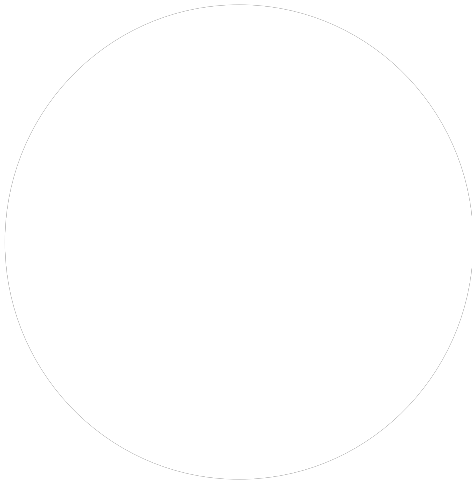




Everything You Need To Know About Neuro-Developmental Delay, Primitive Reflexes & The Vestibular System

Let's journey together to learn about these brain and body systems and how they impact development and everyday functioning.

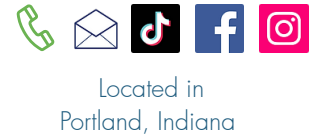
In this post, you will find everything you need to know about **Neuro-Developmental Delay**, **primitive reflexes**, and the **vestibular system**.

This is fascinating stuff! Let's get started!

- [Neuro-Developmental Delay](#)
- [What Are Primitive Reflexes?](#)
- [Moro Reflex](#)
- [ATNR Reflex](#)
- [TLR Reflex](#)
- [STNR Reflex](#)

Neuro-Developmental Delay

Neuro-Developmental Delay (NDD) is a term used to describe an immature and underdeveloped nervous and reflex system that has caused interruptions in early development stages. The immature reflexes interfere with subsequent motor development, visual functioning, hand-eye coordination, and perceptual skills of the child.



About

- Complications with the birthing process
- Birthing into a traumatic environment (e.g. hospital birth)
- Precipitous birth
- Prolonged birth
- Separation from baby
- Stress in Mother or baby during or following birth
- Trauma in infancy
- Lack of experiences as a baby (lack of movement, interaction etc..)
- Medical conditions contributing to neuro-developmental delay



Developmental Delay What Caused it? Quick Guide

Are Reflexes Good or Bad?



What are Primitive Reflexes?

Primitive Reflexes are involuntary motor (physical movement) responses that originate in the brainstem. They are physical responses to different types of stimulation and require no cortical involvement (thought).

Primitive Reflexes Quick Facts

- Developer is interested



- Develop in utero
- Are used in the vaginal birthing process
- Can be correlated with the 7 Cardinal Movements of Birth
- Purpose is linked to the infant's survival outside of the womb
- Help train different systems (visual, motor, balance etc...) to take over when the infant has conscious awareness & control

Let's Make This Easier To Understand!

**Primitive Reflexes are located
inside of the brain stem**

**Essential to baby's survival in
the first few months of life.**



**Primitive Reflexes never
"disappear" They are
"inhibited" so that higher
centers of the brain can now
take over**

**Primitive Reflexes can be
"disinhibited" and return if
there is brain trauma or higher
centers of the brain
deteriorate.**

Primitive Reflexes In Baby

Babies need these primitive reflexes to be in place at birth to essentially keep them alive. There are many different primitive reflexes, some of which include rooting and sucking needed for feeding. Others include blinking, and the auditory orienting reflex that serves

as a "what-is-it" detector.

Primitive Reflexes should be present in baby

The reflex can be seen in its purest form in baby for only a short window of time.

Babies are born with really "immature" nervous systems.

The brain doubles in size in the first year of life.

Life experiences (good and bad) during periods of rapid brain growth greatly influence neurodevelopment (positively or negatively)

The lower brain (Primitive Reflexes) is more developed than the higher levels of the brain at birth.



When Do Primitive Reflexes Disappear?

Remember, primitive reflexes never truly "disappear" they inhibit and remain dormant inside the brain. Just like developmental milestones, primitive reflexes have specific windows of time when they should integrate. Each time a reflex integrates, it lends way for higher brain functioning and conscious control of body systems.

Primitive Reflex Integration Timeline

- Rooting- 3-4 months, longer in breastfed babies
- Moro- 4 months
- Palmar- 5 months
- ATNR- 6 months
- Spinal Galant- 9 months
- STNR- 11 months
- Plantar- 12 months, or correlates with beginning of walking.
- TLR- 3 1/2 years

Signs of Retained Primitive Reflexes



- Anxiety, prone to depression, somatic concerns
- Difficulty reading and/or writing
- Poor balance & coordination
- Sensory sensitivities, sound, limited food preferences
- Seeks out movement, can not sit still
- Quick to anger, irrational anger outbursts
- Scattered, poor organization, poor executive functioning
- Low muscle tone, poor endurance
- Frequently sits with legs folded underneath them
- High muscle tone, toe walker, tongue thruster

How Do Parents Know if Their Child Has Retained Reflexes?

If you are questioning whether your child has retained primitive reflexes, the best way to know for sure is to contact an expert in primitive reflex integration. The therapist can test to see if traces of the reflexes remain and then formulate an individualized plan to integrate the reflexes.

Primitive Reflexes Look Different In Kids & Adults

It's important to note that the physical appearance of the reflex will look much different in a toddler, child, teen, and adult. The purest form of the primitive reflex can be seen for only a short window of time when the person is an infant. This is why it is important to have a trained eye to evaluate for retained primitive reflexes.



**Contact ReSprout
Therapy**



Moro Reflex



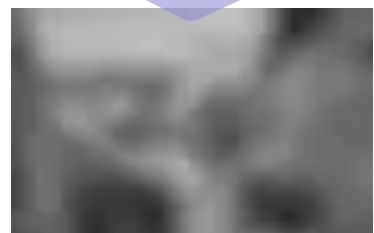
Moro Reflex At Birth

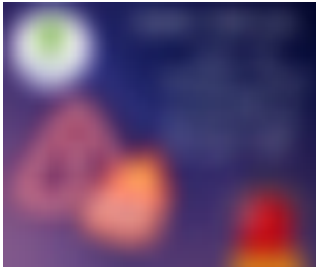
The **Moro reflex** should be present in a full-term, healthy baby. In the early months of life, the Moro reflex is there as a form of protection, especially in a young infant whose movements are purely reflexive. The Moro reflex is thought to be closely linked to our **survival**. If a traumatic event occurs during the birthing or early infancy period, it is thought that this could contribute to a retained Moro reflex. **The Moro reflex should inhibit around 4 months of age.**

What Does the Moro Reflex Look Like In A Baby?

1. The arms open out and extend (abduct)
2. The legs abduct (not as big as a response as the arms)
3. The baby has a sudden intake of breath (inhale)
4. The baby "freezes" in this position for a moment
5. The arms flex back in close to the body into a "fetal" position
6. Typically the baby will start to cry

**May help initiate the first breath
of life**





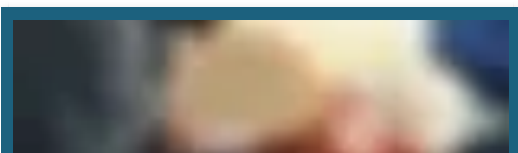
What Triggers The Moro Reflex?

- **Moro** is most sensitive to vestibular stimulation in infants (movement, change in position)
- Can be activated by any form of sensory stimulation
- Loud sound
- Hypersensitive to events or situations that *might* trigger the Moro reaction
- Invasive thoughts, memory
- The Moro reflex sets off an instantaneous reaction to the stimulus before the conscious part of the brain has had time to assess the situation and direct an appropriate response.

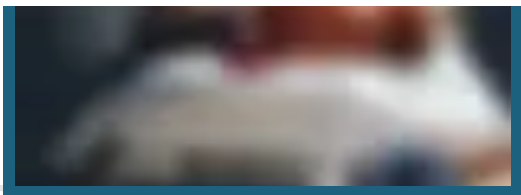
Long-Term Effects of a Retained Moro Reflex

- Vestibular Related Problems
 - Motion sickness
 - Poor balance
 - Poor coordination
- Physical Timidity
 - Cautious with movement
 - Fearful of feet leaving the ground
- Oculo-Motor and Visual Perceptual Problems
 - Skips lines while reading
 - Poor handwriting legibility
 - Poor visual organization
 - Gets overwhelmed in a busy environment
- Poor Impulse Control
 - Wants everything "now"
 - *Reacts before thinking*
- Stimulus Bound Effect
 - Poor attention
 - Attention is drawn to the slightest movement or disturbance
- Auditory Overload / Confusion
 - Overreacts to sounds
 - Avoids noisy environments
 - Can't focus with background noise
- Low Self-Esteem
 - Poor self-image
 - Hard on one's self
- Poor Adaptability
 - Difficulty with transitions
 - Afraid to try new things
 - Sensory defensiveness
- Anxiety
 - Fearful of new situations
 - Worrying about daily tasks
 - Impairing daily functioning
- Immune Issues
 - Easily prone to sickness
- *Sensory Deficits*
 - Sensory defensiveness
 - Sensory seeking
 - Sensory avoiding
 - Sensory thresholds are out of the norm

When Does Moro Reflex Go Away?



- **Moro Reflex should integrate around age 4 months**
- **The "Adult Startle" is a more mature response in which the brain and**



body have conscious control over the response

- The "Adult Startle" response replaces the Moro reflex

Moro Reflex In Children

Body Stuck in Fight or Flight

The Moro Reflex looks different in children than it does in an infant. This can be tricky to detect because you can't always physically "see" the reaction. Children with a retained Moro Reflex experience a range of symptoms when their **body is stuck in fight or flight** that interfere with their daily functioning. These symptoms can include:

- Hypervigilance
- Difficulty concentrating
- Irritability
- Sleep disturbances
- Avoidance of triggering stimuli



Common Ways The Moro Reflex Presents In Children

The Worrier

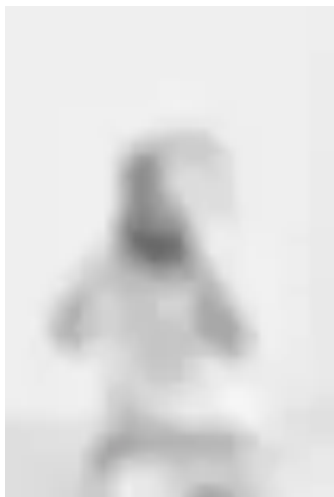
These kids are afraid to try new things. They can be anxious and fearful. They worry about things before they happen. They like to know what to expect ahead of time. If plans unexpectedly change you might see the wrath of the Moro Reflex. They may report some somatic complaints of aches and pains with no medical rea

The Child Who Needs to be in Control

These kids come off as super bossy. It is their way or no way...but for good reason. When they are in control of the situation, they know what to expect. Their brain and body also feel in control. The fight-or-flight response is not triggered, so they remain feeling "in control." If things



don't go their way, watch out because the fight-or-flight has been triggered, and you can't "talk them through it." All reasoning and auditory processing has "gone out the window."



The Avoider

These kids are smart. They may not always be able to verbalize what triggers them, but they can be master manipulators in avoiding. Typically the home environment is their "safe place." Parents learn what does and doesn't trigger their kid so they tailor their environment to fit those needs. We often see the fight-or-flight response when the child is in a new circumstance or environment that can not be avoided such as school, a busy shopping center, etc...

The Kid With BIG Behaviors

These kids can have "explosive personalities". You may not understand what just triggered this behavior such as hitting, kicking, screaming, throwing, etc... It appears as if they are out of control and reacted for no reason. I assure you, there was a reason. It is easy to identify when these kids are in fight-or-flight...many times they can become combative and truly in "fight mode." These kids have a difficult time functioning in a classroom.



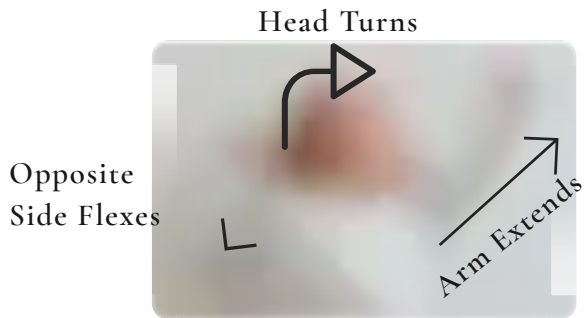
Learn More About The Moro Reflex

Moro Reflex Integration Process
Nervous System Stuck in Fight or Flight
Sensory Reactions





ATNR Reflex



The **ATNR** (Asymmetric Tonic Neck Reflex) should be present in utero and in a full-term, healthy baby. The **ATNR** response is due to the *rotation of the head* which causes the body to respond. When the head rotates, the arm and leg on the same side extend, and the opposite side limbs flex.

ATNR Quick Facts

- Emerges at 18 weeks gestation
- Often coincides with when mother begins to feel fetal movement
- First form of hand-eye training
- Should be present in a full-term, healthy baby
- Should integrate at 6 months of age
- Known as the "academic" reflex
- If not integrated causes significant problems in coordination, reading, and writing

When Is ATNR Integrated?

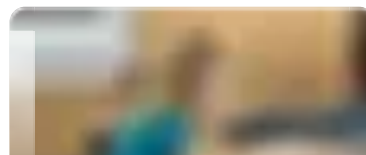
The **ATNR** should integrate around six months of age. This means when the baby turns its head to one side, the arms should no longer respond by moving as shown above.

ATNR The "Academic" Reflex

The ATNR (Asymmetric Tonic Neck Reflex) is also known as the "academic reflex". If a person has a residual ATNR, it can have a big impact on their ability to read and write. Many parents do not know this reflex is retained until their child becomes school-aged.

Symptoms of a Retained ATNR

- Reading difficulties



- Difficulty crossing midline
- Hand-eye coordination problems
- Poor bilateral integration (using two hands together)
- Immature handwriting
- Difficulty in school
- Difficulty separating head, hand & eye movement
- Poor balance
- Difficulty in sports



It is important to have your child tested when you suspect a retained ATNR. They may struggle in school and become very fatigued with reading and writing. Many kids resist performing pencil/paper tasks.

Learn More About The ATNR And Other Primitive Reflexes

- [5 Tips For Reading With A Retained ATNR](#)
- [My Kid Switches Hands When Writing Is This Ok?](#)
- [Unlocking The Power of Reflex Integration](#)
- [Understanding the ATNR From Early Gestation](#)
- [Crossing Midline What Is It And Why Is It So Important?](#)
- [What Is Reading Readiness In Early Childhood?](#)
- [Effects of replicating primary-reflex movements on specific reading difficulties in children: a randomized, double-blind, controlled trial](#)



TLR (Tonic Labyrinthine Reflex)

The **TLR (Tonic Labyrinthine Reflex)** is an interesting reflex! There are many components to the TLR that impact other brain and body systems. Let's check it out!

TLR Quick Facts

- Observed to be present in infants as early as 30 weeks gestation
- TLR is a reaction of the body in response to head movement
- TLR has a direct connection to balance, posture, and muscle tone
- TLR is observed in both flexion and extension (see below)
- TLR can impact visual processing
- TLR should integrate at 3 yrs 6 months

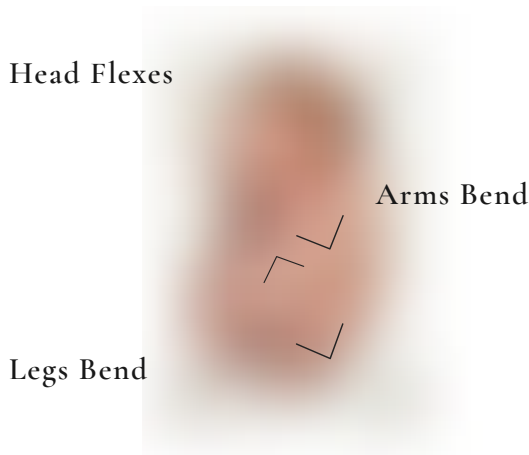
TLR In Flexion

Just a reminder, the TLR (Tonic Labyrinthine Reflex) is triggered by head movement in both flexion (looking down) and extension (looking up). Let's talk about the **TLR in Flexion**. In a baby, when the chin is brought to the chest (flexion) the arms and legs respond to this head movement by also flexing.

TLR in Flexion in Utero

The "fetal position" of the baby in the womb is an expression of the **TLR in flexion**. This serves several purposes:

- The baby is growing and takes up less space when it is "tucked in"
- The pressure of the head on the cervix helps with dilation
- With the head flexed, the baby can enter the birth canal
- This position allows cranial bones to compress
- The hard, bony part of the skull is what is taking the force of contractions, or the head hitting the Mother's pubic bone.



TLR in Flexion In Baby

The "fetal position" of the baby looks very similar to that in the womb. This is how the **TLR in flexion** looks and changes as the baby ages:

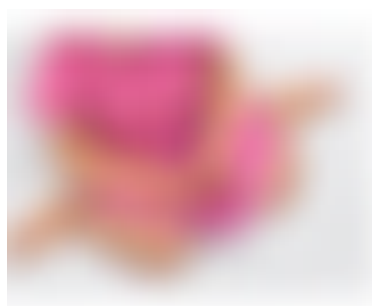
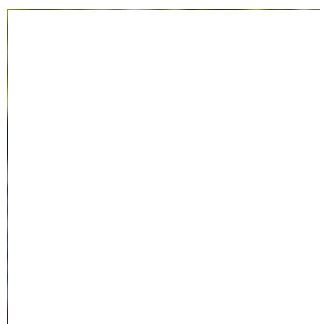
- Increased muscle tone primarily at the hips and knees is observed
- Gravity is now working on this baby outside of the womb
- TLR in the "crude" form is only visible in the first few weeks of life
- As the baby ages, head control develops
- When head control improves, it helps to gradually break up the effects of the TLR
- TLR has until the age of 3 1/2 yrs to integrate naturally

What Does A Retained TLR In Flexion Look Like In An Older Child?

Kids with a retained **TLR in flexion** tend to be "floppy" and have low muscle tone. They need to prop or lean on people or objects. When sitting on the floor they may "W" sit due to their low muscle tone and weak core. Kids can also demonstrate a "slumped" posture while sitting at their desk, or the dinner table. The reason for this is that when the head looks down, the

body responds by also "flexing" or "slumping".

These kids typically are not fans of playing organized sports. They fatigue quickly and lack the postural stability to coordinate movements efficiently. They might struggle with sitting upright on bleachers, or during circle time with no back support.



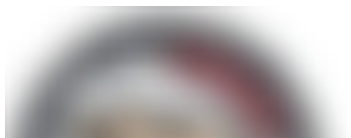
Symptoms of a Retained TLR in Flexion

- **Insecure Balance**
 - May become upset if bumped
 - Clumsy
 - Uncoordinated
- **Poor Posture**
 - Slumped over
 - Slouchy
- **Low Muscle Tone**
 - Poor endurance
 - "Floppy"
- **Vestibular-related problems**
 - Fear of feet leaving the ground
 - Difficulty with playground equipment
 - Fear of looking through the holes in playground equipment
 - Fear of going up or down unfamiliar stairs
 - Motion sickness
 - Vertigo
- **Visual Problems Such As**
 - Figure-ground effect
 - Being overwhelmed by a visually "busy" worksheet
 - Overwhelmed in a visually "busy" environment
 - Poor near-point convergence
 - Eyes become easily fatigued with school work
- **Vestibular-Cerebellar Problems**
 - Problems with sequencing
 - Poor timing



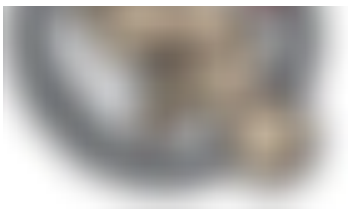
TLR In Extension

Just a reminder, the TLR (Tonic Labyrinthine Reflex) is triggered by head movement in both flexion (looking down) and extension (looking up). Let's talk about the **TLR in extension**. In an infant, when the head is significantly tipped back, the arms and legs respond to this head movement by extending, or "straightening". The purest form of this reflex should only be seen for a few short weeks in infancy.



TLR in Extension During Birth

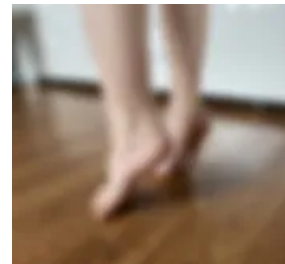
The **TLR in extension** isn't used in-utero until the birthing process. As the



The **TLR in extension** isn't used in utero until the birthing process. As the baby's head is delivered, it will rotate a quarter turn to be in line with the body. The head will then extend back causing the **TLR in extension** to activate. The arms and legs respond along with uterine contractions to deliver the baby.

What Does A Retained TLR In Extension Look Like In An Older Child?

Remember, it can be normal for traces of the TLR to be present until age 3 yrs. 6mo. Kids with a retained **TLR in extension** tend to have high muscle tone. Some of these kids can have a "tongue thrust" when the tongue protrudes through the lips. This can be observed when the child is focused on performing an activity, or when they are using their hands for play, or writing etc... The **TLR in extension** can also cause some kids to toe walk. It is also common for these kids to run with their arms behind them.



Symptoms of a Retained TLR in Extension

- **Insecure Balance**
 - May become upset if bumped
 - Clumsy
 - Uncoordinated
- **Poor Posture**
- **High Muscle Tone**
 - Extensor tone when the head is tipped back
- **Vestibular-related problems**
 - Fear of feet leaving the ground
 - Difficulty with playground equipment
 - Fear of looking through the holes in playground equipment
 - Fear of going up or down unfamiliar stairs
 - Motion sickness
 - Vertigo
- **Toe Walking**
- **Articulation Problems**
 - With or Without Tongue Protrusion
- **Visual Problems Such As**
 - Figure-ground effect
 - Being overwhelmed by a visually "busy" worksheet
 - Overwhelmed in a visually "busy" environment
 - Poor near-point convergence
 - Eyes become easily fatigued with school work
- **Vestibular-Cerebellar Problems**
 - Problems with sequencing
 - Poor timing

Learn More! Check Out These Resources

- [Unlocking The Power Of Reflex Integration Therapy: A Path To Optimal Development](#)
- [Stop The Drop: Why Are Students Falling From Their Chairs?](#)
- [Developmental Delay: What Caused It? Quick Guide](#)
- [Video of 7 Cardinal Movements of Birth- Can You Spot The TLR in Flexion & Extension?](#)

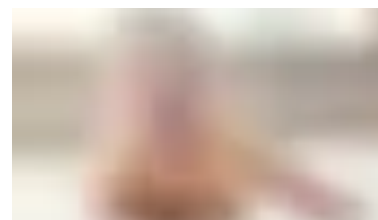


STNR (Symmetrical Tonic Neck Reflex)

The **STNR (Symmetrical Tonic Neck Reflex)** is known as "the crawling reflex." It is responsible for getting the baby off its tummy and onto the hands and knees position so that when they are ready, they can take off and crawl!

STNR Quick Facts

- Present for a short period at birth, plays a part in the newborn "breast crawl" Amazing, Right?
- STNR recedes shortly after birth and reappears at 6-8 months
- STNR helps the baby to push up off their belly onto their hands and knees for the first time
- STNR should integrate *before* the baby begins to crawl
- STNR also helps baby pull up from hands and knees to standing
- STNR helps to train baby's visual skills to shift focus from near to far, and a far distance to a near distance
- STNR helps integrate and inhibit the TLR (Tonic Labyrinthine Reflex)
- STNR should integrate around 11 months
- A retained STNR contributes to poor posture

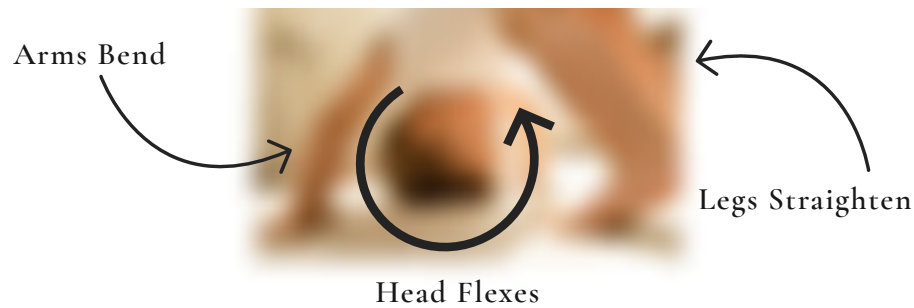


STNR In Flexion



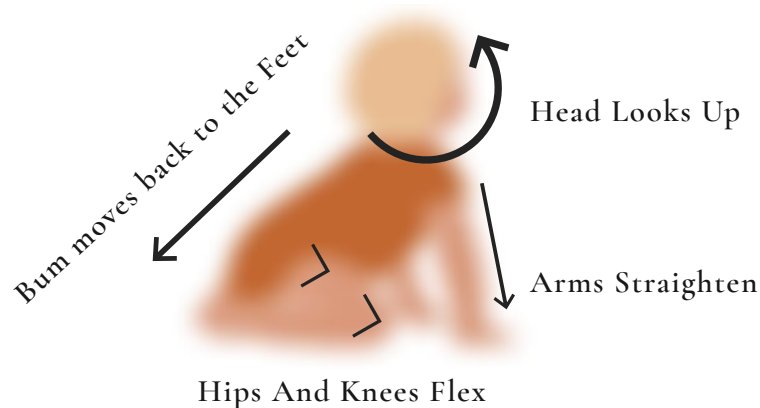
The STNR (Symmetrical Tonic Labyrinthine Reflex) is triggered by head movement in both flexion (looking down) and extension (looking up). Let's talk about the **STNR in Flexion**. In a baby, when the head looks down (flexion) the arms bend (flex), the bottom pushes up all while the hips and knees straighten (extend). Whew! That is a lot to think about happening all at once! Let's explore further...





STNR In Extension

The STNR (Symmetrical Tonic Labyrinthine Reflex) is triggered by head movement in both flexion (looking down) and extension (looking up). Let's talk about the **STNR in Extension**. In a baby, when the STNR is present (should be there) when the head looks up (extends) the arms straighten (extend), and the bum comes down to the feet while the hips and knees bend (flex).



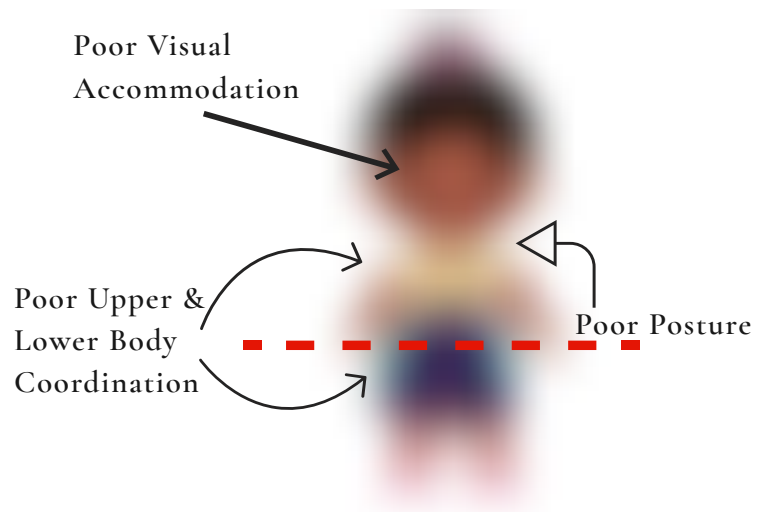
STNR In A Baby

- Most babies rock back and forth on hands and knees to integrate STNR
- STNR helps train the visual system to begin to focus at near and far distances
- Babies diagnosed with Torticollis are at risk for retaining the STNR reflex
- Babies who skip crawling are likely to retain the STNR reflex
- A "bunny hop" crawl, "pulling with arms" or "pushing with feet" crawl are likely to be signs of a retained STNR



STNR Reflex Integration

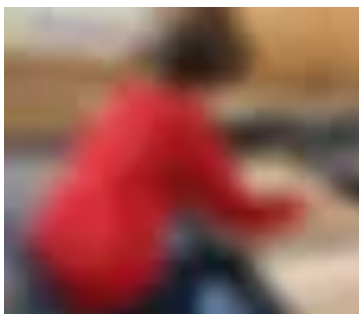
When a person has a retained STNR, they typically have difficulty coordinating their upper body and lower body at the same time. An example of this would be running while also bouncing a basketball. Typically the STNR is the last reflex we target in reflex integration therapy.



Symptoms of Retained STNR

- Poor attention and focus
- Poor hand-eye coordination
- Poor posture in both sitting and standing
- Difficulty coordinating the upper body and lower body at the same time
- Difficulty with vertical tracking
- Messy eater, gets food all over face

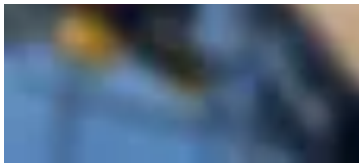
How STNR Impacts School Performance



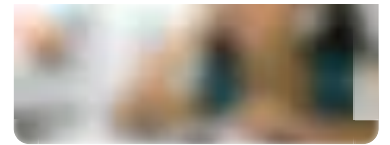
The "Proppers and Leaners"

Kids with a retained STNR typically get labeled as "lazy" in the classroom. These are the kids who are considered "proppers and





leaners." They lack the postural stability to hold themselves up. Remember, when the head looks down at the desk, the arms bend. This is why they need to "hold" their head up. These kids may drape themselves over their desks, or lay their head down on the desk while they work. This does NOT mean they are lazy!



The "Wiggly Fidgety" Kids

- Seek out thigh-to-calf positions to anchor them in their seat
- Struggle to sit "criss cross applesauce" on the carpet
- Can be very fidgety and wiggly
- Seem to be uncomfortable in their own body
- Changes positions frequently
- Could benefit from sitting in a chair in the back of the group



Impact on Visual Motor Skills

- May have difficulty with vertical (up and down) visual tracking
- This makes aligning numbers vertically in math difficult
- May have poor visual accommodation (eyes quickly adjusting from far to near etc...)
- This makes copying notes from the board difficult
- Kids may get behind with copying because their eyes don't adjust quickly

Get Started With ReSprout Therapy

- [Learn More About Reflex Integration Therapy](#)
- [Have More Questions? Contact Us!](#)



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