9.85 Cognition in Infancy and Early Childhood

Finish Methods -- Perception
Today

• Questions --
  – Meltzoff and Borton: What is cross-modal integration and what does it tell us about what the world is like for a baby?
  – Yellow: What is perceptual tuning and why is it important?

• Upcoming deadlines -- critical response due in class next session

• 2-page proposal due in class session 9

• Finish methods -- Perception
“What’s it like to be a baby?”

• Babies as Martians
  – Big heads
  – Big eyes
  – Take over our lives

• “Blooming, buzzing confusion”? 
Smell

(Borrowed slide -- psych.mcmaster.ca/2e03/PerceptualDevelopmentI.ppt)

Figure removed due to copyright restrictions.
Figure 1 Representative examples of facial expressions of awake newborns exposed to 10 s anise odor stimuli. Schaal, Benoist, Luc Marlier, and Robert Soussignan. "Human Foetuses Learn Odours from their Pregnant Mother’s Diet." Chemical Senses 25, no. 6 (2000): 729-37.
Taste: Steiner, Glaser, Hawilo & Berridge (2001)
Borrowed slide -- psych.mcmaster.ca/2e03/PerceptualDevelopmentI.ppt

New World Monkey: Up - Down Protrusion to Sweet Vs. Bitter
- G.-H. Tamarin infant
- C.-T. Tamarin infant
- W.-T.-E. Marmoset

Tongue Protrusion
- Infant Hominoid Tongue Protrusions to Sweet
- Orangutan infant
- Human newborn

Sweet (Up)
- Up Sweet
- Down Bitter

Bitter (Down)
- Up Sweet
- Down Bitter

Gape (to Bitter)
- Orangutan infant
- Human newborn
- Rhesus monkey

Middle Face (Aversion to Bitter)
- Orangutan
- Chimpanzee
- Grimace

‘Smile’ (to Sweet)
- Human newborn

Eye squinch & Nose wrinkle

Touch/Smell/Taste

• Tactile stimuli
  – Neonates and pain?
  – Anesthesia in infancy (Anand & Hickey, 1992)

• Sugar and pain
  – facial expressions, much less
  – EEG and spinal cord responses (Sept, 2010, Lancet) identical
Smell

- At five days will turn towards a pad soaked with breast milk.
- At eight days will selectively turn towards mother as opposed to another mom.
Hearing

- Newborns recognize their mother’s voice -- suck at a rate that will permit hearing mother’s voice over alternative.
- Neonatal audition -- Cat in the Hat study (Casper and DeSpence, 1986).
- Recognition even when story read by a stranger.
- Can hear voices at 25 weeks in utero
Hearing

• Preference for
  – the human voice over other sounds of similar pitch and intensity
  – for sounds within the human voice range to sounds outside the human voice range
  – for female voices over male voices
  – (partially because prefer and can hear higher frequency sounds)
  – their own language vs. other languages
  – infant-directed over adult-directed speech
  – your hearing?
Serbo-Croatian language phonology

Table removed due to copyright restrictions.

See: http://en.wikipedia.org/wiki/Serbo-Croatian_language#Phonology
Hearing

• Until approximately 8-months of age, infants can hear phonemic distinctions in other languages not present in their own.
• Although acoustic signal is continuous, phonemic distinctions are categorical.
• Brief exposure “keeps the window open” for babies (but only if it’s interactive). Perceptual tuning.
• Also by 9-months prefer “possible” nonsense words in their own language (zw and vl are legal in Dutch not English; English-speaking babies prefer English words).
Hearing

• Infants also develop a sensitivity to prosody -- English-speaking 9-month-olds (but not 6-month-olds) have a preference for **strong**/weak accents (**baby, mommy**) over weak/strong on novel words.

• Shows up in music preferences too (Western adults cannot distinguish changes in nonisochronous Balkan rhythms -- Western 12-month-olds can).

• **Balkan music**
Development of visual acuity

Acuity improves rapidly over the first year but children are slightly nearsighted until 3.
How far can a baby see?

Acuity at birth is much worse than adults’. (20/800 = what you see at 800 feet is what neonates see at 20 feet)

Source: [http://psych.ucalgary.ca/PACE/VA-Lab/Marcela/Pages/page35a.html](http://psych.ucalgary.ca/PACE/VA-Lab/Marcela/Pages/page35a.html).
Contrast sensitivity

Smallest detectable difference between light and dark bars of grating

Figure removed due to copyright restrictions.
Source: http://psych.ucalgary.ca/PACE/VA-Lab/Marcela/Pages/page35a.html.
Color

- newborn: weak (only red vs. white) or color discrimination (Adams, 1989, 1995)
- other colors by 2-3 months (Adams & Courage, 1994; Atkinson, 2000; Teller & Bornstein, 1987)
Marketing boon -- from this ...
To this …
Color categorization

Infants habituated to 510-nm light
Then either 480-nm or 540-nm light was presented
Dishabituation only occurred for the 480-nm light
4-month-old infants categorize colors like adults do

Bornstein, Kessen, and Weiskopf (1976)
Vision -- form and orientation

• Newborns

Figure removed due to copyright restrictions.
Vision -- form and orientation

3-month-olds habituated to L preferred novel vertical lines; to R preferred novel horizontal lines.
Vision -- depth perception

• “For those of a creationist bent, one could note that God must have loved depth cues, for He made so many of them” (Yonas & Granrud, 1985, p. 45).
Vision -- depth perception

• “For those of a creationist bent, one could note that God must have loved depth cues, for He made so many of them” (Yonas & Granrud, 1985, p. 45). parallax

Size constancy

Texture gradient

Motion parallax

Images: United States Mint

Image: Flickr. terren in Virginia. CC-BY.

Image by MIT OpenCourseWare.
Depth perception: Infants can use changes in texture gradient, size constancy, motion parallax as depth indicators before 6 months.

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Binocularity

Stereopsis -- ability to use the disparity between the eyes as a cue to depth ... to do this, you have to be able to fuse the images from your left and right eye together. Infants can’t do this until about 3.5 months.

Sudden shift from ~100% preference for orthogonal to ~100% preference for parallel at about 3.5 months!

Shimojo, Bauer, O’Connell & Held (1986)
Vision -- depth perception

• Sensitivity to cues like shadows and perspective develops later.
• 7 but not 5-month-olds reached for “nearer” object (with extended shadow) when viewed monocularly.
• 7 but not 5-month-olds reached for “nearer” cylinder.

Figure removed due to copyright restrictions. Please see: Fig 1.3. *Handbook of Infant Development*. Edited by Gavin Bremner and Alan Fogel. Blackwell Publication, 2001. ISBN: 0631212345.
Tracking and scanning

• Newborns will track a moving object if it’s large enough and moves slowly.

• Newborns begin by scanning the edges of things -- older infants will track details.

From Fogel, 1991
4 day old infants reliably preferred mother’s face when all information was present (Pascalis, 1995).

0-4 mo: unable to make this discrimination if mother wears a scarf around her head.

Older: can recognize mother using interior features only.
Preference for faces? Or preference for face-like stimuli?

• Newborns look longer at faces than non-faces (including scrambled faces).
• Direction of contrast matters
*Face Tracking by Newborns*

Nonetheless, infant detect subtle differences in eye direction at birth

Farroni et al., 2002

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But don’t try this at home ...
Vision -- faces

Adults and 9-month olds distinguished only individual human faces.

Six-month-olds distinguished individual primate faces.

“Perceptual tuning”

Pascalis, et al., 2002 Science

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