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
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 mos 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: myelination, 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