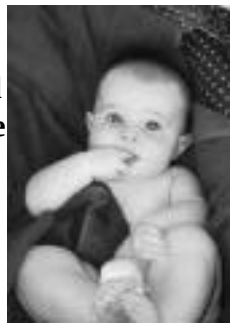
Early Infancy:

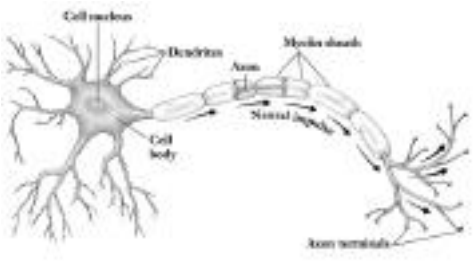
Initial Capacities and the Process of Change



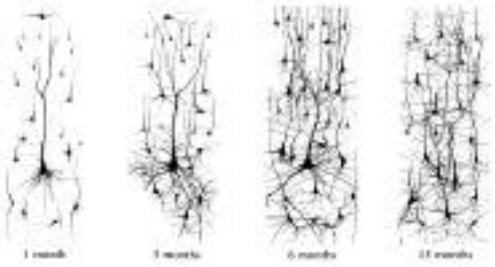
Development of the Brain

Neurons and Networks of Neurons

The Central Nervous System and the Brain



Development of the neural network over the first 15 months postnatally



Principle: Development occurs unevenly

- Brain stem develops first
  - Reactions, vital functions
- Cortical development also uneven
  - Primary motor cortex
    - Arms, trunk, legs
  - Primary sensory cortex
    - Touch, vision, audition
  - Frontal Cortex- last to develop
    - Planning, reasoning, integration

Earliest Capacities

Sensory Processes
- **Hearing**
- **Vision**
- **Taste and smell**
- **Touch, temperature, and position**

Response Process
- **Reflexes**
- **Emotions**

Sensory Processes

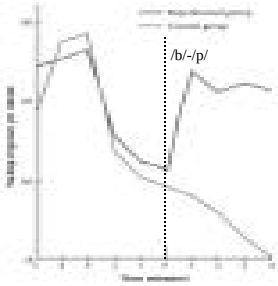
- Hearing
- Vision

Habituation Paradigm

- Baseline rate
  - Sucking
  - Looking
- Presentation of stimulus
  - Behavior rate increases
  - Continue until rate returns to baseline
- Presentation of new stimulus
  - Record behavior rate

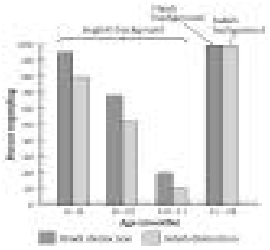
Hearing

- Present prenatally
- Orient toward sound at birth
- Adult level by age 10.
- Phoneme Discrimination by 2 mo.
  - Study by Eimas
    - Evidence for Categorical perception
  - Diminishes for unheard phonemes over time



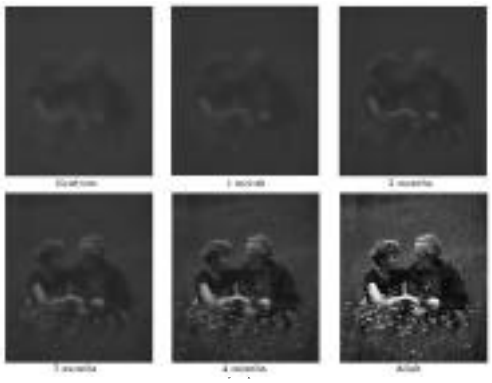
Phoneme Discrimination

- Infants exposed to English, Hindi or Salish
- Can discriminate among all phonemes but ability diminishes over time.
  - Coincides with time of infant articulations

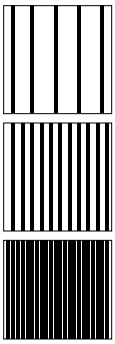


Vision

- Acuity
- Visual Scanning
- Pattern Recognition
- Perception of Faces



Visual Acuity



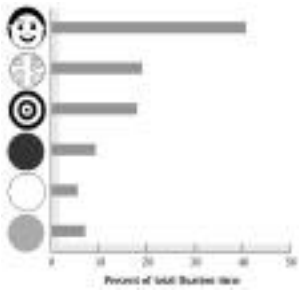
- Fantz's Study
  - Fact: Eyes move with a moving striped field
  - Logic: If baby can't see stripes, then eyes won't move
  - Method: Adjust the spacing between stripes.
  - Test: At what spacing do babies stop moving eyes with stimulus?
  - Result: Neonates - 20/300 vision

Pattern Recognition

- Preferred Looking Paradigm
  - Stimuli presented to infants
  - Viewing apparatus to see where infant is looking
  - Differences in looking show:
    - Infants discriminate patterns
    - Infants prefer some patterns

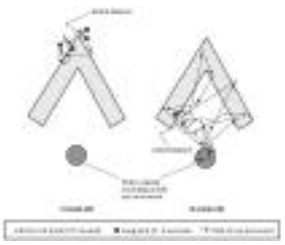
Neonates looking time at various patterns

(Fantz, 1961)



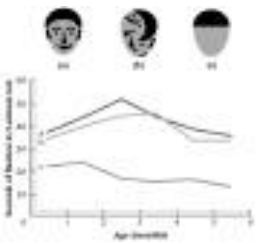
Visual Scanning

- Endogenous vs Exogenous scanning
- Exogenous
  - Focus on area of highest contrast
  - Improved scanning over the first 3 mo



Face Perception

- Newborns prefer faces to other stimuli (Fantz)
- Movement critical factor
  - By 9 minutes will orient to a moving face
  - 2 days old prefer mothers face
  - Decline in preference -2 mo.
    - Johnson study



Infant Reflexes

- Definition
  - Specific, automatic, well-integrated responses to specific stimulation.
- Purpose
  - Survival value
    - Eyeblink, sucking, swallowing
  - Vestigial
    - Grasping, Moro
  - Social Bonding
    - Grasping

Reflexes (cont)

- Time Course
  - Disappear after few months
    - babinski, moro, rooting
  - Disappear & reappear
    - Stepping, crawling
  - Evolves
    - Sucking, grasping
  - Permanent
    - eyeblink

Becoming Coordinated with the Social World

- **Sleeping**
- **Feeding**
- **Crying**

Sleeping (I wish!)

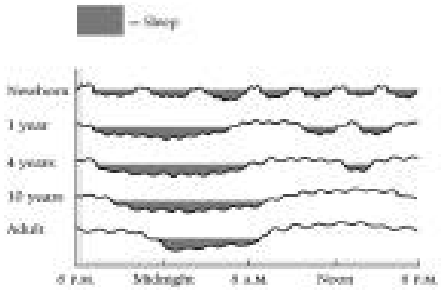
- Various states of arousal
- 2 precursors to adult-like sleep pattern
  - Active - REM
  - Quiet - NREM
- Pattern
  - Initially start in REM
  - By 2 -3 mo start in NREM

How much do babies sleep?

Week 1: 16 - 18 hours

Week 4 : 15 hours

Week 16: 14 hours



But they don't do it all at once!

Why do babies have short sleep cycles?

- Biological - Maturational
  - Small stomach's - need to eat frequently
  - Stages of Arousal
- Environmental- Learning
  - Conditioning: Reinforced for waking
    - Ferber Method
    - "let 'em cry"
- Constructivist

- Constructivist
  - Both biological and environmental
  - Alert cycle, seek stimulation, environmental cues
- Cultural-Context
  - Rural Kenya
    - Babies sleep on mothers back while she works
    - Babies sleep with mother
      - Feed at will
    - Result - shorter night sleep periods compared to US babies

Feeding

Types of Feeding

- Breastfeeding
  - Nutritionally best
  - Protects against illness: ear infections
  - Most easily digested - fewer allergies
  - Bonding?
- Bottle
  - Breastmilk - nutritional benefits but bonding?
  - Formula - easier on mother, iron supplement

Feeding

- Schedule
  - Initially every 2 - 3 hours (changed over time)
  - Schedule or Feed-on-demand?
    - Study by Bernal
      - Mothers told to use a 4-hour schedule
      - Some mothers didn't follow the rules (feed-on-demand)
      - Result - Feed-on-demand cried less
    - Study by Aldrich & Hewitt
      - Fed-on-demand preferred 3 hr schedule, by 2.5mo - 4hr, by 7-8 mo - 4 times a day.

- How would the different frameworks explain the feeding patterns of infants?

Crying

- Increases over the first 6 weeks
  - Universal pattern
- Initially involuntary
  - Controlled by brain stem
- Crying on Purpose
  - Different types of cries (pitch, pauses)
  - Causes: pain, discomfort, hungry, bored
- Comforting a crying baby

What has developed 0 - 10 weeks?

- Biological
  - CNS: myelinization, cortical control, brain cells
  - Psychophysical: increase alertness, sleep changes
- Behavioral
  - Improvement in learning& memory, vision, social smiling, decrease crying/fussiness, reaching
- Social
  - Relationship between infant & caretaker
  - "Crying on Purpose"

Bio-social Behavioral Shift

- Separate lines of development converge
- The development of each line enables emergence of new capability
  - Can seem unrelated
- Feedback/interactive Function

Example: Social Smiling