

# Primitive (Primary) Reflexes

*What is a reflex?*

A **Reflex** is an involuntary - but predictable - reaction to a sensory stimulus.

*What are primitive reflexes?*

**Primitive Reflexes** are reactions to sensory stimulus that are seen in a developing baby. Primitive reflexes are typically seen during the first 6-12 months to life - and are a normal part of the baby learning to move their bodies. Primitive reflexes set up the body for functional movement.

*What is reflex integration?*

As the baby's neurological system develops, higher levels of the brain take over control of muscle movement. The baby begins to move their body with purpose. Primitive reflexes begin to fade out as higher levels of the brain become responsible for movement. This fading out is known as reflex **integration**. Most primitive reflexes are integrated by 6-12 months of age.

Reflexes do not disappear completely - higher levels of the brain just typically override them with purposeful movement. The brain's ability to override reflexes is impacted by many things. If the child does not have adequate exposure to movement (like if a health condition limited movement during the first year of life), higher levels of the brain may not have enough experience to take over. Integration may be delayed until the baby has more experience with movement.

Likewise, it is normal for reflexes to appear if an individual is overly fatigued, stressed or using all of their "brain power" for another task (for example: concentrating extremely hard on something, using great strength for an activity). The brain is overtaxed in these circumstances, and so its ability to override the reflexes may be reduced. Its ability to override reflexes should return to normal once the stressors are removed.

*What does it mean when a reflex is "retained"?*

In some circumstances, the brain's ability to override reflexes is more than reduced, it is impaired. In these situations, the primitive reflexes can be seen even though there is not an apparent excessive use of "brain power". When reflex activity is present consistently, it is considered to be "**retained**".

*My child demonstrates retained reflexes. Is something wrong with them?*

It is not always clear why the brain is not overriding the reflexes. In some instances, it may be due to an underlying neurological condition - such as ADHD, ADD, ASD, etc. In most instances, there is not a clear cut reason - just a small glitch in the development of the neurological system. However, if your child demonstrates retained primitive reflexes, it is important that you discuss this with your pediatrician to rule out any underlying issues.

*How are retained reflexes going to impact my child?*

As per definition, a reflex is an involuntary response to a stimulus. If a child has a "retained" reflex, when he encounters that stimulus, his neurological system will perform the involuntary response. This can become exhausting, because the child must then work twice as hard at responding the way that he should or needs to. The specific ways in which your child's functional performance depends on what reflex is present, which is described in detail below.

# Asymmetrical Tonic Neck Reflex (ATNR)



## ATNR

### ASYMMETRICAL TONIC NECK REFLEX

**Onset:** 0-2 months

**Integration:** 4-6 months

**Stimulus:** Rotation of the head (turning head towards shoulder)

**Response:** Arm and leg on the "face" side straightens. Arm and leg on the "back of head" side bends.

**Purpose:** Prepares the body for reaching (arm extends towards an object the baby is looking at).

## What May Happen If The ATNR Is Retained?

- **Poor Sitting Posture-** Child may sit asymmetrically in a chair. The arm and leg on the "face" side may extend & trunk rotates away from midline. Because child is not upright and centered in a chair, he appears "inattentive" and perhaps "disruptive" when sitting at a table with peers.
- **Attention & Focus-** When child turns his head, their whole body may also turn. This is very distracting and may interfere with task compliance.
- **Impaired Pre-writing & Writing-** When the child rotates his head away from midline, one arm will be influenced to straighten and the other to bend. This will hinder the child's ability to stabilize the paper with non-dominant hand and controlled use of writing tools with the dominant hand. The child may compensate with an immature pencil grasp and/or need frequent reminders from their teacher to hold his paper.
- **Impaired Scissor Use-** Rather than holding the paper at midline and cutting forward, the child may use scissors to cut "to the side". The non-dominant hand may tightly clutch paper versus lightly grasping and shifting as needed. This impairs independence, precision, and speed.
- **Fasteners/Tying/Self-Care -** The solid foundation for using both sides of the body for different movements is missing. The hands are unable to work together smoothly and the eyes struggle to view what hands are manipulating.
- **Impairments in Reading-** Reading requires quick and smooth eye movements. The child may have difficulty separating eye movements from head movement to localize, scan, track, and shift their gaze between targets. The child may lose his/her place and have difficulty locating specific letters, words, or sentences on a page.
- **Keyboard Use-** The ability to keep both hands properly positioned at midline may be prepared.
- **Impairments in Gait-** When turning their head away from midline while walking, the child's entire body follows. This interferes with walking in a controlled manner. The child may appear "disruptive" when required to walk in a line at school.
- **Running-** Poor reciprocal arm swing; arm fencing posture may present because running requires extra strength and endurance. Overall speed and accuracy will be reduced. May not keep up with peers during movement games and physical education.

# Symmetrical Tonic Neck Reflex (STNR):



**Onset:** 4-6 months

**Integration:** 8-12 months

**Stimulus:** Flexion and extension of the head (neck)

**Response:** With neck flexion the upper extremities will flex and the lower extremities will extend. With neck extension the upper extremities will extend and the lower extremities will flex.

**Importance for Baby:** The STNR assists in the development of bilateral patterns of body movement. Allows child to move up against gravity and assume quadruped (on all four's like a dog). Integrates as child begins to crawl and can lift the buttocks from the heels without flexing the neck. Integrated when rocking back and forth on hands and knees.

**Significance on Early Development if Persists:** Interferes with advanced reciprocal creeping. Impairs dissociation between the two lower extremities and transitioning between quadruped to sitting to kneeling to standing and vice versa. If strongly influenced by the STNR a baby will not be able to creep; will bunny hop versus true creeping/crawling on the floor.

Tonic Labyrinthine-Prone & Supine (TLR):

# TLR

## TONIC LABYRINTHINE



**Onset:** Birth

**Integration:** 6 months

**Stimulus:** Change of orientation of the head in space; position of head in relation to gravity while prone (on belly) and supine (on back).

**Response:** In prone flexor tone will predominate with arms flexed by the child's chest. In supine extensor tone will predominate.

**Importance for Baby:** Allows baby's posture to adapt to that of the head.

**Significance on Early Development if Persists:** Will interfere with movement that requires smooth grading of flexor and extensor muscles. In supine child will have compromised ability to raise head up against gravity; this will affect anti-gravity control for movements such as bringing feet and hands together and rolling. In prone (on belly) child will have compromised ability to raise head, extend spine, and bear weight on elbows. This, in turn, will limit time spent on his/her tummy for crawling and developing the movement in their pelvis and shoulders that sets the stage for moving in and out of various body positions (sitting to stand). Without such ability, the baby will be without options for exploring. This will affect social and cognitive gains.

### PERSISTENT TONIC REFLEXES: HOW THESE MAY PRESENT IN EARLY CHILDHOOD & SCHOOL AGE CHILDREN

#### Influence of Retained Asymmetrical Tonic Neck Reflex (ATNR):

- **Poor Isolation of Individual Body Movements-** Ongoing influence by the ATNR may have affected the child's earlier success with creeping or crawling. The skill of crawling has a developmental sequence of its own. In the beginning the baby simply uses his arms to push himself backward. Ultimately the baby should use quick alternating movements

of their arms/legs while only two of four limbs are touching the surface, indicative of intact balance, strength, and ability to isolate movement. Children with poor isolation of individual body parts may also show poor grading and accuracy when moving.

- **Poor Sitting Posture-** Child may sit asymmetrically in a chair; the arm and leg on the “jaw” side of the face extend & torso rotates away from midline. Because child is not upright and centered in a chair, he/she appears “inattentive” and perhaps “disruptive” when sitting at a table with peers.
- **Attention & Focus-** When child turns his/her head, their whole body may also turn. This is very distracting and may interfere with task compliance. The child will be less capable at performing multiple actions. For example, he may not be able to use his eyes to scan the classroom (with a stable head) while folding his paper in one-half (using both hands together) as directed by the teacher.
- **Impaired Pre-writing & Writing-** Writing requires isolated and precise movement of individual body parts; the continued presence of the ATNR interferes with this. When the child rotates his head away from midline, one arm will be influenced to extend and the other to flex. This will impair the stabilization of the paper with non-dominant hand and controlled use of writing tools with the dominant hand. The child may compensate with an immature pencil grasp and need frequent reminders from their teacher to hold his paper. Copying from one source (ex: the board) to another (ex: paper on their desk) requires dissociation of the eyes from the head; the continued presence of the ATNR will also affect this.
- **Impaired Scissor Use-** Rather than holding the paper at midline and cutting forward, the child may use scissors to cut “laterally”. The non-dominant hand may tightly clutch paper versus lightly grasping and shifting as needed. This impairs independence, precision, and speed.
- **Fasteners/Tying/Musical Instruments-** The solid foundation for using both sides of the body for different movements is missing. Hands are unable to work together smoothly; eyes struggle to view what hands are manipulating.
- **Impairments in Reading-** Reading requires quick and smooth eye movements; child may have very poor ability to dissociate eye from head movement to quickly localize, scan, track, and shift their gaze between targets. The child may lose his/her place and have difficulty locating specific letters, words, or sentences on a page.
- **Keyboard Use-** Will impair ability to keep both hands properly positioned at midline on the home row keys; may need to persist with hunt and peck method.
- **Impairments in Gait-** When turning their head off midline while walking, the child’s entire body follows. This interferes with walking in a controlled manner and remaining with peers during physical education/ group movement activities. May appear “disruptive” when required to walk in a line at school.
- **Running-** Poor reciprocal arm swing; arm fencing posture may present because running requires extra strength and endurance. Overall speed and accuracy will be reduced. May not keep up with peers during movement games and physical education.

### Influence of Retained Symmetrical Tonic Neck Reflex (STNR):

- **Decreased Strength & Balance**- Ongoing influence by the STNR may have affected the child's earlier success with creeping or crawling; the child may have used the Bunny Hop method which requires less balance, strength, and control. Without these pre-requisites, equilibrium or optimal balance will not be realized. Balance is not just necessary for gymnastics, it is also needed for basic skills such as kicking a ball, going up/down stairs, and stepping down from a curb.
- **Sitting**- Slouches while sitting in a chair; slumps at his/her desk. More likely to fall out of chair than other classmates.
- **Floor Sitting**- More likely to W sit. This may lead to overstretching in some muscle groups and tightness in others. Over time, this may further limit the child's flexibility and ability to spontaneously sit in a variety of sitting postures.
- **Walking**- May predispose children to walk up on their toes rather than flat feet.
- **Writing**- Places their head on their non-writing arm on the desk while writing with their dominant hand. Very slow copying skills; each time child's head moves up (extends) or down (flexes) there will be movement in the arms that may interfere with the motor act of writing.
- **Ball Handling Skills**- Are immature; difficulty with throwing and catching. Strong hands are need for sports such as playing baseball or basketball.

### Influence of Retained Tonic Labyrinthine Reflex (TLR):

- **Walking**- May present as extra cautious; the child lacks strong arms necessary to protect from trips and falls.
- **Sitting**- Slouches while sitting in a chair; can sit upright for short periods.
- **Writing**- Leans down over the page when writing.
- **Balance**- Difficulty with stairs, curbs, bus steps and managing uneven terrain.

## COMMON FINDINGS AND TREATMENT CONSIDERATIONS FOR CHILDREN WITH PERSISTENT TONIC REFLEXES

### **Common Finding: Delayed or Incomplete Righting and Equilibrium Reactions**

If primitive tonic reflexes are poorly integrated, the righting and equilibrium reactions will not optimally mature. If the tonic reflexes persist past the typical developmental age range, it is safe to assume the child's righting and equilibrium reactions are impaired. The child will be using his/her hands to prop him/herself because of incomplete balance. This will impair bilateral hand use for function; a common concern for referral to Occupational Therapy.

**Treatment Considerations:** Design treatment that activates mature postural responses (righting and equilibrium reactions) and the influence of the tonic reflexes will be minimized. Increase trunk rotation; this is needed for full expression of mature equilibrium. Reach and move across midline of the body; this is also needed for full

expression of mature equilibrium. Promote balance without the use of arms to support self; narrow child's lower extremity or upper extremity base of support. For example, while child is using his/her arms while prone, skillfully minimize the amount of abduction and external rotation at one, then both hips. Also, while weight bearing on arms, facilitate prone extension with elbows positioned just below the child's ears, rather than supporting his/her-self on forearms of widely abducted arms. When possible use movable equipment such as balls, swings, tilt boards, bolsters, or T stools.

### **Common Finding: Decreased Axial Strength & Compensatory Tightening of Certain Muscles**

May see poor trunk extension with accompanying shoulder elevation to compensate for reduced strength. The rib cage may be high in the chest and flared. The child may not spontaneously rotate his/her torso while moving to perform functional tasks; instead will over rely on symmetrical flexion/extension patterns. This will compromise efficient movement for performing functional tasks and result in tightening in certain muscles such as the latissimus and pectorals.

**Treatment Considerations:** The procedure for inhibiting tonic reflexes requires activation of muscles antagonistic to those activated by the primitive responses. For example, to counteract the effects of the tonic labyrinthine (prone), provide intervention designed to increase strength in the posterior trunk musculature. To counteract the effects of the tonic labyrinthine (supine), provide intervention designed to increase strength by moving against gravity with rotation. Regarding flexibility, determine if stretching the muscle groups that "fix" for stability is needed. For example, to stretch the pectorals child stretches arms behind back, stretch the latissimus by externally rotating and reaching up with both arms, stretch the hamstrings by long sitting and touching toes.

### **Common Finding: Joint laxity or Hypermobility**

May see pronated feet, "winging" in the scapula, hypermobile finger joints, hyper-extended knees, and/or lordosis in lumbar spine.

**Treatment Considerations:** The biomechanical consequence of joint laxity and hypermobility is a poor ability to generate sufficient force for movement. Just as babies develop, when treating be sure to encourage movement in small ranges to develop stability.

## **SAMPLE INTERVENTION ACTIVITIES**

Remember to focus not only on maintaining this static position, but the transition into and out of prone. The child should remain static for brief periods; even minimal weight shifting from the child's center of gravity may activate the muscles of the spine and shoulder girdle. Remember...upper extremity strength is important for ideal protective

extension and use of the arms for transitioning between positions and minimizing the influence of primitive reflexes.

# PRONE



**Prone for fine motor activities & games-** The elbows provide a point of stability for freeing the hands for manipulating.

1. Hold a large dowel with both hands, use this to push a ball back and forth
2. Use arms to push a ball back and forth
3. Color, print, draw, read, or complete puzzles in prone
4. Use whistles or play games that require blowing through a straw
5. Pivot in both directions
6. Prone on therapy ball, platform swing, or over bolster
7. Prone on scooter board- push off with arms from wall to glide backward
8. Prone on scooter board-being pulled by a rope while grasping onto it with both hands

# PRONE EXTENSION



Superman/Super Woman- prone extension with arms and legs fully extended activates muscles antagonistic to the tonic labyrinthine prone reflex

# SUPINE FLEXION



**Meatball Position-** activates muscles antagonistic to the tonic labyrinthine supine reflex

1. Child uses their own hands to place/remove stickers on knees or feet
2. Child uses their own hands to place/remove rings from their feet

### **Supine**

1. Bounce ball off hands while child's shoulders flexed to 90 degrees with elbows straight; therapist drops ball from above for child to volley back
2. Use legs to kick suspended ball
3. Supine on therapy ball; transition into sitting

### **Bridge Position**

### **Rolling**

1. Outside-down or up hills
2. With arms overhead or at side
3. Be sure to encourage chin tuck

# SIDELYING



The **Sidelying Position** offers the opportunity to increase strength and endurance while moving in 3 planes. The child will learn to balance by keeping their head and body oriented in midline; remember to not only focus on maintaining this static position, but transition into and out of sidelying. The child should remain static for brief periods; even minimal weight shifting from the child's center of gravity may activate head and torso righting. Be sure to encourage the use of this position on their right and left sides. This will lengthen muscles needed for full rotation of the trunk. Remember...full expression of equilibrium reactions require torso rotation and freedom of movement in the upper and lower extremities.

**Reach-** Use free arm to encourage reaching and other movement/manipulation

1. Play games such as Connect Four in high sidelying
2. Swat at suspended ball with free arm while in high sidelying

3. Work puzzles with free hand while in high sidelying

# SIDE SIT



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While **Side Sitting** strive to have child free both hands free to manipulate object at midline; this may require considerable time and practice. To work toward this encourage the child to adjust to small weight shifts away from their midline. Remember...diagonal control sets the stage for isolation of movement for each limb, important for minimizing the effects of primitive reflexes on functional movement.

1. Side Sit
2. String beads in side sit
3. Lace in side sit
4. Toss a ball while side sitting
5. Catch a balloon while in side sitting

# LONG LEG SITTING



**Long Leg Sitting** offers the opportunity to stretch muscles that are often tight in children that need to “fix” due to immature balance and ongoing influence from primitive reflexes. This position can help lengthen the hamstrings; a muscle that often tightens as children over-use to stabilize. Strive to have child free both hands to manipulate an object at midline. This position also provides a chance to develop balance by narrowing the child’s base of support.

# 4-POINT QUADRUPED



## 4-Point Quadruped:

1. On tilt board
2. Turn head side to side, raise head up & down, or “roll” neck without moving knees or hands
3. Rock body back & forth or side to side while knees and hands planted

## Creeping on Hands & Knees:

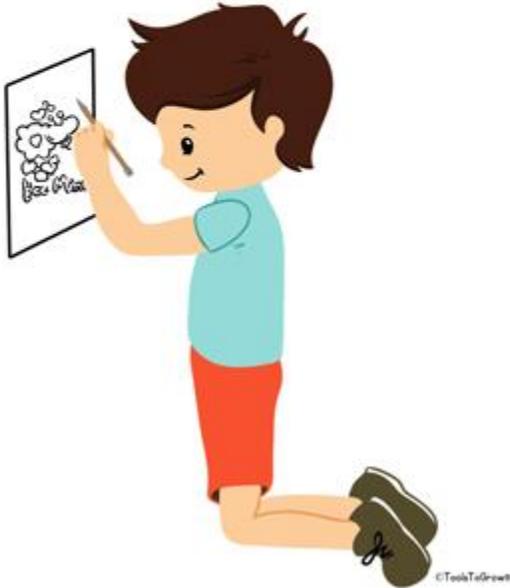
1. Creep through tunnel forward and backward
2. Creep over obstacles such as cushions, pillows, bolsters, etc.
3. Creep sideways

# 2-POINT QUADRUPED



Donkey Kicks- raise one leg into extension, then flex/extend knee so as to kick  
Two Point- Maintain one arm & one leg in full extension

# TALL KNEEL



# ONE-HALF KNEEL



Transitioning between **Tall** and **One-Half Kneel** provides an excellent opportunity to develop the strength and balance to not only minimize the influence of primitive reflexes, but to develop the motor planning for energy efficient and functional movements.

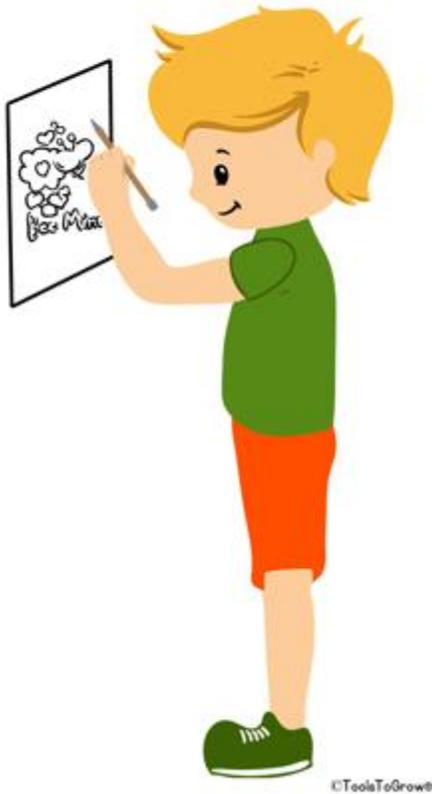
- Slowly transition between tall and one-half kneel
- Use hands to complete tasks placed on vertical surface

# SQUAT



When encouraging transitional movements, such as **Standing to Squat**, be sure to focus not only on the end position, but accomplishing the movement in a smooth and efficient manner. This will set the stage for the child to adopt this pattern in to their functional movements. Squatting provides opportunity for developing hip stability and balance.

# STANDING



## When Standing & Walking:

1. Stand and roll a ball up & down the wall with head sideways and arms perpendicular to torso
2. Stand and balance on one foot for several seconds
3. Hop from one foot to another
4. Stand with feet planted while catching a ball thrown slightly out of reach toward his/her side
5. Stand facing wall with straight elbows and palms against wall, rotate head left to right without bending elbows
6. Stand with back to wall and legs apart; touch right foot to left hand, then left foot to right hand
7. Stand while using hands to complete tasks placed on vertical surface
8. Walk while holding a tray full of objects; pause and turn head side to side and up/down
9. Walk & catch objects with a play fishing pole; use one hand to hold the pole and other to remove "caught" object