Physical Development in Infancy

Images of Children’s Development

- Bottle-feeding in developing countries
  - Unsterilized bottles, formula made with unclean water
  - Many children get common illnesses; may die
- Breastfeeding in developing countries
  - Breast milk has advantages; immunizes newborn
- Hospitals have vital role in educating mothers

How do Infants grown and develop physically?

1. Patterns of Growth—Cephalocaudal pattern—A developmental sequence in which growth occurs from the head down; sensory and motor development generally proceed in this manner. Proximodistal pattern—Development starts at the center of the body and moves towards the extremities, such as with muscular control in infancy.

2. Height and Weight—Ninety-five percent of North American newborns are between 18 to 22 inches long and weight between 5.5 and 10 pounds. Infants grow about 1 inch per month during the first year and have nearly tripled their birth weight by their first birthday. Growth slows considerably in the second year of life. The average two year old will weigh 26-32 pounds and will grow to 32-35 inches tall (almost half of their adult height).

3. The Brain—At birth, infants possess approximately 100 billion neurons. Extensive brain development continues after birth. Because the brain is still developing so rapidly in infancy, the infant’s head should be protected from falls or other injuries and the baby should never be shaken.

-Shaken baby syndrome: brain swelling and hemorrhaging
-PET and MRI – Positron-emission tomography (PET) scans pose a radiation risk to babies, and infants wriggle too much to capture accurate images using magnetic resonance imaging (MRI).
-EEG shows brain activity spurt from 1½ to 2 years of age and it also measures the brain’s electrical activity, to learn more about the brain’s development in infancy.

-Brain Development – At birth, the newborns’ brain is about 25 percent of its adult weight. By the second birthday, the brain is about 75 percent of its adult weight.

- Mapping the brain-
  - Forebrain – the portion of the brain farthest from the spinal cord, which includes the cerebral cortex and several structures beneath it.
  - Cerebral cortex—covers the forebrain like a wrinkled cap. It has two halves, or hemispheres. There are four main areas, called lobes, in each hemisphere. Frontal, Occipital, Temporal, Parietal
    --Frontal lobes—which are involved in voluntary movement, thinking, personality, memory, emotion, sustained attention, and intentionality or purpose
    --Occipital lobes—which function in vision
--Temporal lobes—which have an active role in hearing, language processing, and memory
--Parietal lobes—which play important roles in registering spatial location, attention, and motor control

Areas of the brain do not mature uniformly. Also, the two hemispheres of the cerebral cortex are not identical in anatomy or function; the term lateralization refers to the specialization in function of each hemisphere.

- Neuron: a neuron is a nerve cell that handles information processing
  - Axons and dendrites—these are two types of fibers that extend from the neuron’s cell body. Generally the axon carries signals away from the cell body and dendrites carry signals toward it.
- Myelin sheath: layer of fat cells that encases and insulates most axons
- Myelination -Two significant changes involving neurons in the first year of life are changes in myelination, or the process of encasing axons with fat cells, and in the connectivity among neurons to create new neural pathways and continues into adolescence

- Changes in regions of the brain—The processes of dramatic growth and later pruning of synapses in the visual, auditory, and prefrontal cortex vary considerably by brain region. The pace of myelination also varies in different areas of the brain. The prefrontal cortex has the most prolonged development of any brain region, with changes detectable at least into the adolescent years.
- Early experience and the brain—After birth, environmental experiences guide the brain’s development and influence the brain’s neural connections. The infant’s brain depends on experiences to determine how connections are made.

4. Sleep—The typical newborn sleeps approximately 18 hours a day, though newborns vary in how much they sleep. The range is from about 10 hours to about 21 hours. Cultural variations also influence sleeping patterns.

- REM sleep— About one-half of infant’s sleep is REM, and infants often begin their sleep cycle with REM rather than non-REM sleep.
- Shared sleeping—Sharing a bed with a mother is a common practice in many cultures. While some researchers believe that shared sleeping promotes breast feeding and a quicker response to infants, others have found that bed sharing is linked with a greater incidence of SIDS.
- SIDS—Sudden infant death syndrome remains the highest cause of infant death in the United States. Risk of SIDS is highest at 2 to 4 months of age. Researchers have found that the risk of SIDS is reduced when infants sleep on their backs.

The following are risk factors for SIDS:
  - Lower birth weight
  - Siblings with SIDS
  - Sleep apnea
  - Lower socioeconomic groups
  - Exposure to cigarette smoke
  - Placement in soft bedding
o Highest risk in African American and Inuit infants
o Abnormal brain stem functioning
o SIDS is less likely in infants who use a pacifier when they go to bed and in infants who sleep in a bedroom with a fan.

5. Nutrition

○ Nutritional needs—Nutritionists recommend that infants consume approximately 50 calories per day for each pound they weigh. Healthy infants need more fruits and vegetables, and less junk food.

○ Breast versus bottle feeding—The growing consensus is that breast feeding is better than bottle feeding for a baby’s health.

○ Benefits of breast feeding for the Child:
  - have fewer gastrointestinal infections.
  - have fewer lower respiratory tract infections
  - exclusive breast feeding for three months protects against wheezing in babies, but unclear if it prevents asthma in older children
  - less likely to develop middle ear infections (otitis media)
  - less likely to have (atopic dermatitis) this chronic inflammation of the skin
  - less likely to become overweight or obese in childhood, adolescence, and adulthood
  - less likely to develop type 1 diabetes in childhood and type 2 diabetes in adulthood
  - less likely to experience SIDS

○ Benefits of breast feeding for the Mother:
  - lower incidence of breast cancer
  - a reduction in ovarian cancer
  - small reduction in type 2 diabetes

○ Malnutrition in infancy—Early weaning of infants from breast milk to inadequate sources of nutrients can cause protein deficiency and malnutrition. Two life-threatening conditions that can result from malnutrition are marasmus and kwashiorkor. Marasmus is caused by a severe protein-calorie deficiency and results in a wasting away of body tissues in the infant’s first year. Kwashiorkor, caused by severe protein deficiency, usually appears between 1 & 3 years of age. It causes a child’s vital organs to collect the nutrients that are present and deprive other parts of the body of them.

6. Health—Immunization and accident prevention are important aspects of children’s health.

○ Immunization—widespread immunization for preventable diseases is responsible for a dramatic advance in infant health in the past four decades. The recommended schedule for many immunizations begins in infancy.

○ Accident prevention—Accidents are a major cause of death in infancy, especially from 6 to 12 months of age. Infants need to be closely monitored as they gain increased locomotor and manipulative skills and a curiosity to explore the environment.
  - Increased monitoring needed in infancy
1. **Asphyxiation**: leading cause of death under 1
2. Choking hazards: toys, chunky foods
3. Burn risks: sun, electrical, heaters, hot water
4. Other risks: car accidents, cuts, pet bites

How do infants develop motor skills?

- **Dynamic Systems Theory**— According to dynamic systems theory, infants assemble motor skills for perceiving and acting. To develop motor skills, infants must perceive something in the environment that motivates them to act and use their perceptions to fine-tune their movements. Motor skills represent solutions to the infant’s goals.

- **Reflexes**—Reflexes are built-in reactions to stimuli that govern newborns’ movements.
  1. Rooting reflex—An infant responds to a touch on the cheek by turning toward the touch.
  2. Sucking reflex—Newborns automatically suck an object placed in their mouth.
  3. Moro reflex—When startled, the newborn arches its back, throws back its head, and flings out its arms and legs.
  4. Babinski reflex—infants fan out their toes and twist their foot inward when the sole of their foot is stroked, disappears after 9 months to 1 year of age
  5. Grasping reflex—An infant grasps when palms are touched.

- **Gross Motor Skills**—Example of gross motor skills, which are skills that involve large-muscle activities, include moving one’s arms and walking.
  1. Development of posture—Dynamic process linked with sensory modalities—skin, muscles, vestibular organs in the inner ear, and cues from vision and hearing.
  2. Learning to walk—To walk upright, the baby must be able both to balance on one leg as the other is swung forward and to shift the weight from one leg to another.
  3. The first year: Motor Development Milestones and Variations—The timing of milestones, especially later ones such as walking, may vary by as much as 2 to 4 months, and experiences can modify the onset of these accomplishments.
  4. Development in the second year—Toddlers become more motorically skilled and mobile. Motor activity during the second year is vital to the child’s competent development and few restrictions, except for safety, should be placed on their adventures.
  5. Cultural variations—Mothers in developing cultures tend to stimulate their infants’ motor skills more than mothers in more advanced cultures.
  6. Fine motor skills—Finely, tuned movements, such as grasping a toy or any activity that requires finger dexterity, demonstrates fine motor skills.
What are Sensation and Perception?
1. **Sensation:** occurs when information contacts sensory receptors – eyes, ears, tongue, nostrils, and skin
2. **Perception:** interpretation of what is sensed

- The Ecological View is that perception brings the organism in contact with its environment for the purposes of adaptation. Affordances are opportunities for interactions offered by objects and enhanced by previous experiences.
- People directly perceive information in the world around them and perception allows human-environmental interaction and adaptation

Studying Infant Perception
- Visual preference method—Studying whether infants can distinguish one stimulus from another by measuring the length of time they attend to different stimuli.
- Habituation—Decreased responsiveness to a stimulus after repeated presentations. Research method used with infants. Dishabituation is the recovery of a habituated response after a change in stimulation.
- Other methods—To assess an infant’s attention to sound, researchers often use a method called high-amplitude sucking, in which infants suck on a nipple connected to a sound generating system. To determine if an infant can see or hear a stimulus, researchers might look for the *orienting response*, which involves turning one’s head toward a sight or sound, or to monitor the infant’s *tracking*, which consists of eye moments that follow a moving object.
- Equipment—Videotape equipment, high-speed computers, and other forms of technology can facilitate the use of most methods for investigations of infant perceptual abilities.

Visual Perception
- Visual acuity and Human Faces—Estimates of the newborn’s visual acuity varies from 20/240 to 20/640 on the well-known Snellen chart used for eye examinations, which means that a newborn can see at 20 feet what a normal adult can see at 240 to 640 feet. Infants can discriminate some colors early in infancy, and by 4 months of age, may have color preferences that mirror those of adults. Both maturation and experience are involved in the development of normal vision.
- Color Vision—The infant’s color vision also improves. By 8 weeks, and possibly 4 weeks, infants can discriminate some colors.
- Perceptual constancy—Babies as young as 3 months show some evidence of size constancy, the recognition that an object remains the same even though the retinal image of the object changes, and shape constancy, the recognition that an object remains the same shape even though its orientation changes.
- Perception of Occluded Objects—In the first two months of postnatal development, infants don’t perceive occluded objects as complete, instead perceiving only what is visible.
• Depth perception—Although researchers do not know exactly how early in life infants can perceive depth, there is evidence that infants develop the ability to use binocular cues by about 3 to 4 months of age.

Other Senses
• Hearing—Begins in the womb. Fetuses can hear and learn specific sounds in utero. Newborns prefer some kinds of sounds over others, and changes in perception of a sound’s loudness, pitch, and localization take place in the first two years.
• Touch and pain—Newborns respond to touch and feel pain. Smell—Newborns can differentiate between odors and show preferences for certain kinds of smells over others.
• Taste—Sensitivity to taste might be present even before birth. In one study, even at only 2 hours of age, babies made different facial expressions when they tasted sweet, sour, and bitter solutions.

Intermodal Perception—The integration of two or more sensory modalities.

Nature, Nurture, and Perceptual Development—A full portrait of perceptual development includes the influence of nature, nurture, and a developing sensitivity to information.

Perceptual-Motor Coupling—Individuals perceive in order to move and move in order to perceive. Perceptual and motor developments do not occur in isolation from one another but instead are coupled.