQ matched 6-12 year olds with autism
- false picture control
(photo of object in a location, object moved, still in picture?)



Mental Flexibility & Theory of Mind

Video “A Change of Mind,” Scientific American
Frontiers: Developmental Psychology
removed due to copyright restrictions.

Concrete & Formal Operational

Concrete operations (7-11)

logical operations with concrete entities (water)

no so much abstract

8-9 year olds - 4 is even, $4+1$ is odd, but not

broader abstraction that $\text{even} + 1 = \text{odd}$

Formal operations (12 on ...)

logical operations with abstract entities

hypothetical, deductive reasoning, propositional thinking

Criticism of Piaget

Stage-like versus continuous development

Age

Children achieve many of the stages set by Piaget earlier (including object permanence)



A



B

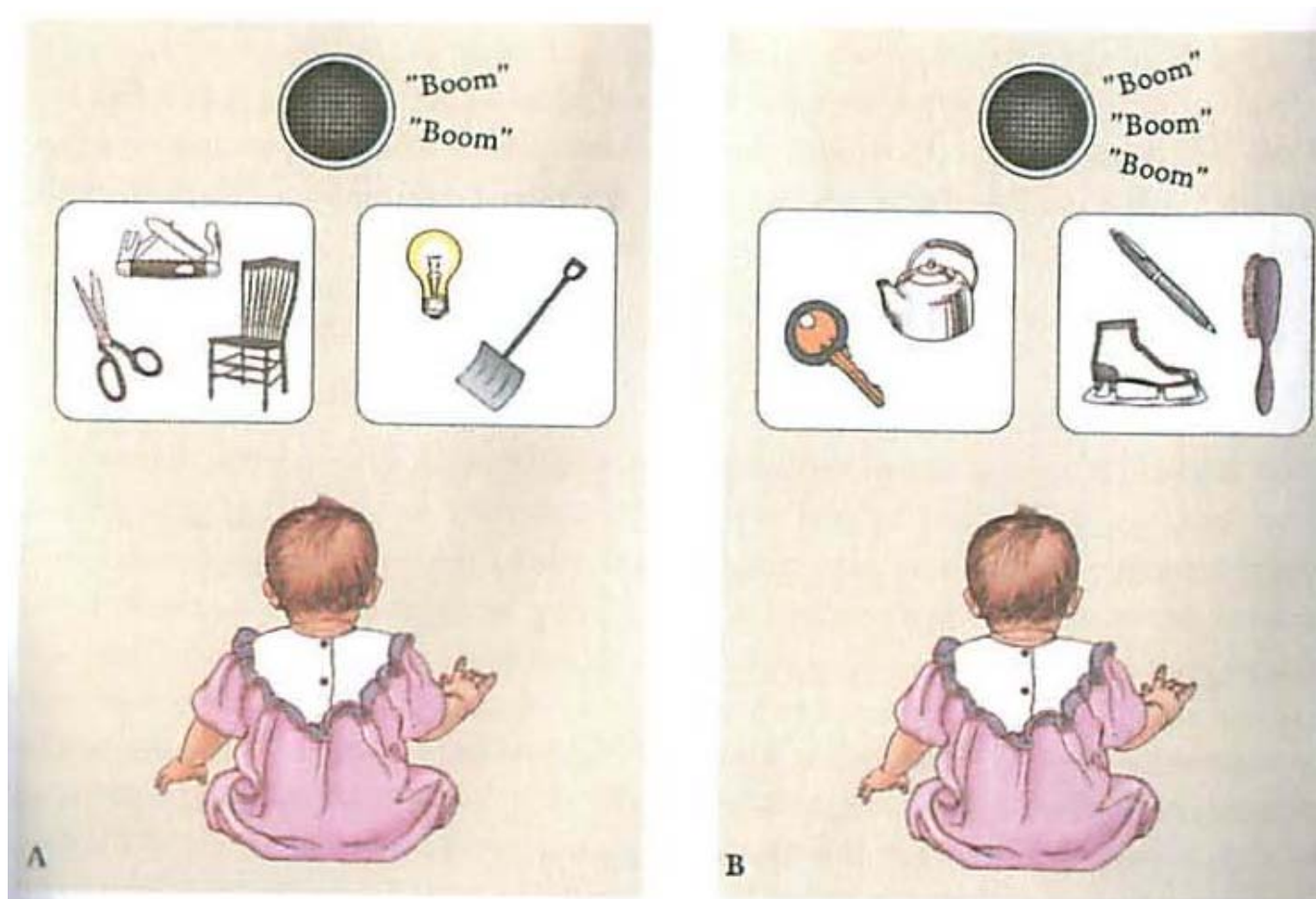


C

Well B

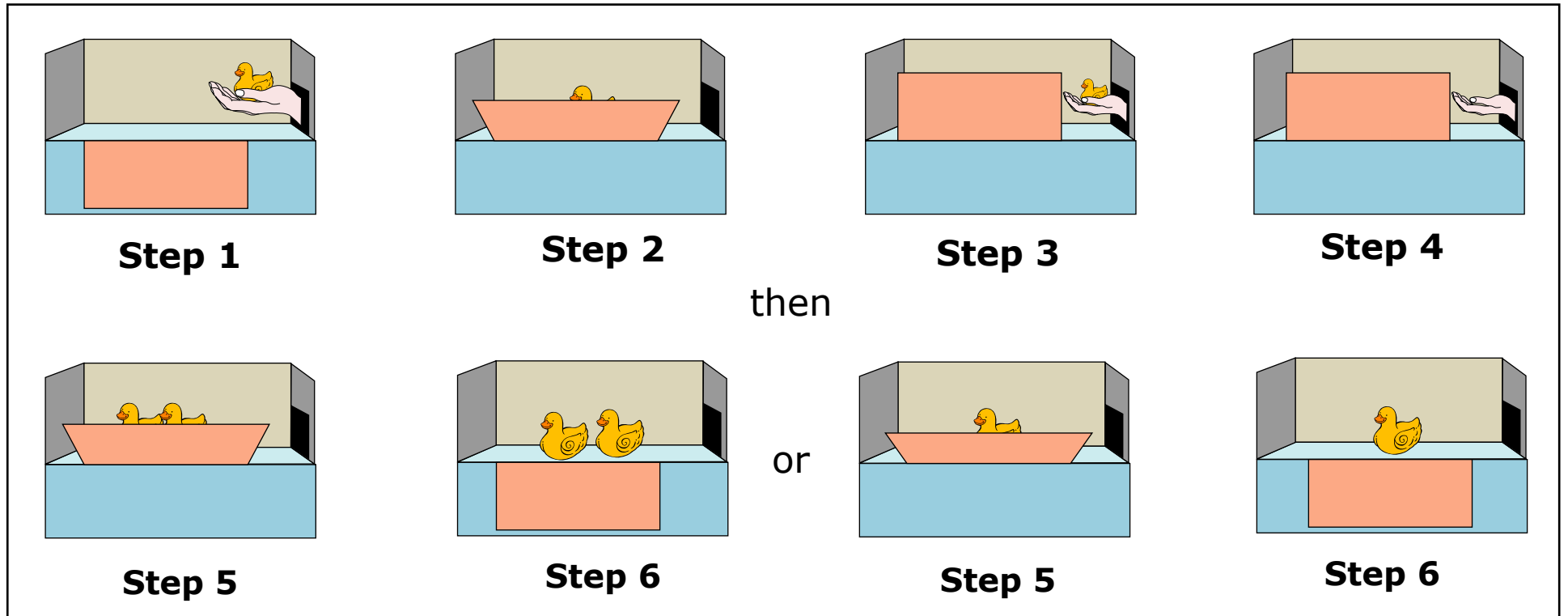
Well A

A dissociation between what the infant knows and what the infant does. (A) A seven-month-old looks at a toy that has just been placed in B, one of the two wells. (B) He continues to look at well B after both wells are covered. (C) When finally allowed to reach for the toy, he uncovers well A, in which he found the toy on a previous trial, rather than well B, in which he saw the toy being placed. In this particular sequence, he actually still looks at B while uncovering A, suggesting a dissociation between what the infant knows and what he does.



Some rudiments of number in six-month-olds. Six-month-olds were shown two panels that contained either two or three simple objects. Concurrently, a drum was sounded over a loudspeaker, producing rhythmic booms either in twos ("boom, boom") or in threes ("boom, boom, boom"). (A) When the drum was sounded "boom, boom," the baby looked at the panel that contained two items. (B) When the drum sounded "boom, boom, boom," the baby looked at the panel that contained three items. This result suggests that the baby has some rudimentary concept of twoness and threeness, a concept that holds whether the items "counted" are visual objects or sounds

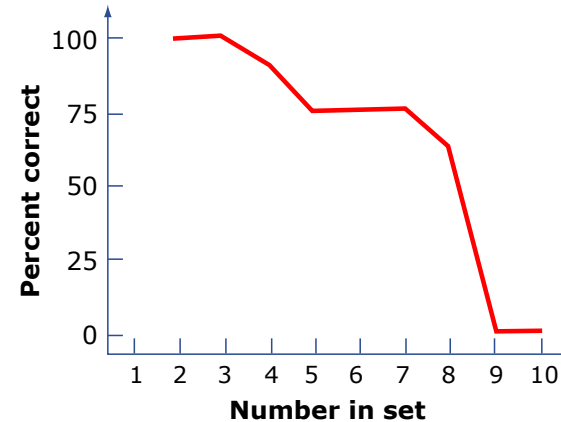
Infants Performing Addition and Subtraction



Counting: Innate or Cultural ?



(a)



Counting abilities seem to be determined in part by culture. Members of the Pirahã tribe were asked to perform a counting task. While they showed high levels of accuracy with one or two items, their success rates fell drastically after three items, and could not count more than nine items.

Image by MIT OpenCourseWare.

***One, two, many* may be innate**
Differentiating *many* may be cultural

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