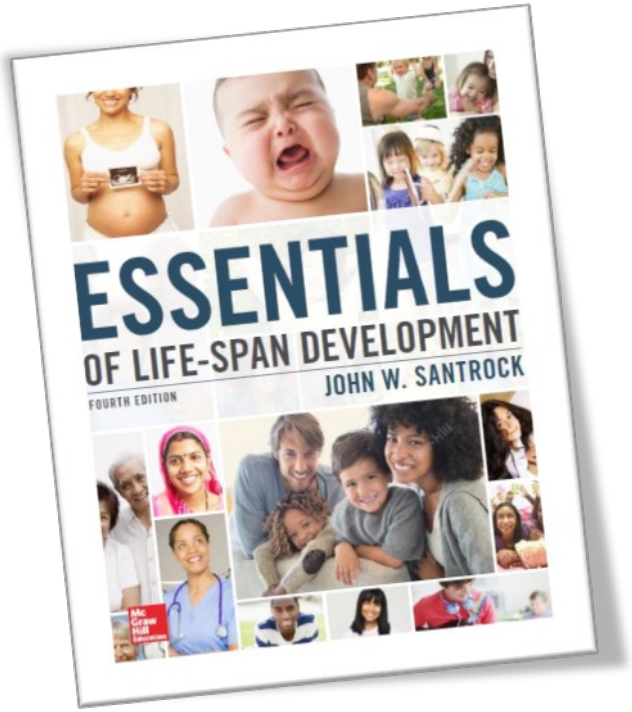


ESSENTIALS OF LIFE-SPAN DEVELOPMENT

4e

JOHN W. SANTROCK

PHYSICAL AND COGNITIVE DEVELOPMENT IN INFANCY

3

CHAPTER OUTLINE

- Physical growth and development in infancy
- Motor development
- Sensory and perceptual development
- Cognitive development
- Language development

PHYSICAL GROWTH AND DEVELOPMENT

- Patterns of growth
  - **Cephalocaudal pattern**
    - Sequence in which the earliest growth always occurs at the top
    - Physical growth and differentiation of features work their way down from top to bottom
  - **Proximodistal pattern**
    - Sequence in which growth starts at the center of the body and moves toward the extremities

PHYSICAL GROWTH AND DEVELOPMENT

- Height and weight
  - Average American newborn is 20 inches long and weighs 7½ pounds
  - Most newborns lose 5-7% of body weight before adjusting to feeding
    - Weight gain then becomes rapid
  - Grow about ¾ inch per month during the first year
    - Growth rate slows considerably in second year of life
  - By 2 years, infants weigh approximately 26 to 32 pounds and average 32-35 inches tall

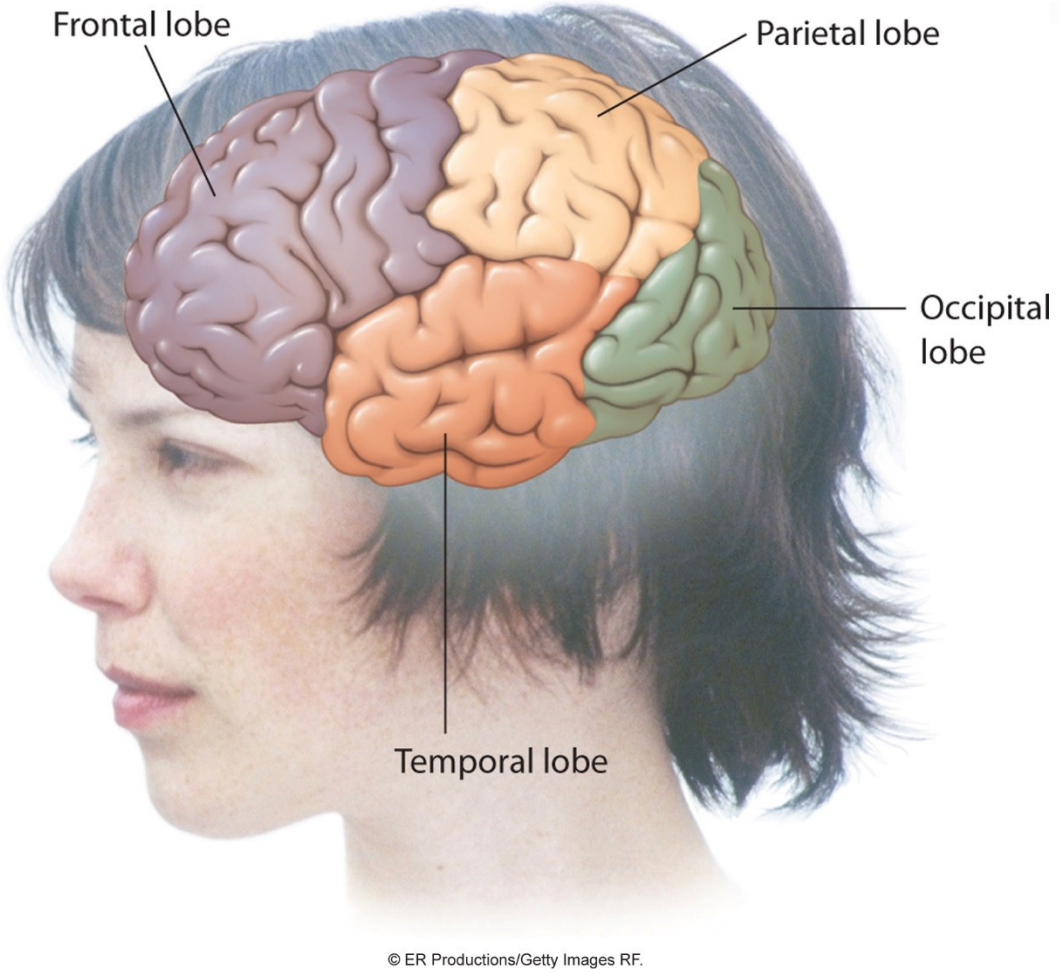
PHYSICAL GROWTH AND DEVELOPMENT

- The Brain
  - Extensive brain development continues after birth, throughout infancy, and even later
  - At birth, the brain weighs about 25% of its adult weight
    - By 2 years, the brain is 75% of its adult weight
    - Brain areas do not mature uniformly
  - Shaken baby syndrome - Brain swelling and hemorrhaging

PHYSICAL GROWTH AND DEVELOPMENT

- Mapping the brain
  - *Forebrain* – includes cerebral cortex and several structures beneath it
  - *Cerebral cortex* – covers forebrain like a wrinkled cap
  - *4 lobes* – frontal lobe, temporal lobe, parietal lobe, occipital lobe
  - *Lateralization* – specialization of function in one hemisphere or the other of the brain
    - Brain begins to specialize at birth

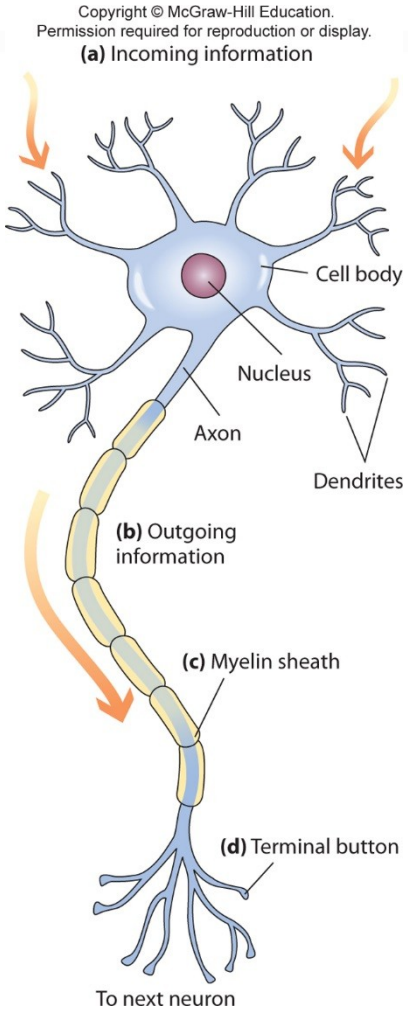
FIGURE 3.3 - THE BRAIN'S FOUR LOBES



PHYSICAL GROWTH AND DEVELOPMENT

- The neuron
  - *Neuron* – nerve cell that handles information processing
    - Axon and dendrite fibers
  - *Myelin sheath* – layer of fat that encases many axons
    - Provides insulation, helps electrical signals travel faster down axon, facilitates communication
  - *Neurotransmitters* – chemicals in the brain
  - *Synapses* – tiny gaps between neurons

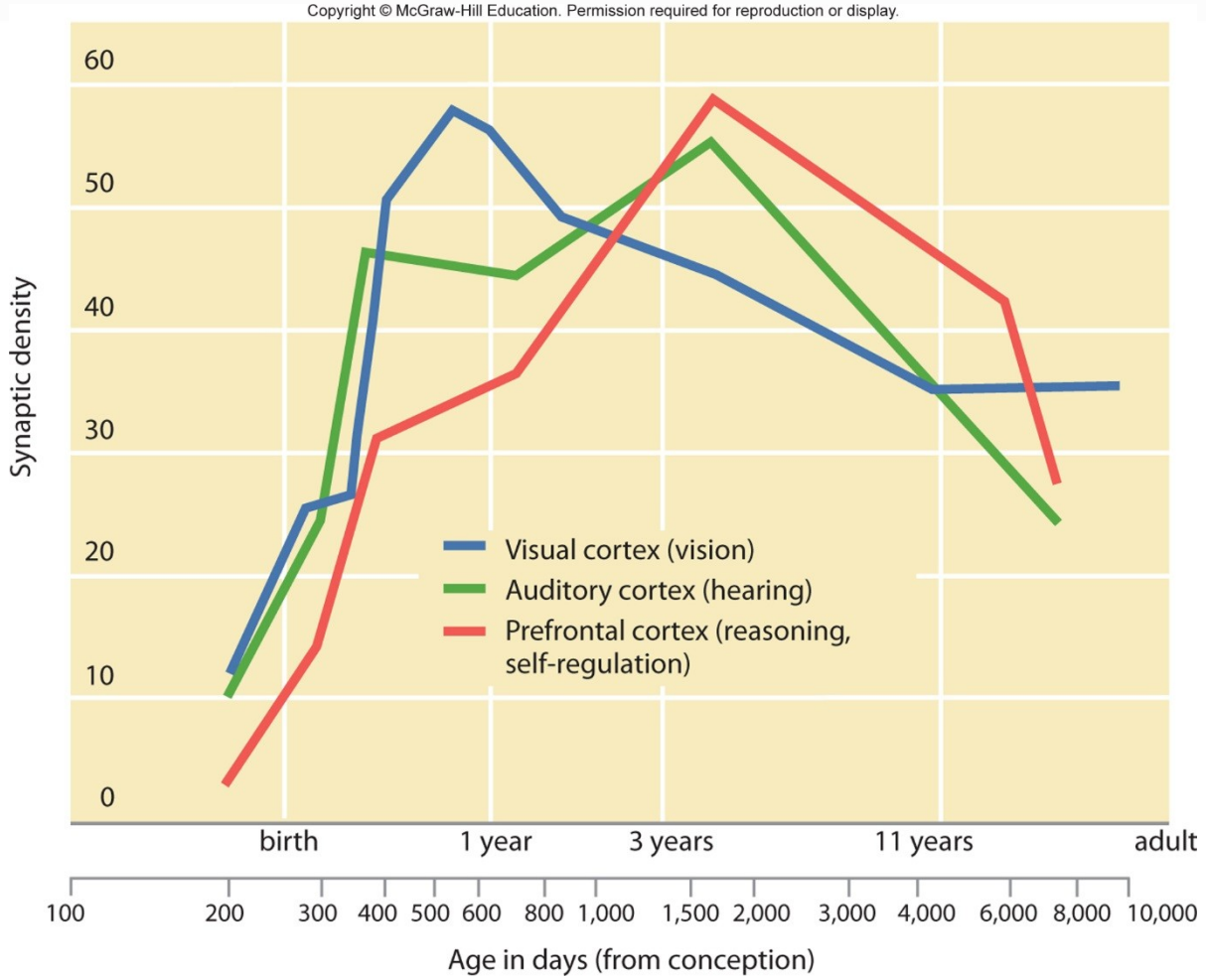
FIGURE 3.4 - THE NEURON



PHYSICAL GROWTH AND DEVELOPMENT

- Changes in neurons
  - *Myelination* – process of encasing axons with fat cells
    - Begins prenatally and continues throughout childhood and adolescence
    - Pace of myelination varies in different areas of the brain
  - Connectivity between neurons increases
    - New dendrites grow and new neural pathways are created
    - Used connections become stronger and survive, unused ones are replaced or disappear (“pruning”)
  - Blooming and pruning vary by brain region
    - Heredity and environment influence timing and course

FIGURE 3.5 – SYNAPTIC DENSITY IN BRAIN FROM INFANCY TO ADULTHOOD



PHYSICAL GROWTH AND DEVELOPMENT

- Early experience and the brain
  - Genes direct how the brain establishes basic wiring patterns before birth
    - After birth, environmental experiences guide brain's development
  - Infants whose caregivers expose them to a variety of stimuli are most likely to develop to their full potential
    - Children in deprived environments may have depressed brain activity
  - Brain demonstrates both flexibility and resilience due to profusion of neutral connections

PHYSICAL GROWTH AND DEVELOPMENT

- Neuroconstructivist view
  - Biological processes and environmental conditions influence brain's development
  - Brain has plasticity and is context-dependent
  - Development of the brain and the child's cognitive development are closely linked

PHYSICAL GROWTH AND DEVELOPMENT

- Sleep
  - Typical newborn sleeps 16-17 hours per day
  - By 6 months, the majority of infants sleep throughout the night
  - Night-time waking is the most common infant sleep-related problem
- REM (rapid eye movement) sleep
  - Infants spend about half of their sleep time in REM sleep
  - Often begin sleep cycle with REM sleep rather than non-REM sleep
  - May promote infant brain development

PHYSICAL GROWTH AND DEVELOPMENT

- **Sudden infant death syndrome (SIDS)**
  - Occurs when an infant stops breathing, usually at night
  - Suddenly dies without an apparent cause
- SIDS is the highest cause of infant death in the United States
  - Rates decrease when infants sleep on their backs

PHYSICAL GROWTH AND DEVELOPMENT

- SIDS more likely to occur:
  - In infants with abnormal brain stem functioning involving serotonin
  - In low birth weight infants
  - In African American and Eskimo infants
  - In infants passively exposed to cigarette smoke
  - When infants and parents share the same bed
  - When infants don’t use a pacifier when they go to sleep
  - When infants sleep in a bedroom without a fan

PHYSICAL GROWTH AND DEVELOPMENT

- Breast versus bottle-feeding
  - Human milk or formula is an appropriate source of nutrients and energy for first 4-6 months of life
  - Breast feeding is considered better for baby's health
- Benefits for baby:
  - Appropriate weight gain
  - Lowered risk of childhood obesity
  - Fewer gastrointestinal infections
  - Fewer lower respiratory tract infections
  - No evidence found for cognitive development or cardiovascular functioning

PHYSICAL GROWTH AND DEVELOPMENT

- Benefits of breast feeding for mother:
  - Lower incidence of breast cancer
  - Reduction in ovarian cancer
- Mother should not breast feed if:
  - She is infected with HIV or some other infectious disease
  - She has active tuberculosis
  - She is taking any drug that unsafe for the infant

PHYSICAL GROWTH AND DEVELOPMENT

- Nutritional needs
  - U.S. parents feed babies too few fruits and vegetables, too much junk food
  - Adequate early nutrition is an important aspect of healthy development

MOTOR DEVELOPMENT

- Dynamic systems theory
  - Infants assemble motor skills for perceiving and acting
  - Perception and action are coupled together
- Motor skill is developed by:
  - Development of the nervous system
  - Body's physical properties and its possibilities for movement
  - Goal the child is motivated to reach
  - Environmental support for the skill

MOTOR DEVELOPMENT

- Reflexes - Built-in reactions to stimuli
  - Govern the newborn's movements
  - Genetically carried survival mechanisms that are automatic and involuntary

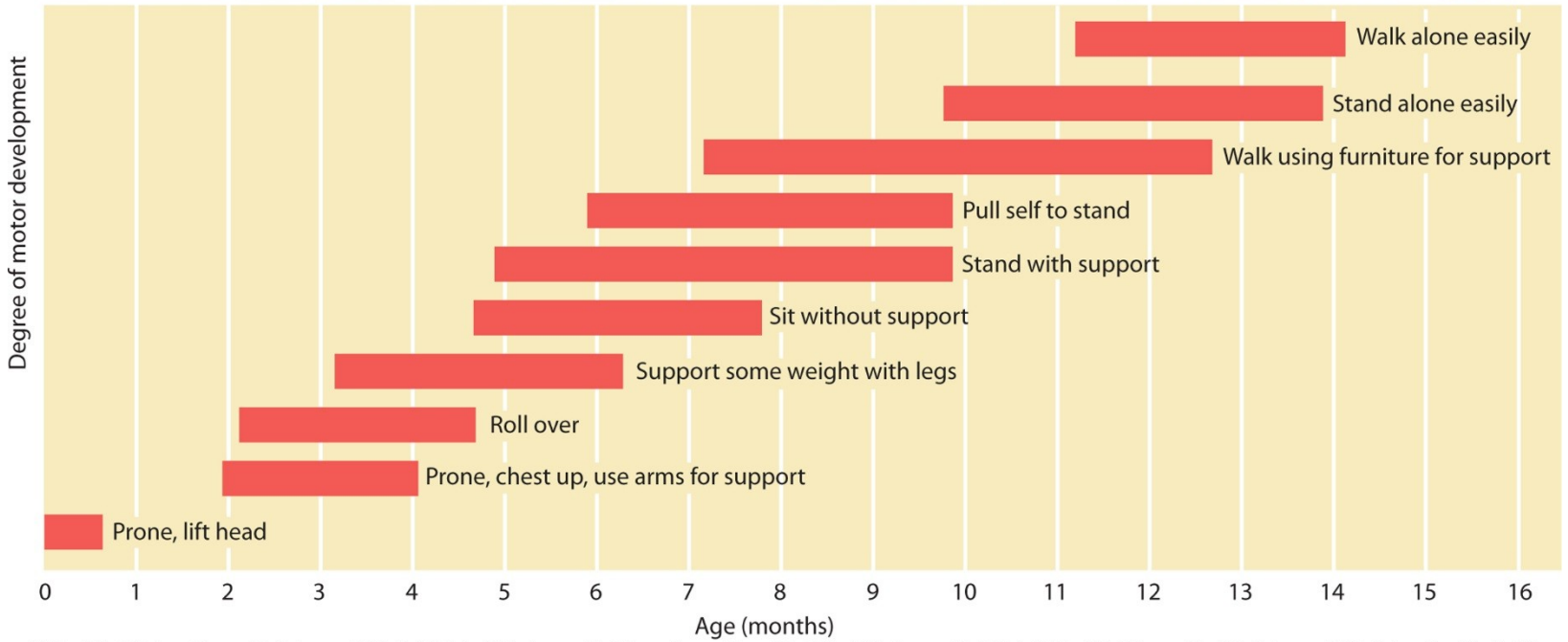
MOTOR DEVELOPMENT

- *Rooting reflex*
  - Occurs when the infant's cheek is stroked or the side of the mouth is touched, turns its head in an effort to find something to suck
- *Sucking reflex*
  - Occurs when newborns automatically suck an object placed in mouth
- *Moro reflex*
  - Occurs in response to a sudden, intense noise or movement
- *Grasping reflex*
  - Occurs when something touches the infant's palms, responds by grasping tightly

MOTOR DEVELOPMENT

- **Gross motor skills**
  - Involve large-muscle activities
  - Such as moving one's arms and walking
- Newborn infants cannot voluntarily control their posture
  - Locomotion and postural control are closely linked, especially in walking upright

FIGURE 3.9 - MILESTONES IN GROSS MOTOR DEVELOPMENT



MOTOR DEVELOPMENT

- Gross motor skills develop in the second year
  - Toddlers become more mobile as motor skills are honed
  - By 13-18 months:
    - Toddlers can pull a toy attached to a string or climb stairs
  - By 18-24 months:
    - Toddlers can walk quickly
    - Balance on their feet
    - Walk backward and stand and kick a ball

MOTOR DEVELOPMENT

- **Fine motor skills**
  - Involve more finely tuned movements
  - Grasping a toy, using a spoon, buttoning a shirt, or anything that requires finger dexterity
- Infants need to exercise their fine motor skills

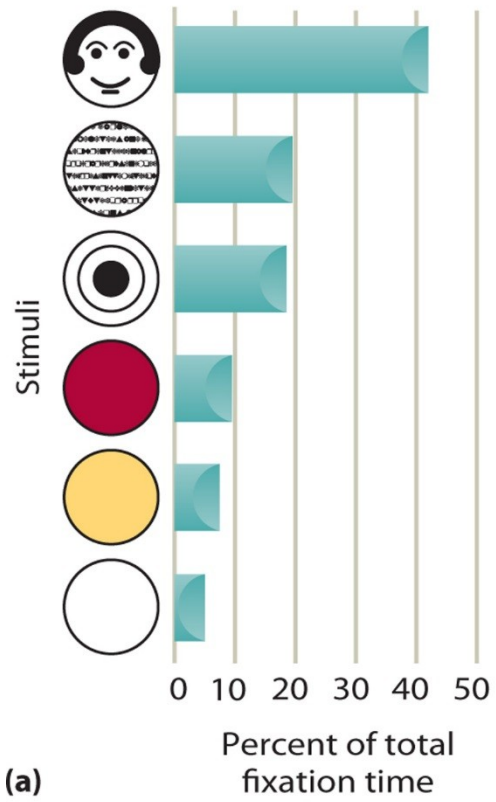
SENSORY AND PERCEPTUAL DEVELOPMENT

- **Sensation**
  - Occurs when information interacts with sensory receptors
  - Eyes, ears, tongue, nostrils, and skin
- **Perception**
  - Interpretation of what is sensed

SENSORY AND PERCEPTUAL DEVELOPMENT

- **Ecological view**
  - Directly perceives information that exists in the world around us
- Studying the infant's perception
  - **Visual preference method**: Studying whether infants can distinguish one stimulus from another by measuring the length of time they attend to different stimuli

FIGURE 3.11 - FANTZ'S EXPERIMENT ON INFANTS' VISUAL PERCEPTION



Courtesy of the family of David Linton.

SENSORY AND PERCEPTUAL DEVELOPMENT

- Habituation and dishabituation
  - **Habituation**: Name given to decreased responsiveness to a stimulus after repeated presentations of the stimulus
  - **Dishabituation**: Recovery of a habituated response after a change in stimulation
- Eye-tracking
  - Technology can facilitate the use of most methods for investigating the infant's perceptual abilities

SENSORY AND PERCEPTUAL DEVELOPMENT

- Visual acuity and color
  - Newborn's vision is estimated at 20/600
  - By 6 months, vision changes to 20/40
  - Faces among most important visual stimuli
  - Color vision improves
- Perceiving occluded objects
- Depth perception

FIGURE 3.13 - VISUAL ACUITY DURING THE FIRST MONTHS OF LIFE

© Kevin Peterson/Getty Images/Simulation by Vischeck RF.

FIGURE 3.14 - INFANTS' PREDICTIVE TRACKING OF A BRIEFLY OCCLUDED MOVING BALL

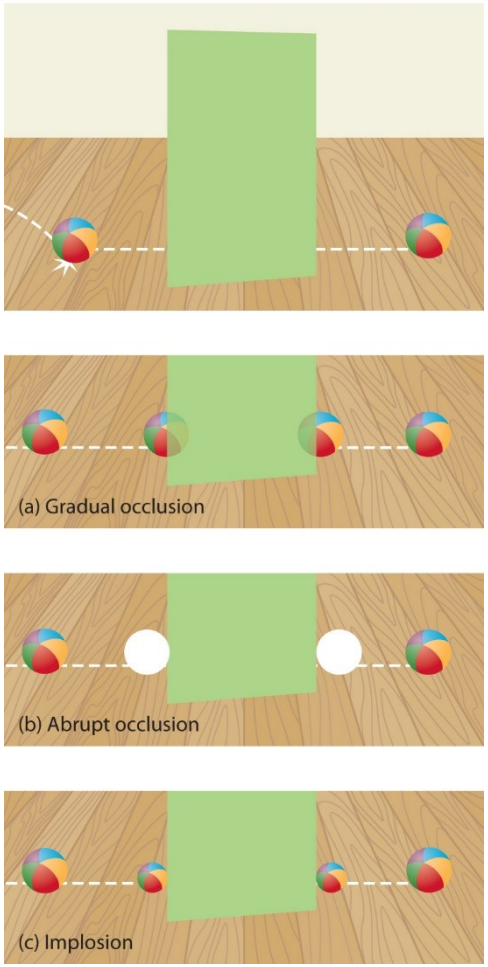


FIGURE 3.15 - EXAMINING INFANTS' DEPTH PERCEPTION ON THE VISUAL CLIFF

© Mark Richards/PhotoEdit.

SENSORY AND PERCEPTUAL DEVELOPMENT

- Hearing changes
  - Loudness
  - Pitch
  - Localization
- Touch and pain
  - Pain perception
- Smell
  - Differentiation of odors and preferences
- Taste
  - Sensitivity to taste
  - Taste preferences

SENSORY AND PERCEPTUAL DEVELOPMENT

- **Intermodal perception**
  - Involves integrating information from two or more sensory modalities
    - Vision and hearing
  - Most perception is intermodal, becomes sharper in first year of life

SENSORY AND PERCEPTUAL DEVELOPMENT

- Nature, nurture, and perceptual development
  - *Nativists* - Emphasize nature
  - *Empiricists* - Emphasize learning and experience
- Perceptual-motor coupling
  - Perception and action are not isolated but rather are coupled
  - Individuals perceive in order to move and move in order to perceive

COGNITIVE DEVELOPMENT

- Piaget's Theory
  - Build mental structures to help us adapt to the world
  - Individuals go through 4 stages of development, advancing understanding of the world
- Processes of development
  - **Schemes**: Actions or mental representations that organize knowledge
    - Behavioral scheme (physical activities)
    - Mental scheme (cognitive activities)
  - **Assimilation**: Using existing schemes to deal with new information or experiences
  - **Accommodation**: Adjusting schemes to fit new information and experiences

COGNITIVE DEVELOPMENT

- **Organization**: Grouping of isolated behaviors and thoughts into a higher-order system
- **Equilibration**: Mechanism by which children shift from one stage of thought to the next

COGNITIVE DEVELOPMENT

- **Sensorimotor Stage** (Birth - 2 years)
  - Infants construct an understanding of the world by coordinating sensory experiences with physical, motor actions
- **Object permanence**
  - Understanding that objects continue to exist even when they cannot be seen, heard, or touched

FIGURE 3.16 - OBJECT PERMANENCE

© Doug Goodman/Science Source.

COGNITIVE DEVELOPMENT

- Evaluating Piaget's Sensorimotor stage
  - **A-not-B error**: Tendency of infants to reach where an object was located earlier rather than where the object was last hidden
    - Older infants are less likely to make the A-not-B error because their concept of object permanence is more complete
  - **Core knowledge approach**: States that infants are born with domain-specific innate knowledge systems

COGNITIVE DEVELOPMENT

- Operant conditioning
  - If an infant's behavior is followed by a rewarding stimulus, the behavior is likely to recur
- **Attention**:
  - Focusing of mental resources on select information
  - Habituation and dishabituation closely linked
  - **Joint attention** – individuals focus on the same object or event
    - Ability to track another's behavior
    - One person's directing another's attention

COGNITIVE DEVELOPMENT

- Imitation
  - Imitative abilities as biologically based
  - **Deferred imitation**: Occurs after a delay of hours or days
- **Memory**
  - Involves retention of information over time
    - **Implicit memory**: Without conscious recollection
    - **Explicit memory**: Conscious remembering of facts and experiences
  - *Childhood amnesia* - Most adults can remember little, if anything, from the first 3 years of their life

COGNITIVE DEVELOPMENT

- Concept formation and categorization
  - **Concepts**: Cognitive groupings of similar objects, events, people, or ideas
  - *Perceptual categorization* – categorization based on similar perceptual features of objects
  - *Conceptual categorization*

LANGUAGE DEVELOPMENT

- **Language**
  - Form of communication that is spoken, written, or signed
  - Based on a system of symbols
  - Consists of the words used by a community and the rules for varying and combining them
- **Infinite generativity** - Ability to produce an endless number of meaningful sentences using:
  - Finite set of words and rules

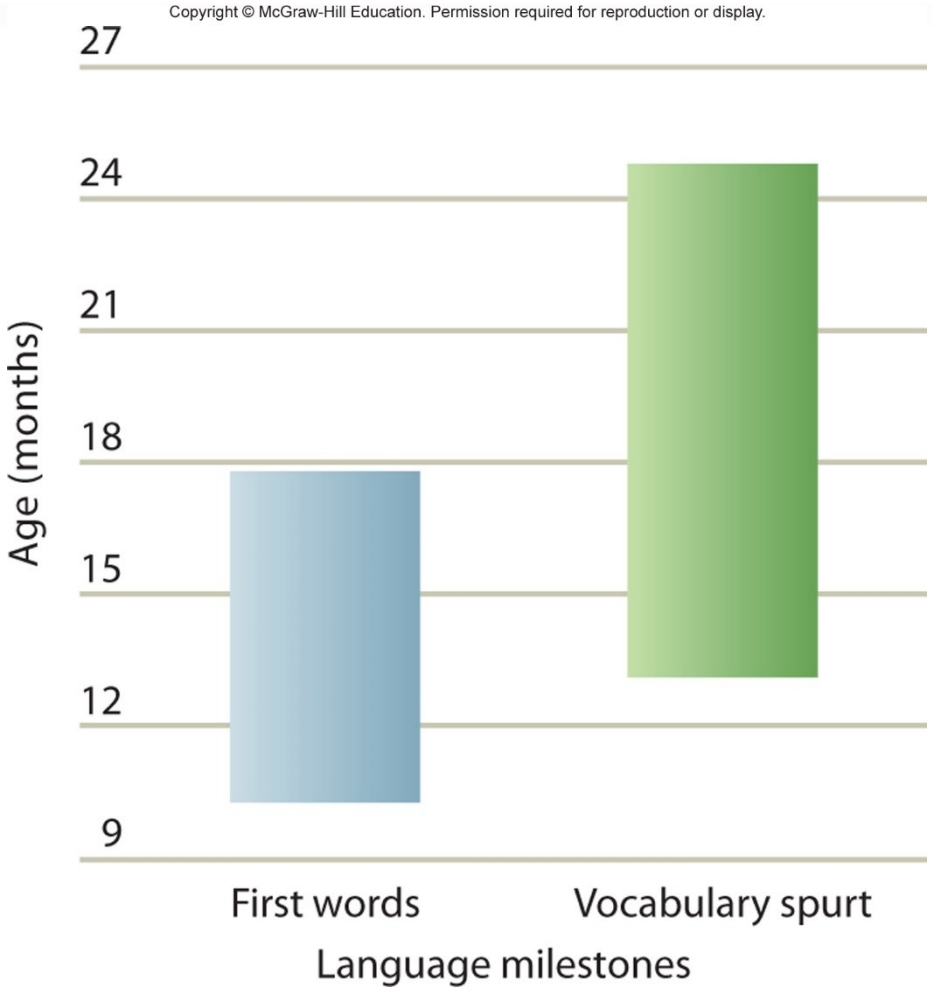
LANGUAGE DEVELOPMENT

- Babbling and gestures
  - Crying
  - Cooing
  - Babbling
  - Showing and pointing
- Recognizing language sounds
  - *Phonemes* – basic sound units of language
  - "Citizens of the world" – infants can distinguish sound changes no matter what language the syllables come from

LANGUAGE DEVELOPMENT

- First words
  - Infant receptive vocabulary considerably exceeds spoken vocabulary
    - *Receptive vocabulary* - Words the child understands
    - *Spoken vocabulary* - Words the child uses
    - Vocabulary spurt – Rapid increase in vocabulary

FIGURE 3.22 - VARIATION IN LANGUAGE MILESTONES



LANGUAGE DEVELOPMENT

- Two-word utterances
  - To convey meaning, child relies on gesture, tone, and context
- **Telegraphic speech**: Use of short and precise words without grammatical markers
  - Articles, auxiliary verbs, and other connectives

LANGUAGE DEVELOPMENT

- Biological influences on language
  - *Broca's area* – Area in the brain's left frontal lobe that is involved in speech production
  - *Wernicke's area* – Area in the brain's left hemisphere that is involved in language comprehension

LANGUAGE DEVELOPMENT

- **Language acquisition device (LAD)**
  - Chomsky's term that describes a biological endowment enabling the child to detect the features and rules of language, including phonology, syntax, and semantics

LANGUAGE DEVELOPMENT

- Environmental influences on language
  - Behaviorist view of language learning has several problems
    - Does not explain how people create novel sentences
    - Children learn the syntax of their native language even if they are not reinforced for doing so
  - Early speech input and poverty has effects on children's language skills
  - Vocabulary development is linked to family's socioeconomic status and type of talk that parents direct to their children
  - **Child-directed speech**: Language spoken in a higher pitch than normal, using simple words and sentences

LANGUAGE DEVELOPMENT

- Strategies to enhance child's acquisition of language:
  - *Recasting*
  - *Expanding*
  - *Labeling*

INTERACTIONIST VIEW

- Biology and experience contribute to language development