Motor Development

Physical Development

• Growth in bones
  – Lengthen
  – Harden
• Growth in Muscle
  – Lengthen
  – Thicken
• **Physical development necessary for locomotion.

Growth in height and weight from birth to 3 years
Physical Development (cont)

Change in body proportions with age

Brain Developments (3-12 mos)

- Explosion in rate of synaptic density
  - Pruning (Use it or lose it)
- Major synaptic growth in motor cortex - 6 mos.
- Frontal cortex development
  - Control of Inhibition (self-regulation)

Development of Locomotion
Video

• Myrtle McGraw
• Esther Thelen
  – reaching
  – stepping reflex
  – contextual influences on behavior
  – Sequence and timing of motor development
• Microgenetic method

Prenatal Period

• Motor activity believed to promote other aspects of development
  – Synaptic development and pruning

What about later?

What influence does locomotion have on development?
Rosensweig, et al 1972

Procedure.
- Rats raised in 3 environments
  - Normal-isolated
  - Normal-group
  - Enriched-group

Results
- Neuroanatomical changes:
  - wt of cortex, brain enzyme for learning, synapses, cell bodies
- Behavioral effects-learning
- Watching doesn't work!

Held & Hein, 1963

Method
- Kittens raised in darkness
  - Only visual experience in kitty carousel
  - I.V.: Half controllers, half passengers in carousel
  - D.V. Performance on "visual cliff"

(From Held, 1965)

Result
- Kittens who controlled the movement of the carousel
  - avoided the cliff
  - physically adjusted for the "fall"
- Passenger kittens
  - Did NOT avoid cliff
  - Did NOT physically adjust for the "fall"
But what about Humans?

- Visual Cliff
  - Major Finding
    - Before 6 mo babies don’t avoid the visual cliff and cross it.
  - Interpretation
    - Before 6 mo babies depth perception is undeveloped.
    - But there is a confound (2 things varying systematically)
  - Age and locomotion ability

Bertenthal, et al., 1994

- Method
  Participants: Crawlers at 6, 7, or 8 mos.
  Procedure: Assessed on Visual cliff (Gibson & Walk)
    - I.V. Crawling for 11 or 41 days

Percent of infants avoiding deep side of cliff
So, is it locomotion itself that influences performance?

OR, is it experience falling?

Campos, Bertenthal, & Kermoian, 1992

- Method
  - Participants: 7 mos. old infants
  - Procedure: 4 groups
    - Prelocomotors w/walkers
    - Prelocomotors w/out
    - Locomotors w/walkers
    - Locomoter w/out
  - Dependent Measure: heart rate response on visual cliff (Wariness/fear of heights)
Campos, Bertenthal, & Kermoian, 1992

- **Results**
  - Prelocomoters w/ walkers = locomoters without
  - Prelocomoters w/o walkers (no change)
  - “Double dose” locomoters (w/walkers) greatest change

- **Conclusion**
  - Locomotion not age is causal factor in the development of wariness of heights

Bertenthal, et al., 1994

- **Method**
  - Participants: Infants who began to crawl at 6, 7, or 8 mo.
  - Procedure: Assessed after crawling for 11 or 41 days
  - Dependent Measure: Spatial search

Object Permanence Task (Piaget)
<table>
<thead>
<tr>
<th>Infant group</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precrawling</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Belly crawling</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Hands-and-knees crawling</td>
<td>13</td>
<td>5</td>
</tr>
</tbody>
</table>

Benson & Uzgiris, 1985

- Participants: 9- to 12-month old infants
- Method:
  - Hidden objects Task
  - Training - Movement 180° around hiding box
  - Independent Variable
    - Self-Initiated Movement (SIL) vs carried
- Result
  - SIL more frequently correct

Conclusion

★ Active interaction with environment promotes development of:
1. Depth Perception
2. Wariness of heights (emotional development)
3. Spatial Relations (search tasks)
Effects of locomotion on social relationships

Biringen, et al., 1995

• 3 sessions
  9 1/2 mos. (all crawling)
  12 months (some walking-matched control)
  14 mos. (all walking)

Categorized infants as earlier vs later walkers

Measures - Biringen, et al

• Videotaped home observation
  – Rated maternal sensitivity
  – Infant responsiveness
  – “Test of wills”
• Bayley Infant Scales: mental & motor abilities
• Maternal perceptions of infant emotions
Findings - Biringen, et al.

• Earlier walkers had less positive relations
• More testing of wills (esp. boys)
• No cognitive differences.
• Later walkers more stable affective relationship.

• Conclusion
  – When infants start walking has an impact on their social relationship with their caretakers

Conclusion

• Timing of transitions is important!

Piaget’s Theory (Constructivist)

• Action
• Reflex schemas
• Motor activity
• Assimilation/accomodation
Fundamental Principles of Development

- Regressions are common
- Development proceeds unevenly
- Wide individual differences
- Timing is important
- Importance of context
- Sequence is fundamental
- Stagelike changes