FIRST ADAPTATIONS IN INFANCY

A Neonate’s Competencies Have 5 Important Characteristics:

- They depend on prewired abilities built into the nervous system at birth.
- They often meet survival needs.
- From the beginning, they involve organized sequences of actions that serve some purpose.
- They involve selective responses.
- They allow infants to detect relationships between actions and consequences.

BRAIN DEVELOPMENT

Early Brain Growth: Structure of a Neuron

- Cell Body (Soma)
- Dendrite
- Axon
- Myelin Sheath
- Nodes of Ranvier
- Terminal Buttons
- Synapse
Researchers use a combination of approaches to study early brain development:

- Measure indirectly by charting head growth.
- Post-mortem examinations.
- Electroencephalography (EEG).
- Magnetic resonance imaging (MRI).
- Position emission tomography (PET).
- Estimate from animal experiments.

**Brain Growth**

- At birth babies brain has almost all the ________ it will ever have, but many ________ in the ____________________________ don't yet function efficiently.
- Infant brain at birth is ________ of its adult weight.
- By one year, the brain has _______________ in weight.
- By 4 years the brain is _______________ of its adult weight.
- At birth head circumference is _______________ and grows in spurts to its average adult size of _________________.

**Changes in Structure & Function**

- Spinal cord and brainstem are fully functional at birth. Why? What functions do they support?

- Cerebral cortex (higher cognitive functions) has the longest period of continued development.
Processes involved in early brain development

- neurogenesis/proliferation & neuron migration
- neuron elaboration & differentiation
  - Synaptogenesis
  - glial cell formation & myelination
- pruning excess synapses & loss of plasticity

Experience & Developmental Context

- The development of the nervous system is fostered and constrained by infants’ experiences, helping in the development of specialized functions in the cortex.
  - Experience-expectant synaptogenesis:
  - Experience-dependent synaptogenesis:

Changes in Structure & Function

- Brain Plasticity

- Brain Lateralization:
  - Left Hemisphere:
  - Right Hemisphere:

- The loss of the brain's plasticity has benefits as well as drawbacks:
The Effects Of Early Environmental Stimulation On Brain Development

  - Enriched Condition
  - Impoverished Condition

  Results

REFLEXES IN THE NEWBORN

- Reflex: An automatic, inborn response to a particular stimulus.

METHODS OF STUDYING PERCEPTUAL DEVELOPMENT

- For a long time, thought perceptual abilities at birth & infancy were minimal:

- How can we possibly know what a baby sees, hears, smells, and perceives when she can't tell us about it?

  Measures of Attention: Preferential Looking

- Measures of attention: state of alertness or arousal focused on a specific aspect of environment.

- Preferential Looking: tendency to look at something longer than others.

- Spontaneous Looking Preferences:

- Special photographic techniques

  Visual Preferences in Newborns

- Infants spend more time looking at __________________________________________________

- Infants spend the most time looking at a drawing of a _____________________________

- Is this just preference for complexity?
Newborns and Human Faces

- Infants were shown blank shape, a proper face, or scrambled facial features.
  - proper face and scrambled face have same complexity.
  - Infants looked more intensely at the ________________________________

Measures of Attention: Physiological Response Measures

- **Orienting Response**: behavioral and physiological changes that occur when a stimulus is first presented.
  - Autonomic Nervous System response to stimulation
  - CNS response: Cortical Evoked Potential

Use of Learning Principles to Study Infant Perception

Habituation-Dishabituation Paradigm

- **Habituation**:

- **Dishabituation**:
  - The **habituation-dishabituation sequence** is used to explore whether infants can **perceive** ____________________________________________________________________.

Operant Conditioning

- **Operant conditioning** is a form of learning in which a behavior is followed by a stimulus that changes the probability that the behavior will occur again.
  - A **reinforcer** is a stimulus that ____________________________________________.
  - Operant conditioning allows researchers to determine what stimuli babies **perceive** and ____________________________________________________________________.

- Used a lot for exploring infant hearing:
  - **High amplitude sucking**
SENSING & PERCEIVING THE WORLD: INFANT VISION

- Vision is the least mature of the newborn baby’s senses.
- Infants are ________________________________ and reasons for this are 2 fold:
  - **Retinas:**
  - **Immaturity of Visual Cortex:**

  **Vision Develops rapidly:** Infants begin to perceive patterns, objects, and depth w/in the __________________________________________

  **Visual Acuity:** Degree to which one can perceive________________________________________

  At 2 wks old acuity is approximately __________________________.

  Increases rapidly over the first 6 months of life ________________________________

  Measured in infancy by __________________________ and __________________________ that occurs in the brain in response to visual stimuli (*Visual Evoked Potentials*).

**Preferential Looking & Visual Acuity**

- Pairing stimuli with different frequency stripes to gray stimulus and observe preferential looking.
- The closer together the stripes the more difficult the discrimination (greater VA)

**SENSORY SYSTEMS IN THE NEWBORN: HEARING**

- **Newborns prefer mom’s voice:** Decasper & Fifer (1980):
  - Newborns are ________________________________________________
  - Newborns prefer speech that is high-pitched and expressive ________________________________
    ____________________________________________________________
  - Fetuses respond to sound ____________________________________________.
    - noises affect brain wave patterns and heart rate.
SENSORY SYSTEMS IN THE NEWBORN: HEARING

- **Decasper & Spence (1986):** “The Cat in the Hat Study.”
  - Women read aloud a passage from the “The Cat In The Hat” twice a day during the last six weeks of pregnancy.
  - 2-3 days after birth memory was tested.
  - Results:
    - Newborns prefer to listen to ___________________________________________________________________.

OLFACTION & TASTE IN THE NEWBORN

- At birth Olfaction and Taste are more highly developed than vision and hearing.
- The responsiveness of infants to the smell of certain foods is similar to that of adults.
- A newborn infant is attracted to the odor of her own mother’s lactating breast.
- Infant **facial expressions** indicate they can distinguish among several tastes, (e.g., sweet, sour, and bitter), but not others (e.g., salty).

DEPTH PERCEPTION IN INFANCY

- **Depth perception** requires the combination of many visual abilities.
- Infants are born with little or no depth perception, but this ability develops rapidly over the first year of life.
- Investigators have concluded that **avoidance** of heights is made possible by ________________
  ____________________________________________________________________________________.
- **Visual Cliff:**

TOUCH IN THE NEWBORN

- Touch is more fully developed at birth than other senses.
- Necessity of human touch: __________________________________________________________________________
- Touch is involved in many newborn __________________________________________________________________.
- Even premature newborns and older fetuses feel __________________________________________________________________.
FIRST ADAPTATIONS IN CONTEXT

- Newborns come into the world prepared in many ways for the developmental tasks they face. They have:
  - reflexes
  - a variety of sensory capacities
  - preadaptations to attend certain stimuli
  - preadaptations for social interaction

- Environment, in turn, provides experiences that help shape brain development, motor skills, perceptual abilities, and learned behaviors.