Testing Procedures for Developmental Reflexes

Rooting Reaction

- **ONSET:** Begins 28 weeks gestation
- **INTEGRATION:** 2-5 months
- **POSITION:** Place child supine with head in midline and the hands on the chest.
- **PROCEDURE:** Using your finger, stroke the perioral skin at the corner of the mouth, moving laterally toward the cheek, upper lip, and the lower lip, in turn.
- **RESPONSE:** After stimulation of the corners of the mouth, there is a directed head turning toward the stimulated side. Stimulation of the upper lip produces opening of the mouth and retro flexion of the head. Stimulation of lower lip produces mouth opening and ventro flexion of the head. In all instances the infant tries to suck the stimulating finger.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Absent in depressed babies, particularly those depressed by barbiturates.
  - Turning away from the stimulus will occur in satiated babies.
  - Asymmetry can indicate insult to one side of the brain, or facial injury.
  - Can be facilitated by placing infant in feeding position before stimulating.

Sucking

- **ONSET:** Begins 28 weeks gestation
- **INTEGRATION:** 2-5 months
- **POSITION:** Place child supine with head in the midline, hands on the chest.
- **PROCEDURE:** Place a finger or nipple into the infant's mouth.
- **RESPONSE:** Rhythmical sucking movements.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Poor sucking (weak, slow, with short periods) is found in apathetic babies. Suck may even be absent.
  - Barbiturates seem to depress sucking. (Breast-fed baby whose mother is receiving drugs may be affected.)
  - Sucking is often less intense and less regular during first few days.
  - Satisfied babies will show weak suck. Hungry babies will suck initially, cry to non-nutritive stimulus.
  - Failure to obtain is early indicator of CNS dysfunction.
  - Persistence beyond 5 months is often seen in children with oral-motor dysfunction.
Traction Response
- **ONSET:** 28 weeks gestation
- **INTEGRATION:** 2-3 months
- **POSITION:** Place child supine with head in the midline.
- **PROCEDURE:** Grasp child's wrists and pull toward sitting position, stretching the shoulder adductors and arm flexors.
- **RESPONSE:** Action of shoulders, elbows, wrist and fingers in synergistic pattern.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Symmetry/dysmetry of movement, strength at 26-28 weeks.
  - Asymmetry may indicate one side of brain or injury to shoulder muscles or brachial plexus.
  - Persistence beyond 5 months may indicate lack of interlimb relationships.

Moro
- **ONSET:** Begins at 28 weeks gestation
- **INTEGRATION:** 5-6 months
- **POSITION:** Place child supine with head in the midline, arms on chest.
- **PROCEDURE:** Support infant's head and shoulders with hand, allow head to drop back 20-30 degrees with respect to trunk, stretching neck muscles.
- **RESPONSE:** Abduction of arms with extension of the elbows, wrists and fingers, followed by subsequent adduction of the arms and internal rotation.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate insult to one side of brain, injury to peripheral nerves of the extremity or the muscles of the extremity.
  - Persistence beyond 6 months may indicate CNS dysfunction.
  - Different from the Startle reaction which can be elicited by a loud noise or sudden light, and consists of a flexor movement and eye blink only.
  - Integration coincides with development of head control.

Crossed Extension
- **ONSET:** Begins at 28 weeks gestation
- **INTEGRATION:** 1-2 months
- **POSITION:** Place child supine with head in midline, arms on chest and lower extremities extended.
- **PROCEDURE:** Hold one leg at the knee, maintaining that extremity in extension, apply firm pressure to sole of the foot. Test both lower extremities.
- **RESPONSE:** Flexion, adduction and then extension of contralateral lower extremity.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate injury to peripheral nerves of the extremity or muscle weakness.
  - Failure to obtain may indicate spinal cord lesion.
Flexor Withdrawal

- ONSET: Begins 28 weeks gestation
- INTEGRATION: 1-2 months
- POSITION: Place child supine with head in the midline, legs relaxed and semi-flexed.
- PROCEDURE: Noxious stimuli, such as pinprick or pinch to side of one foot.
- RESPONSE: Withdrawal of stimulated leg from the stimulus. Flexor response attenuated.

DEVELOPMENTAL SIGNIFICANCE:
- Abnormality in the integrity of the flexor spinal reflex arcs of the lower limbs as mass characteristic.
- Prolonged withdrawal response to repeated stimuli.
- Persistence beyond 2 months may indicate CP or DMD.

Galant's Response (Incurvation of the Trunk)

- ONSET: Begins at 32 weeks gestation
- INTEGRATION: 2 months, may persist
- POSITION: Place infant in prone position, in normal alignment of head and trunk.
- PROCEDURE: Gently stroke along a paravertebral line about 3 centimeters from midline and from shoulder down to buttocks. Stimulate repetitively. Stimulate on both sides.

DEVELOPMENTAL SIGNIFICANCE:
- One of the more primitive reflexes in normal newborns.
- Absent response indicates the level of a transverse lesion of the spinal cord.
- Long-lasting persistence of a normally temporary response may indicate a syndrome.
- Persistence may cause an asymmetrical development in the development of types movements at the neck for sitting and standing.

Neonatal Neck Righting

- ONSET: Begins 34 weeks of gestation
- INTEGRATION: Inhibited by neck righting with rotation along body axis to 4 months.
- POSITION: Place child supine, head in midline.
- PROCEDURE: Turn child's head to one side. Test both directions.
- RESPONSE: The child's trunk may initially swing in opposite direction then will follow the direction of the headturn. Body turns as an entity.

DEVELOPMENTAL SIGNIFICANCE:
- Needed for child to roll from back to side.
- Asymmetrical response indicates CNS dysfunction.
- May be important in the birth process.
- Obligate neck righting and inability to flex to side may be neurologic.
**Proprioceptive Placing (Legs)**

- **ONSET:** Begins 35 weeks of gestation
- **INTEGRATION:** 2 months
- **POSITION:** Hold the child in a vertical position near edge of examining table. Examiner’s hands are placed under the arms and around the chest. Support the head of young infants.
- **PROCEDURE:** Move the child so that dorsum of one foot presses firmly against edge of table.
- **RESPONSE:** Infant’s foot is lifted by flexion in knee and hip above table. The leg then extends and the foot is placed squarely on the tabletop.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate CNS dysfunction, muscle weakness or peripheral nerve injury.
  - Response should be seen only in leg that is stimulated. Bilateral response to unilateral stimulus may indicate CNS dysfunction.
  - May be obtained at any age as a withdrawal response if traction exerted against foot to point of discomfort.

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**Spontaneous Stepping**

- **ONSET:** Begins 37 weeks gestation
- **INTEGRATION:** 2 months
- **POSITION:** Support infant in the vertical position with examiner’s hands under the arms and around the chest.
- **PROCEDURE:** Support child upright, feet touching the table surface. Incline the child forward and gently move the child forward to accompany any stepping.
- **RESPONSE:** Child will make alternating, rhythmical and coordinated stepping movements.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Premature infants walk in toe-heel fashion, full term infants walk with alternate foot contact.
  - Asymmetry may indicate CNS dysfunction, muscle weakness or peripheral nerve injury.
  - Stepping reaction is integrated along with neonatal positive supporting.
  - Differs from voluntary walking, as spontaneous stepping is rhythmical and not dependent on gravity, no equilibrium.

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**Tonic Labyrinthine**

- **ONSET:** Birth
- **INTEGRATION:** 6-12 months
- **POSITIONS:**
  - **Supine** – place infant in supine, head in midline.
  - **Prone** – place infant in prone, head turned to one side, trunk aligned.
- **PROCEDURE:**
  - Child in supine, push up to sitting position with examiner’s hand on back of child’s head. Evaluate presence of extensor tone by amount of pressure of infant’s head and trunk pushing back.
  - Child in prone, lift his head up 90 degrees to evaluate presence of flexor tone by amount of pressure of infant’s head pushing down.
- **RESPONSE:**
  - **Supine** – extensor tone dominates, child will not flex in push to sit. Examiner will feel child push head back into examiner’s hand. Hips will be extended.
  - **Prone** – child will demonstrate, child will not lift head even if examiner touches head. Hips will be flexed. Examiner will feel child push chin down into examiner’s hand.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Child will not be able to lift head to clear airway in prone.
  - Child will not be able to bring hands to mouth in supine.
  - If dominates posture and persists, motor development will be delayed.
Proprioceptive Placing (arms)

- **ONSET:** Birth
- **INTEGRATION:** 2 months
- **POSITION:** Support infant in the vertical position with examiner’s hands under the arms and around the chest. Support head of young infant.
- **PROCEDURE:** Move child so that the dorsum of one hand firmly presses against a protruding edge of a tabletop.
- **RESPONSE:** Extremity flexes and the hand is brought above the table. The extremity then extends with wrist extended, fingers extended, and abducted, and places on the surface. Fingers may remain fisted in the newborn, and only extremity and wrist extend.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate CNS dysfunction, peripheral nerve injury, and primary muscle weakness.
  - Response should be seen only in the arm that is stimulated. Bilateral response to unilateral stimulus may indicate CNS dysfunction.

Asymmetrical Tonic Neck

- **ONSET:** Birth to 2 months
- **INTEGRATION:** 4-6 months
- **POSITION:** Place child supine with head in midline.
- **PROCEDURE:** Turn the head slowly to one side, and hold in the extreme position with jaw over the shoulder. Child may turn head actively.
- **RESPONSE:** Arm and leg on jaw side, extend. Arm and leg on skull side flex.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - In full term infants, upper extremities participate more strongly than lower extremities. In premature, response seen more strongly in lower extremities.
  - Disappears as neck-righting with rotation appears.
  - Asymmetry may indicate CNS dysfunction, peripheral nerve injury or primary muscle weakness.
  - Response never totally obligatory in a normal infant.
  - Persistence beyond 6 months is indication of CNS dysfunction.
  - The many problems that may be noted with an imposable ATNR include: inability to engage hands in the midline, scoliosis, subluxation or dislocation of hip on skull side, inability to grasp and regard an object at the same time, inability to separate movements of the head from movements of the arms and trunk.

Palmar Grasp

- **ONSET:** Birth to 2 months
- **INTEGRATION:** 4-6 months
- **POSITION:** Place infant supine with head in midline and hands free.
- **PROCEDURE:** Place index finger of examiner into the hands of the infant from the ulnar side and gently press against the palmar surface.
- **RESPONSE:** Infant’s fingers will flex around the examiner’s index finger.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Following development of grasp reflex, infant begins to reach and utilize crude palmar grasp.
  - Asymmetry may indicate CNS dysfunction, primary muscle weakness or peripheral nerve injury.
  - Must be inhibited to get voluntary prehension.
Avoidance Reactions

- **ONSET**: Begins at birth, develops over first ten months.
- **INTEGRATION**: 6-7 years
- **POSITION**: Supine, or sitting with head in neutral and handle free.
- **PROCEDURE**: Using your own fingers, touch child with a light, distally moving contact to ulnar border, volar surface of fingers, radial border of hand.
- **RESPONSE**:
  - Ulnar border – radial deviation, supination
  - Volar surface – extension, abduction fingers
  - Radial border – ulnar deviation, pronation
- **DEVELOPMENTAL SIGNIFICANCE**:
  - Avoiding responses contaminate posture and movement throughout early childhood.
  - Avoiding responses can be elicited easily in children through 0-7 years.
  - Well-coordinated reach and grasp seen as avoidance reactions integrated.
  - Exaggeration of avoiding responses reported in athetoid cerebral palsy child and children with minimal brain dysfunctions.

Landau

- **ONSET**: 2-4 months
- **INTEGRATION**: 12-24 months
- **POSITION**: Examiner supports child horizontally in the air in prone position with one hand under the lower part of the thorax.
- **PROCEDURE**: Position in space.
- **RESPONSE**: Head extends, back and hips extend in sequence.
- **DEVELOPMENTAL SIGNIFICANCE**:
  - This is not an isolated reflex but a reaction produced by labyrinthine righting, optical righting, body on head, body on body and neck righting.
  - Never invariably present even during the second half of the first year.
  - Poor quality of response seen in children with congenital myopathies, or hypotonia.
  - Breaks up total flexor pattern seen at birth, promotes extension.

Visual Placing (arms)

- **ONSET**: 3-4 months
- **INTEGRATION**: Persists throughout life
- **POSITION**: Examiner holds child vertically under the arms and around the chest.
- **PROCEDURE**: Advance child toward supporting surface such as tabletop.
- **RESPONSE**: The child will flex elbow, extend wrist then hand, and place it on the support with fingers extended and abducted.
- **DEVELOPMENTAL SIGNIFICANCE**:
  - Asymmetry may indicate CNS dysfunction particularly hemiplegia, primary muscle weakness, or peripheral nerve injury.
  - Requires visual attention, not seen in newborns or blind children.
  - Failure to obtain may indicate CNS dysfunctions.
  - PLEASE NOTE: Tactile placing may be elicited by touching dorsum of child’s hand on tabletop. Child will place. Onset, integration, and response are identical.
Visual Placing (legs)

- **ONSET:** 3-5 months
- **INTEGRATION:** Persists throughout life.
- **POSITION:** The examiner holds the child vertically with hands under the infant's arms and around the chest.
- **PROCEDURE:** Advance child toward supporting surface such as tabletop.
- **RESPONSE:** Child will lie leg and then extend foot on top of table or supporting surface.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate CNS dysfunction particularly hemiplegia, primary muscle weakness, or peripheral nerve injury.
  - Required visual response, not seen in newborns or blind children.
  - Needed for independent walking to place over obstacles in path.
  - PLEASE NOTE: Tactile placing may be elicited by touching dorsum of child's foot on tabletop. Child will place. Onset, integration, and response are identical.

Symmetrical Tonic Neck

- **ONSET:** 4-6 months
- **INTEGRATION:** 10-12 months
- **POSITION:** Place child in ventral position supported by the trunk, over the examiner's knees.
- **PROCEDURE:** Examiner passively first ventroflexes then dorsiflexes the child's head.
- **RESPONSE:** Ventroflexion of the head produces flexion of the upper extremities, extension of the lower extremities. Dorsiflexion of the head produces extension of the upper extremities and flexion of the lower extremities. In some children the opposite response is seen. Ventroflexion of head produces extension of upper extremities, flexion of lower. Note and change in posture of extremities with movements of head in sagittal plane.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - May be used by infant to get into four-point position.
  - Integration of this reflex coincides with crawling in four-point position.
  - Persistence of this reflex prevents the child from moving trunk and extremities in rotational patterns when head is moved in a sagittal plane.

Neck Righting

- **ONSET:** 4-6 months
- **INTEGRATION:** 5 years when child can get to standing without rotation.
- **POSITION:** Place child supine, head in midline.
- **PROCEDURE:** Flex child's head and rotate slowly to one side. Hold in extreme position with jaw over shoulder. Repeat on opposite side.
- **RESPONSE:** Child will turn in direction of head turning. Rotation of shoulders, trunk and then pelvis to side or prone.
- **DEVELOPMENTAL SIGNIFICANCE:**
  - Needed for child to roll supine to prone and prone to supine.
  - Indicates rotation around body axis has developed in child.
  - Asymmetry may indicate CNS dysfunction, muscle weakness or hypertonus.
  - Body will right to neck dorsiflexion or ventroflexion as well.
  - Used in child prone to four-point position and upright kneeling.
Body Righting

- **ONSET:** 4 to 6 months
- **INTEGRATION:** Inhibited by child, 4-5 years.
- **POSITION:** Place child supine, head in midline.
- **PROCEDURE:** Flex one leg and rotate it across the pelvis to the opposite side.
- **RESPONSE:** The child will turn to prone segmentally, first the trunk, then pectoral girdle and then head.

- **DEVELOPMENTAL SIGNIFICANCE:**
  - Asymmetry may indicate CNS dysfunction, primary muscle weakness or peripheral nerve injury, or an uncooperative child.
  - Important in acquisition of sitting, and standing.
  - Persistence of complete rotation from supine to prone to get to sitting beyond 4 years indicates sensorimotor delay. Often seen in children with mild brain dysfunction after 5 years of age.

Instinctual Grasp

- **ONSET:** Begins 4 months, develops to 11 months
- **INTEGRATION:** Persists
- **POSITION:** Sitting, hands and arms are free.
- **PROCEDURE:** Touch any part of the hand with the eraser end of a pencil.
- **RESPONSE:** Child will orient, adjust to stimulus, grope after stimulus, and eventually prehend the pencil.

- **DEVELOPMENTAL SIGNIFICANCE:**
  - Orientation of hand to contact stimulus, vision not required.
  - Well-coordinated movement of the limb in space occurs only after development of the instinctive grasp reaction and its integration with visual mechanisms.
  - Child will adjust posture to grasp with pronation if an object presented horizontally, grasp with supination if an object presented vertically.
  - When developed completely, true pincer grasp with opposition of thumb and index finger can occur.

Tilting Reaction – Prone

- **ONSET:** 6 months
- **INTEGRATION:** Persists throughout life
- **POSITION:** Place the child prone on a tilt board.
- **PROCEDURE:** Slowly tilt board laterally to the right and left.
- **RESPONSE:** As the center of gravity is displaced off the base of support, the child will curve against the displacement of center of gravity, concavity of the spine upward toward the tilt, the upper arm and leg may abduct in an attempt to bring center of gravity back over base of support. Curving of the trunk is the most important element.

- **DEVELOPMENTAL SIGNIFICANCE:**
  - Medial righting reflex.
  - Asymmetry may indicate CNS dysfunction or muscle weakness.
  - Necessary part of balance mechanism for supporting prone on hands, and bring one arm in prone to reach for a toy.
  - Labyrinth must be intact for tilting to be present.
  - Quick tilt will produce protective extension.
  - PLEASE NOTE: Same reaction called Equilibrium Reaction if child is placed on non-movable surface. Child is pushed slowly to move center of gravity off base of support.
Positive Support – Weight Bearing

- **ONSET**: 6-9 months
- **INTEGRATION**: Persists throughout life
- **POSITION**: Examiner supports infant in vertical position with hands under the infant's arms and around the chest.
- **PROCEDURE**: Allow the infant's feet to make firm contact with tabletop or other flat surface.
- **RESPONSE**: Simultaneous contraction of the lower extremity flexors and extensors for full weight bearing on the lower extremities, hips and knees are extended.
- **DEVELOPMENTAL SIGNIFICANCE**:
  - Needed for normal standing and walking.
  - Asymmetry may indicate CNS dysfunction, muscle weakness or peripheral nerve injury.
  - Absent or weak in child with hypotonia, primary muscle disease, or spinal cord injury.

Protective Extension – Forward

- **ONSET**: 6-7 months
- **INTEGRATION**: Persists throughout life
- **POSITION**: Examiner supports infant in vertical position in space with hands around the infant's body.
- **PROCEDURE**: Plunge child downward toward a table or other flat surface.
- **RESPONSE**: The child will extend head, extend and abduct arms and fingers as if to break a fall. Weight is taken on extended arms.
- **DEVELOPMENTAL SIGNIFICANCE**:
  - Needed for sitting with arm support and four-point kneeling.
  - Asymmetry may indicate muscle weakness, peripheral nerve injury, or CNS dysfunction.
  - Protective extension plus positive supporting reaction allow child to protect against a fast tilt of center of gravity off base of support.

Protective Extension – Sideways

- **ONSET**: 7-8 months
- **INTEGRATION**: Persists throughout life
- **POSITION**: Place child in sitting position with legs out in front.
- **PROCEDURE**: Examiner pushes child on one shoulder with enough force to displace center of gravity over base of support and cause child to lose balance.
- **RESPONSE**: Child will abduct arm on side opposite force with extension of elbow, wrist, and fingers before contact is made with the table. Weight is taken on open palm and fingers.
- **DEVELOPMENTAL SIGNIFICANCE**:
  - Asymmetry may indicate muscle weakness, peripheral nerve injury, or CNS dysfunction.
  - Needed for sitting with and without hand support.
  - Failure to obtain may indicate developmental delay or mental retardation.
Tilting Reaction – Supine

- ONSET: 7–8 months
- INTEGRATION: Persists throughout life
- POSITION: Place child supine on a tilt board, center of rotation of board longitudinally along body axis.
- PROCEDURE: Slowly tilt board laterally, left and right.
- RESPONSE: Child’s trunk is curved against the tilt, with the concavity of the spine upward. The head or rotated with the face toward the upper side. Slight abduction of the upper arm and leg may be seen.

Tilting Reaction – Sitting

- ONSET: 7–8 months
- INTEGRATION: Persists throughout life
- POSITION: Sitting on tilt board facing crosswise or lengthwise, with the vertical body axis directly over the center of rotation of the board.
- PROCEDURE: Slowly tilt board to the right and left then antero-posteriorly, so the center of gravity is displaced off the base of support.
- RESPONSE: To lateral tilt, the body remains upright and is flexed against the tilt, with the concavity of the spine upward; the neck is flexed laterally and the head slightly rotated with the face toward the upper side. The arm and leg on the upper side are abducted while those on the lower side are adducted and extended.
- To anterior tilt, the body remains upright, the spine extends and the limbs are retracted.
- To posterior tilt, the body remains upright, with the spine flexing; the arms are flexed at the shoulders, elbows extended. Curving of the trunk is the most important element.
- DEVELOPMENTAL SIGNIFICANCE:
  - Asymmetry may indicate CNS dysfunction.
  - Full tilt reaction in prone and beginning tilt in sitting necessary for sitting independently.
  - Indicates right reactions have been modified.
  - Quick tilt will produce protective extension.
- NOTE: Same reaction called Equilibrium Reaction if child is placed on non-movable surface. Child is pushed hard enough to move center of gravity off base of support.

Balance & Equilibrium – Tilting Reactions

- Balance are Equilibrium reactions when placed on unmovable object. This is what we really studied in lab by perturbing balance. This is how we mainly move through life. Movement is a constant losing of balance and regaining it against gravity to move through space.