Infant Reflexes and Stereotypies

Objectives
• Explain the infant reflexes and their importance.
• Pinpoint and explain the number of infant reflexes.
• Describe the primitive reflexes.
• Describe the postural reflexes.
• List and explain some stereotypies.

What are Infant Reflexes?
• Involuntary stereotyped movement responses to a particular stimuli.
• Dominant movement form during the last 4 months of prenatal life and first 4 months after birth.
• Occur subcortically (below the level of the higher brain centers)
• Examples?
Infant vs. Lifespan Reflexes

- Most "infant" reflexes do not last beyond the first year.
- Infant reflexes may not completely disappear.
  - May be inhibited by maturing CNS.
  - May be integrated into new movements.
- Reflexes that endure are called "lifespan" reflexes.
  - Examples?

Infant reflexes and stereotypies are very important in the process of development.
Why is the study of infant reflexes important?

- Dominant form of movement for last 4 months prenatally and first 4 months postnatally.
- Primitive reflexes critical for human survival.
- Postural reflexes believed to be foundation for later voluntary movements.
- Appearance and disappearance helpful in diagnosing neurological disorders.

Role of the Reflexes in Survival

- Human infants essentially helpless.
  - Highly dependent on their caretakers and reflexes for protection and survival.
- Primitive reflexes occur during gestation or at birth and most are repressed by 6 months of age.
- Primitive reflexes are important for protection, nutrition, and survival.
- Examples?

Role of Reflexes in Developing Future Movement

- Postural reflexes are related to the development of later voluntary movement.
  - Reflexes integrated, modified, and incorporated into more complex patterns to form voluntary movements.
  - Automatic movement is “practice” for future voluntary movements.
  - Some believe reflexes may not be related to future motor development.
  - Examples?
Role of Reflexes in Developing Future Movement

<table>
<thead>
<tr>
<th>Infant Reflex</th>
<th>Future Voluntary Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crawling</td>
<td>Crawling</td>
</tr>
<tr>
<td>Labyrinthine</td>
<td>Upright posture</td>
</tr>
<tr>
<td>Palmar grasp</td>
<td>Grasping</td>
</tr>
<tr>
<td>Stepping</td>
<td>Walking</td>
</tr>
</tbody>
</table>

Reflexes as Diagnostic Tools

- Reflexes can determine **level of neurological maturation**.
  - Reflexes are age-specific in normal, healthy infants
  - Severe deviations from normal time frame may indicate neurological immaturity or dysfunction.

- Reflexes should be **tested** carefully and only by **trained professionals**.
  - Need state of quiet.
  - If baby restless, crying, sleepy, or distracted, may not respond to applied stimulus.

Reflexes as Diagnostic Tools

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moro reflex</td>
<td>May signify cerebral birth injury if lacking or asymmetric.</td>
</tr>
<tr>
<td>Asymmetric tonic reflex</td>
<td>May indicate cerebral palsy or other neurological problem if persists past normal time.</td>
</tr>
</tbody>
</table>
Reflexes as Diagnostic Tools

- Milani Comparetti Neuromotor Development Examination
  - Measures several infant reflexes from birth to 24 months.
  - Develops profile of child’s movement in relation to what is expected at a specific age.
  - Especially valuable with children suspected of motor delay.

Reflexes as Diagnostic Tools

- Primitive Reflex Profile
  - Quantification of the level of presence or strength of primitive reflexes
  - 3 reflexes: moro, asymmetric tonic neck, symmetric tonic neck
  - 5 point classification system (0 for absent, 4 for so strong it dominates individual).

Pinpointing the Number of Infant Reflexes

- Different terminologies used for same reflex by experts
  - Rooting reflex = search reflex; cardinal points reflex
- Reflexes are often poorly defined and more complex than once thought
  - Palmar grasp vs. traction response
Primitive Reflexes

- Palmar Grasp
- Sucking
- Search
- Moro
- Startle
- Asymmetric Tonic Neck
- Symmetric Tonic Neck
- Plantar Grasp
- Babinski
- Palmar Madibular
- Palmar Mental

One of the most noticeable reflexes
May lead to voluntary reaching / grasping
May predict handedness in adulthood

No palmer grasp may indicate neurological problems (spasticity)

In utero - 3 months postpartum

S: touch of lips
R: sucking action

Often in conjunction with searching reflex
**Primitive Reflexes ~ Search**

| Stimulus / Response | S: touch cheek  
|---------------------|-----------------  
| R: head moves toward stimuli |  
| Duration | Weeks prenatal - 3 months postpartum  
| Concerns | No reflex problematic for nutrition  
| No reflex or lack of persistence may be sign of CNS or sensorimotor dysfunction. |  
| Other | Often in conjunction with sucking reflex.  
| | Contributes to head/body-righting reflexes.  

**Primitive Reflexes ~ Moro**

| Stimulus / Response | S: Suddenly but gently lower baby’s head  
|---------------------|---------------------------------  
| S: Hit surface beside baby |  
| R: Arms and legs extend |  
| Duration | Prenatal – 4-6 months postpartum  
| Concerns | May signify CNS dysfunction if lacking  
| May signify sensory motor problem if persists  
| May delay sitting & head control if persists  
| May indicate injury to one side of brain if asymmetrical |  
| Other | Reaction time increases with age  
| | Preceeds startle reflex |
### Primitive Reflexes ~ Startle

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>Duration</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>S: Same as Moro</td>
<td>2-3 months after Moro disappears – 1 year</td>
<td>Less severe startle reflexes elicited through lifespan</td>
</tr>
<tr>
<td>R: Arms and legs flex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Primitive Reflexes ~ Asymmetric Tonic Neck

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>Duration</th>
<th>Concerns</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>S: Prone/supine position, turn head to one side</td>
<td>After birth – 3 months</td>
<td>Facilitates bilateral body awareness, Facilitates hand-eye coordination</td>
<td>Also called 'bow and arrow' or 'fencer’s' position</td>
</tr>
<tr>
<td>R: Limbs flex on one side, extend on other side</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Primitive Reflexes ~ Symmetric Tonic Neck

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>Duration</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>S: Baby sitting up and tip forward</td>
<td>After birth – 3 months</td>
<td>Persistence may impede many motor skills and cause spinal flexion deformities</td>
</tr>
<tr>
<td>R: Neck and arms flex, legs extend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S: Baby sitting up and tip backward</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R: Neck and arms extend, legs flex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Primitive Reflexes ~ Plantar Grasp

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>R: Toes grasp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Birth – 1 year</td>
</tr>
<tr>
<td>Other</td>
<td>Must disappear before the baby can stand or walk. Issue of shoes versus no shoes?</td>
</tr>
</tbody>
</table>

### Primitive Reflexes ~ Babinski

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>S: Stroke bottom or lateral portion of foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>R:</td>
<td>Great toe turns downward</td>
</tr>
<tr>
<td>Duration</td>
<td>Birth – 4 months</td>
</tr>
<tr>
<td>Concern</td>
<td>Test of the pyramidal tract (i.e. ability to perform conscious / voluntary movement)</td>
</tr>
</tbody>
</table>

### Primitive Reflexes ~ Palmar Mandibular

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>S: Pressure to both palms or hair to hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>R:</td>
<td>Eyes close, mouth opens, and/or neck flexes (which tilts the head forward)</td>
</tr>
<tr>
<td>Duration</td>
<td>Birth – 3 months</td>
</tr>
<tr>
<td>Other</td>
<td>Also called the Babkin reflex</td>
</tr>
</tbody>
</table>
Primitive Reflexes ~ Palmar Mental

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>S: Scratch base of palm</th>
<th>R: Lower jaw opens and closes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Birth – 3 months</td>
<td></td>
</tr>
</tbody>
</table>

Postural Reflexes

- Stepping
- Crawling
- Swimming
- Head and Body Righting
- Parachuting
- Labyrinthine
- Pull Up

Postural Reflexes ~ Stepping

<table>
<thead>
<tr>
<th>Stimulus / Response</th>
<th>S: Infant upright with feet touching surface</th>
<th>R: Legs lift and descend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>After birth – 5-6 months</td>
<td></td>
</tr>
<tr>
<td>Concerns</td>
<td>Essential forerunner to walking</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Sometimes called walking reflex</td>
<td>Developmental changes in reflex over time</td>
</tr>
</tbody>
</table>
### Postural Reflexes ~ Crawling

| Stimulus / Response | S: Prone position on surface, stroke alternate feet  
R: Legs and arms move in crawling action |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Birth – 3-4 months</td>
</tr>
<tr>
<td>Concerns</td>
<td>Precursor to later voluntary creeping</td>
</tr>
</tbody>
</table>

### Postural Reflexes ~ Swimming

| Stimulus / Response | S: Infant held horizontally  
R: Arms and legs move in coordinated swimming type action |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>2 weeks after birth – 5 months</td>
</tr>
<tr>
<td>Other</td>
<td>Recognition of reflex led to popularity of infant swim programs</td>
</tr>
</tbody>
</table>

### Postural Reflexes ~ Head and Body Righting

| Stimulus / Response | S: Supine, turn body in either direction  
R: Head "rights" itself with the body  
S: Supine, turn head in either direction  
R: Body "rights" itself with the head |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>Head:1-6 months; Body: 5 months-1 year</td>
</tr>
<tr>
<td>Concerns</td>
<td>Related to voluntary rolling movements.</td>
</tr>
<tr>
<td>Reflexes ~ Parachuting</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>----------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Stimulus / Response</strong></td>
<td>S: Off balance in upright position</td>
</tr>
<tr>
<td></td>
<td>R: Protective movement in direction of fall</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>4 months – 1 year</td>
</tr>
<tr>
<td><strong>Concerns</strong></td>
<td>Assessed in preterm babies as markers of neurological development</td>
</tr>
<tr>
<td></td>
<td>Related to upright posture</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Also called propping reflex</td>
</tr>
<tr>
<td></td>
<td>Occurs downward, sideways, &amp; backward</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reflexes ~ Labyrinthine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stimulus / Response</strong></td>
<td>S: Baby held upright, tilted in one direction</td>
</tr>
<tr>
<td></td>
<td>R: Baby tilts head in opposite direction</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>2-3 months – 1 year</td>
</tr>
<tr>
<td><strong>Concerns</strong></td>
<td>Related to upright posture</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Also considered primitive reflex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reflexes ~ Pull Up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stimulus / Response</strong></td>
<td>S: Sitting/standing, hold hands, tip in one direction</td>
</tr>
<tr>
<td></td>
<td>R: Arms flex or extend in to maintain upright position</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>3 months – 1 year</td>
</tr>
<tr>
<td><strong>Concerns</strong></td>
<td>Related to upright posture</td>
</tr>
</tbody>
</table>
Stereotypies

• Reflexes are most studied form of human movement during first few months.
• Stereotypies are another form of movement observable during infancy.
• Characterized by patterned, stereotyped, highly intrinsic, and involuntary movements of the body

Stereotypies

• Lourie (1949)
  – Unusual movements are inherent and crucial to life of a healthy child
  – Decrease tension and anxiety
  – Provide stimulation for development of later voluntary movements

Stereotypies

• Thelen (1979)
  – Serve no purpose
  – Not regulated by the nervous system
  – Infants spent up to 40% of time exhibiting stereotypies (peaks at 24-42 weeks).
  – Grouped stereotypies by body region
    • Legs and feet
    • Hands and arms
    • Fingers
    • Torso
    • Head and face
Stereotypies

- Common stereotypies
  - Single leg kick
  - Two-leg kick
  - Alternate leg kick
  - Arm wave
  - Arm wave with object
  - Arm banging against a surface
  - Finger flexion

Video Clips of Infant Reflexes