Chapter 2: Infancy

Module 2.1
Physical Development in Infancy

Looking Ahead

- How do the human body and nervous system develop?
- Does the environment affect the pattern of development?
- What developmental tasks must infants accomplish in this period?
- What is the role of nutrition in physical development?
- What sensory capabilities do infants possess?
Physical Growth

- Rapid growth during first two years

<table>
<thead>
<tr>
<th>Table 2.1</th>
<th>THE MAJOR PRINCIPLES GOVERNING GROWTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth follows a pattern that begins at the head and upper body parts and then proceeds to the rest of the body, based on Greek and Latin roots meaning “head to tail.”</td>
<td>Development proceeds from the center or the body outward, based on the Latin words for “near” and “far.”</td>
</tr>
</tbody>
</table>
Head-to-body size ratio changes dramatically

<table>
<thead>
<tr>
<th>Age</th>
<th>Head-to-body size ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>1/4</td>
</tr>
<tr>
<td>2 Years</td>
<td>1/5</td>
</tr>
<tr>
<td>6 Years Age</td>
<td>1/6</td>
</tr>
<tr>
<td>12 Years</td>
<td>1/7</td>
</tr>
<tr>
<td>25 Years</td>
<td>1/8</td>
</tr>
</tbody>
</table>

Nervous System and Brain

- **Nervous system** comprises the brain and the nerves that extend throughout the body
- **Neurons** are the basic cells of the nervous system
Cellular Basis of Brain Development

- Migration of cells
- Formation and growth of axons
- Formation of dendrites
- Formation of synaptic connections
- Myelination
How brains grow

- **Birth:**
  - 100-200 billion neurons
  - Relatively few neuron-to-neuron connections
- **During first two years:**
  - Billions of new connections established and become more complex

[Images of brain development]

Use it or lose it

**Synaptic pruning**

- Unused neurons are eliminated
- Allows established neurons to build more elaborate communication networks with other neurons
- Development of nervous system proceeds most effectively through loss of cells

*But also note the importance of myelin*
Form and Function: Brain Growth

- Neurons reposition themselves with growth, becoming arranged by function
  - Cerebral cortex
  - Subcortical levels

Environmental Influences on Brain Development

- Plasticity
- Sensitive period
Don’t shake the baby!

- Shaken Baby Syndrome
  - Brain sensitive to injury
  - Shaking can lead to brain rotation within skull
    - Blood vessels tear → severe medical problems, long-term disabilities, and sometimes death

MOTOR DEVELOPMENT
Reflexes: Inborn Physical Skills

- Reflexes: learned, organized involuntary responses that occur automatically in presence of certain stimuli

Major Reflexes in Full-Term Neonates: Survival

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breathing</td>
<td>permanent</td>
</tr>
<tr>
<td>Eye-blink</td>
<td>permanent</td>
</tr>
<tr>
<td>Pupillary</td>
<td>permanent</td>
</tr>
<tr>
<td>Rooting</td>
<td>Disappears over first few weeks; replaced by voluntary head turning</td>
</tr>
<tr>
<td>Sucking</td>
<td>permanent</td>
</tr>
<tr>
<td>Swallowing</td>
<td>permanent</td>
</tr>
</tbody>
</table>
Major Reflexes in Full-Term Neonates:
Primitive

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bibinski (plantar)</td>
<td>8 month-1 year</td>
</tr>
<tr>
<td>Palmar grasping</td>
<td>3-4 months; replaced by voluntary grasping</td>
</tr>
<tr>
<td>Moro</td>
<td>Arms and arching stop at 4-6 months</td>
</tr>
<tr>
<td>Swimming</td>
<td>4-6 months</td>
</tr>
<tr>
<td>Stepping</td>
<td>First 8 weeks</td>
</tr>
</tbody>
</table>
Motor Development in Infancy

Milestones of Normal Motor Development

- 3.2 months: rolling over
- 3.3 months: grasping object
- 5.0 months: sitting without support
- 7.2 months: standing while holding on
- 8.2 months: grasping with thumb and finger
- 9.5 months: standing alone well
- 12.3 months: walking well
- 14.5 months: building tower of two cubes
- 16.6 months: walking up steps
- 23.8 months: jumping in place

(Source: Adapted from Frankenburg et al., 1992)
Motor Development in Infancy

Fine Motor Skills

Table 2.4 MILESTONES OF FINE MOTOR DEVELOPMENT

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Opens hand prominently</td>
</tr>
<tr>
<td>3</td>
<td>Grasps rattle</td>
</tr>
<tr>
<td>8</td>
<td>Grasps with thumb and finger</td>
</tr>
<tr>
<td>11</td>
<td>Holds crayon adaptively</td>
</tr>
<tr>
<td>14</td>
<td>Builds tower of two cubes</td>
</tr>
<tr>
<td>16</td>
<td>Places pegs in board</td>
</tr>
<tr>
<td>24</td>
<td>Imitates strokes on paper</td>
</tr>
<tr>
<td>33</td>
<td>Copies circle</td>
</tr>
</tbody>
</table>

(Source: Adapted from Frankenburg et al., 1992.)
Developmental Norms

Comparing Individual to Group Norms:
- Represent the average performance of a large sample of children of a given age
- Permit comparisons between a particular child’s performance on a particular behavior and the average performance of the children in the norm sample
- Must be interpreted with caution
  - Brazelton Neonatal Behavior Assessment Scale (NBAS)

Nutrition in Infancy

Fueling Motor Development
- Without proper nutrition, infants cannot reach physical potential and may suffer cognitive and social consequences
- Infants differ in growth rates, body composition, metabolism, and activity levels
So what is a healthy caloric allotment for infants?

- About 50 calories per day for each pound of weight
- Most infants regulate their caloric intake quite effectively on their own
- If allowed to consume as much they seem to want, and not pressured to eat more, they will be healthy

Malnutrition

- Children living in many developing countries
- Slower growth rate
- Chronically malnourished during infancy = later lower IQ score
Learning about the World

- Sensation
- Perception

Visual Perception: Seeing the World

- Newborn’s distance vision ranges from 20/200 to 20/600
- By 6 months, average infant’s vision is already 20/20
- Other visual abilities grow rapidly
  - Binocular vision
  - Depth perception