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Physical, Sensory, and Perceptual Development In Infancy
The Brain and Nervous System

- Develops rapidly during the first 2 years
  - Midbrain and Medulla most fully developed at birth
  - Cortex is the least developed
Synaptic Development

**Synaptogenesis**
- The creation of synapses—connections between neurons
- Occurs rapidly during first years after birth
- Happens in spurts
- Brain weight quadruples by age 4

**Pruning**
- Eliminating unused neural pathways and connections
Synaptic Development

- **Plasticity**
  - The brain’s ability to change in response to experience

- **Use it or Lose it**
  - Intellectually challenging environment creates a more complex network of synapses.
  - So stimulate your baby!!!
Myelination

- Formation of myelin sheath
  - Covering around individual axons
  - Provides insulation and speeds up neuronal processes
- Follows Cephalocaudal and Proximodistal patterns
- Most rapid during first 2 years
- Continues throughout childhood and adolescence
Reflexes and Behavioral States

Adaptive reflexes

- Help survival
  - Sucking
  - Withdrawal from pain
  - Opening and closing of pupil

- Weak or absent reflexes warn of possible neuronal development problems
Reflexes and Behavioral States

Primitive Reflexes

- Controlled by less sophisticated parts of the brain
  - Moro (or “startle”) Reflex
  - Babinski Reflex: Only babies do.
  - Stroke down the little-toe side of baby’s foot with your finger. Instead of curling or flexing his little toes downward, he will lift them up in extension and splay them out.

- These reflexes should disappear by six to eight months

- Persistence may indicate neurological problems
Reflexes and Behavioral States

States of Consciousness

- Patterns of sleep and wakefulness stabilize with age
- Neonates sleep 80% of the time
- By 8 weeks, babies begin to sleep through the night
- By 6 months, babies average 14 hours sleep per day
- Clear nighttime patterns and daytime naps are established
Reflexes and Behavioral States

Cries

- Basic cry signals hunger – rhythmic pattern
- Anger cry – louder and more intense
- Pain cry – very abrupt onset

Cross-cultural studies suggest crying increases until 6 weeks then tapers off

Prompt attention to crying in the first three months leads to less crying later
Physical Changes

Growth

- By Age One
  - 10 – 12 inches of growth
  - Infants triple their body weight

- Around Age Two
  - Toddlers reach half their adult heights.
  - Proportionately much larger heads
Motor skills interact with other aspects of physical development (Thelen)

Muscles, bones, weight—all work together

Opportunities to practice motor skills are important
Changes in number and density of bones responsible for improved coordination

Ossification
- The process of hardening of the bones
- Begins during prenatal development
- Continues through puberty
- Motor development depends on ossification
Muscles
- All are present at birth
- Decline in muscle tissue to fat ratio occurs by age 1

Lungs and Heart
- Rapid growth during first 2 years leads to stamina
Bottle-Feeding
- May be needed *supplement* for preterm babies
- Special needs formulas available
- Can be high quality

Solid Foods
- Do not help babies to sleep through the night
- Should start between 4 – 6 months
Health Care and Immunizations

- Motor skills assessed during doctor visits
- Vaccinations given to prevent diseases
  - U.S. vaccinations are high
  - Continued education efforts and government support needed

Illnesses in first 2 Years

- Respiratory illnesses common
- Chronic ear infections
  - May compromise language development and learning
Death within the first year of life

- 7 babies per 1000 in the U.S.
  - Has declined steadily for several decades
  - Higher in U. S. than in other industrialized countries

- Varies widely among U.S. ethnic groups

- Related to prenatal care
Leading cause of death in U.S. infants 1-12 months

More common in babies with **apnea** (brief cessations in breathing)

More frequent in babies who sleep on their stomachs

Higher risk if mother smokes during pregnancy or smoking in the home after birth
Rapid development of visual acuity
+ Approximately 20-20 by about age 2

Color Vision
+ Red, green and blue present by 1 month
+ Infant’s ability to sense color almost identical to an adult’s

Tracking
+ The process of following a moving object
+ Initially inefficient but improves rapidly
Sensory Skills

- **Hearing**
  - Newborns hear adult voices well
  - High-pitched noises must be loud to be heard
  - Infants can locate direction of some sounds at birth

- **Smelling and Tasting**
  - Newborns react differently to each basic taste as early as birth

- **Touch and Motion**
  - Best developed of all senses
Perceptual Skills

Studying Perceptual Development

- **Preference Technique**
  - How long baby attends to a particular stimulus

- **Habituation/Dishabituation**
  - Loss of interest in a particular stimulus after repeated exposures

- **Operant Conditioning**
  - Vary the stimulus and study the learned responses
Looking Skills

Depth Perception

- **Binocular cues**
  + Involve both eyes
  + The closer an object, the more the view from the two eyes differs
  + Information from eye muscles tells about distance

- **Monocular cues**
  + Input from one eye
  + *Interposition*
  + *Linear perspective*

- **Kinetic cues**
  + Motion from objects or the eyes
Depth Perception

- **Visual Cliff** – Gibson and Walk (1960)
  - Initially showed that 6-month-old babies would not cross the visual cliff
  - Recent Research
    - Babies use kinetic information as early as 3 months
    - Binocular cues are used at 4 months
    - Linear perspective cues are used last, at 5 – 7 months
  - 3 month olds have some depth perception
What Babies Look At

- Babies initially scan for light/dark contrast.
- At 2 months, babies scan entire objects and scan for patterns.
- Caron and Caron (1981) suggest that by 3 – 4 months babies can find and pay attention to patterns.
What Babies Look At

Faces

- NOT uniquely interesting to infants
- Clearly prefer attractive faces
- Prefer mother’s face from the earliest hours of life
- Focus on internal features of the face at about age 2-3 months
At 1 month, can discriminate between *pa* and *ba*

At 6 months, can discriminate between two-syllable words

By 3 months, respond to male, female, and children’s voices similarly

At 6 months, distinguish sound contrasts in any language; by 1 year old, this ability fades

Prefer the mother’s voice above all others
Intermodal perception

+ Learn in one sense modality, transfer information to another modality

Nativists

+ Believe most perceptual abilities inborn
+ Indeed many of these abilities are present at birth

Empiricists

+ Claim most perceptual abilities are learned
+ Experience is needed to develop perceptual systems