Setting the Context: The Expanding Brain

• **Cerebral cortex**
  – Outer furrowed mantle of brain
  – Site of every conscious perception, action, thought
  – Influences behavior a few months after birth
  – Brain volume quadruples during first 4 years

The Expanding Brain

• Neurons formed during fetal period
• After birth, **synaptogenesis** occurs
  – Proliferation of connections at the synapses
  – **Pruning** follows

• **Myelination**: formation of fatty layer encasing axons
  – Visual cortex myelinated by 1 year
  – Frontal lobes, age 20 or beyond
Neural Pruning and Brain Plasticity

- **Plasticity**: Cortex malleable particularly during infancy and early childhood before pruning is complete
  - Plasticity allows other brain regions to compensate following injury
  - Brain is less plastic following childhood

LEARN THE TERMS

- Cerebral cortex
- Axon
- Dendrite
- Synapse
- Synaptogenesis
- Myelination
- Plastic

Basic Newborn States

- **Eating**
  - Amazing changes occur during infancy
- **Reflexes**
  - Automatic responses or actions programmed by non-cortical brain centers
  - Present at birth; promote survival

Breast Milk: Nature’s First Food

- **Breast-feeding pronouncements have undergone historical shifts**
  - Currently recommended by AAP and UNICEF for first 6 months
  - Protects from diseases
- **Correlational studies show that breast-fed babies**
  - Experience fewer gastrointestinal problems and middle ear infections
  - Are more resistant to colds and flu
  - Appear to be superior in later measures of intelligence in elementary school
- **Breast-feeding challenges**
  - Mothers’ need to work
  - Cultural attitudes toward breast-feeding
  - Inability to breast-feed for some mothers
Malnutrition: A Serious Developing-World Concern

• In recent decades, stunting rates declined in poor regions of the world; stunting still affects 209 million children, roughly two in five developing-world girls and boys
  – Undernutrition: Chronic lack of adequate food
    • Kwashiorkor: lack of protein, amino acids
    • Micronutrient deficiencies
  – Stunting: Excessively short stature caused by chronic inadequate nutrition
    • Below 5th percentile in height norms for their age
    • Takes serious toll on cognition, health, and every activity of life

Percentage of Stunted Children Under Age 5 in the Developing World

United States: Developed Country

• Food insecurity in U.S.
  – Concern for lack of sufficient funds for food
    • 1 in 5 mothers report this fear
• Severe food insecurity in U.S.
  • 1 in 10 mothers report lack of food for children
• U.S. Federal Nutrition Programs for Children
  – Food Stamps (now SNAP/Supplemental Nutrition Assistance Program)
  – Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)
  – Child and Adult Care Food Program (CACFP)

LEARN THE TERMS

• Reflex
  – Sucking reflex
  – Rooting reflex
• Undernutrition
• Stunting
• Micronutrient deficiency
• Food insecurity
**Crying: The First Communication Signal**

- **Crying**
  - Lifetime peak at about 5 weeks
  - Distinctive change in crying happens at 4 months
  - Vital to survival
- **Colic**
  - Frantic, continual crying during first 3 months
  - Immature digestive system
  - May contribute to parental stress, but is temporary

**Interventions: What Quiets a Young Baby?**

- **Crying and quieting undergo developmental changes**
  - Pacifier, breast, bottle
  - Swaddling
  - Kangaroo care
  - Hold close to body
  - Infant massage

**Sleeping: The Main Newborn State**

- **Newborns**
  - Sleep 18 hours a day
  - Wake every 3-4 hours
- **6 months**
  - May sleep 6 hours a night
- **1 year**
  - 12 hours a night and naps during day

**Sleep Cycles**

- **(A) Brain-wave patterns during sleep**
- **(B) Time spent sleeping, by age**

Brain-wave patterns and lifespan changes in sleep and wakefulness
Interventions: What Helps a Baby Self-Soothe?

• **Bidirectional influences:** Sleep deprivation contributes to irritability in parents and infant
  – By 6 months, upon waking, infants can self-soothe.

• **What do experts suggest?**
  – Real key to promoting infant sleep is to put a baby to bed with love.
  – Erikson and Bowlby: Sensitive response to crying infant during first year
  – Behaviorists disagree: Do not respond.

Where do you stand?

What does the relevant research reveal about the following co-sleeping stereotypes?

• Co-sleeping makes a child less independent and mature.
• Co-sleeping disrupts parents' and children's sleep.
• Co-sleeping is dangerous because it can cause a baby to be smothered.

Sudden Infant Death Syndrome: SIDS

• 1 in 1,000 in the United States; top-ranking cause of infant death in the developed world.
• Possible relationship with too few or too many neurons in area of brain
• Peak risk zone 1 to 10 months
• Reduce risk:
  – When infants sleeps, place infant on his/her back
  – Keep away from fluffy bedding
  – Utilize baby sleeping-basket

LEARN THE TERMS

• Colic
• Swaddling
• Kangaroo care
• REM sleep
• Self-soothing
• Co-sleeping
• Sudden infant death syndrome (SIDS)
Sensory and Motor Development

What do newborns see?

- Researchers
  - Use the preferential-looking paradigm and habituation techniques
  - Observe changes in the infant's interest in a stimulus from extreme interest to habituation, and finally renewed interest to another new stimulus

- Capabilities
  - With a visual acuity score of roughly 20/400 (versus ideal adult 20/20), a newborn would qualify as legally blind in many states; 20/20 by about year 1

Focusing on Faces

- Newborns
  - Prefer faces to other stimuli, especially mother's face
  - Prefer attractive-looking people
  - Mimic facial expressions
  - Prefer new faces of every ethnicity at 3 months; only discriminate between faces of own ethnicity at 9 months

Newborns looked most at face-like drawing.
Are we biologically programmed to selectively look at faces?

Sensory and Motor Development

- Hearing
  - In the womb, fetuses can discriminate different tones

- Smell
  - Within the 1st week, infants prefer smell of breast milk

- Taste
  - Infants stop sucking and wrinkle face in response to bitter, sour, or salty tastes
  - Avidly suck on sweet solutions

Seeing Depth and Fearing Heights

- Visual cliff
  - When 8 month-old babies begin to crawl, they perceive differences in depth and fear heights
Expanding Body Size and Mastering Motor Milestone

- **Body Growth**
  - Most pronounced in infancy
  - Slows during childhood
  - Increases during preadolescence

- **Motor milestones**
  - Cephalocaudal
  - Proximodistal
  - Mass-to-specific

Variations Related to Infant Mobility

- **Traditional view**: Motor milestones viewed as static stages (e.g., sit, crawl, walk)

- **Contemporary researchers**: Variability and ingenuity of efforts to move acknowledged (e.g., belly-crawling, scooting)
  - Rate at which babies master motor milestones has no relation to later intelligence.
  - Developmental disorders are the exception

- Motor milestones have widespread effects

LEARN THE TERMS

- Preferential-looking paradigm
- Habituation
- Face-perception studies
- Depth perception
- Visual cliff
- Baby-proofing

Cognition: Piaget

<table>
<thead>
<tr>
<th>Piaget</th>
<th>Stages: Focus on Infancy</th>
<th>Basic Principles</th>
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| • Studied his own children  
  • Stage approach | • Sensorimotor  
  • Preoperations  
  • Concrete operations  
  • Formal operations | • Schemas  
  • Assimilation  
  • Accommodation  
  • Adaptation |
Circular Reactions: Habits That Pin Down Reality

| Repetitive action-oriented schemas (habits) | • Through circular reactions, the infant explores and incorporates new information into existing schemas |
| Primary circular reactions (1 to 4 months) | • Infant’s first habits (body-centered) |
| Secondary (about 4 months to 1 year) | • Infant explores environment |
| Tertiary (begin about 1 year) | • “Little scientist” activities (baby explores the properties of objects) |

Tracking Early Thinking

• Evidenced by
  – Deferred imitation
    • When infant repeats an action observed at an earlier time
  – Means end behavior
    • Occurs about 1 year, when infant performs a different or separate action to reach a goal
  – Limitation in Thinking: A-not-B error
    • Approaching year 1, even though a baby sees an object hidden in a second hiding place, he/she returns to the originally viewed hiding place to find it.

Object-Permanence: Sensorimotor Stage

• Understanding that objects exist even when out of sight
  – Around 5-6 months, infants begin to look for hidden objects
  – At about 8 months infant develops object permanence ("little-scientist stage")

A minute ago, this 4-month-old girl was delightedly grabbing this little dog but, when this barrier blocked her image, it was “out of sight, out of mind.”

Critiquing Piaget

• Contributions
  – Transformed perceptions of childhood
• Criticisms
  – Infants grasp physical reality basics before age 1
  – Understanding of physical reality develops gradually
LEARN THE TERMS

• Sensorimotor stage
• Circular reactions
• Primary circular reactions
• Secondary circular reactions
• Tertiary circular reactions
• Little-scientist phase
• Means-end behavior
• Object permanence
• A-not-B error

Cognition: A New Perspective

• **Information-processing**: A perspective on understanding cognition that divides thinking into specific steps and component processes, much like a computer

![Two Impossible Events](image)

Infant Memory and Conceptual Abilities

• **Memory**
  – Babies as young as 9 months can remember events from previous day (deferred imitation)

• **Forming categories**
  – By 7 to 9 months of age, babies can distinguish between animals and vehicles

• **Understanding numbers**
  – By about 5 months, infants can make differentiations between different numbers

Tackling the Core of What Makes Us Human: Infant Social Cognition

• **Social cognition**
  – Refers to any skill related to understanding feelings and negotiating interpersonal interactions
  – Inferences made about people’s inner feelings and goals, based on their actions
  – Begins as early as 5 months

• **Joint attention**
  – First sign of getting human intentions when a baby looks at an object to which an adult points or the infant follows a person’s gaze
**Infant Social Cognition**

- After seeing this video sequence of events, even infants under 6 months of age preferentially reached for the "nice" tiger rather than the "mean dog".

- This shows that the fundamental human social-cognitive awareness, "he's acting mean or nice" emerges at a remarkably young age.

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**LEARN THE TERMS**

- Information-processing approach
- Social cognition

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**Language: The Endpoint of Infancy**

- Noam Chomsky's **nature-oriented** concept: Language Acquisition Device (LAD)
  - Hypothetical brain structure that enables our species to learn and produce language
  - Unique to our human species

- Chomsky's concept is in opposition to Skinner's **nurture-oriented** perspective
  - Language learned by being reinforced for producing specific words

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**Language: Social-Interactionist View**

- The specific language learned is dependent on nurture—the place where a person is reared.

- Presently, **social-interactionist** view:
  - Interactions between baby and caregivers—each wants to communicate, one encourages the other
  - Emphasis on the social function of language
Language Milestones from Birth to Age 2

2–4 months
- Cooing: First sounds growing out of reflexes. Example: "oooh"

6–11 months

12 months
- Holophrases: First one-word sentences. Example: "ja" ("I want juice")

18 months–2 years
- Telegraphic speech: Two-word combinations, often accompanied by an explosion in vocabulary. Example: "Me juice"

Language: Basic Principles

- **Telegraphic speech**
  - First word-combining stage

- **Infant-directed speech (IDS) from caregivers**
  - Higher-pitched, elongated vowels, and exaggerated tones attract baby’s interest
  - Research suggests that IDS helps babies to master language

The relationship between grey matter (synaptogenesis) concentration in the cerebellum at 7 months of age and language comprehension at a child's first birthday

![Graph](image-url)