

# Reflex Integration

## TLR

## A. ONSET AND PATTERNS OF THE TONIC LABYRINTHINE REFLEX (TLR)



**The Tonic Labyrinthine Reflex (TLR)** is a reflex pattern that is present at birth and activated by the movement of the head's position. TLR is an involuntary reaction in response to the head flexion and extension position with respect to the spine.

When the head is in front of the spine (flexed), the rest of the body responds in a **flexed position in unison**.

Similarly, when the head is behind the spine (extends), the rest of the body responds in **an extended position**.

To break down the reflex's name, the word Tonic means tone and Labyrinthine stands for Labrinth, the two inner ears located inside the head, containing the vestibule, cochlea and semicircular canals. In short, the TLR influences the head's tone, alignment and balance against gravity.

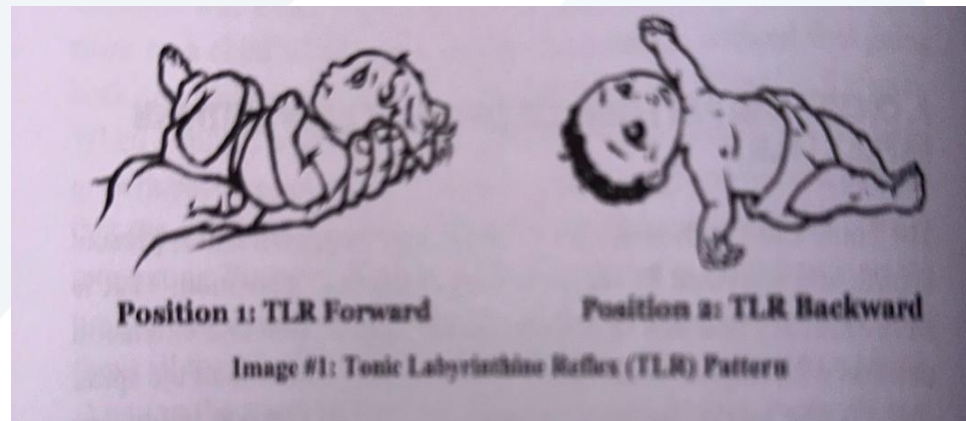
The TLR has two positions, TLR **forward** and TLR **backward**.

The TLR forward is the same position that the fetus holds in the womb. **It emerges in utero, is present at birth, and integrates around four months of age after birth.** The TLR backward **emerges in utero, is present at birth, and starts to slowly integrate at six weeks after birth up to 3 years of age.**

# A. ONSET AND PATTERNS OF THE TONIC LABYRINTHINE REFLEX (TLR)

The TLR helps differentiate and coordinate the front and back of the body. It "splits" the body in the frontal plane (front and back or posterior and anterior) and enables the flexion and extension of muscles in response to head position.

The coordination of these two positions helps the brain and body **to coordinate the flexion and extension muscle movements, muscle tone, upright posture, front-back coordination, head-righting skills, vestibular skills, proprioception, and spatial body awareness**. Other reflexes, such as the Symmetrical Tonic Neck Reflex, "split" the body horizontally (top and bottom), while the Asymmetrical Tonic Neck Reflex (ATNR) "splits" the body vertically (left and right).

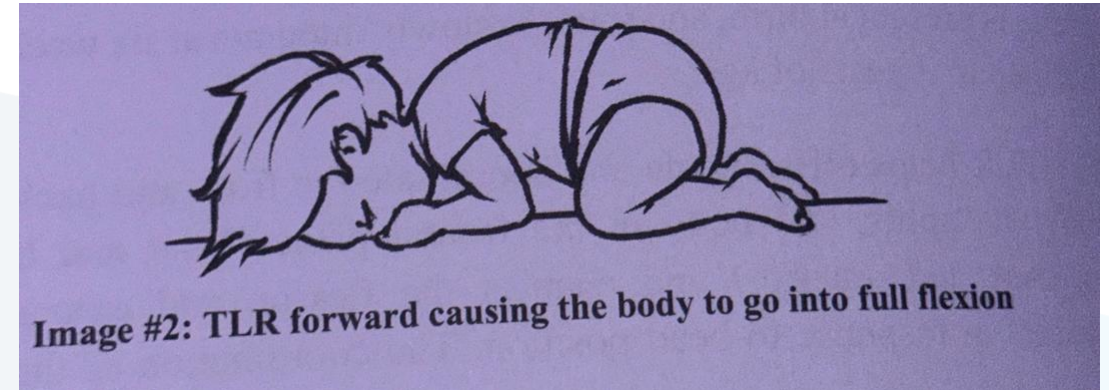


## POSITION 1: TLR FORWARD

Sensory trigger: Head moving in front of the spine

Motor responses include:

- Flexion of the upper body
- Flexion of the lower body
- Flexion of the core muscles

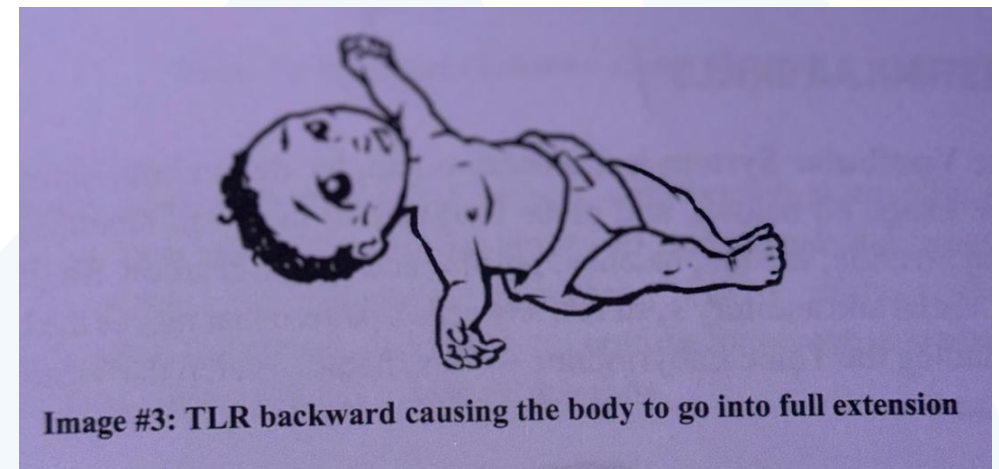


## POSITION 2: TLR BACKWARD

Sensory trigger: Head moving to the back of the spine

Motor responses include:

- Extension of the upper body
- Extension of the lower body
- Extension of the back



## B. BENEFITS OF THE TONIC LABYRINTHINE REFLEX (TLR)HEAD CONTROL



One of the earliest and most crucial skills infants learn is **head control**.

### 1. Head control

is key to gaining proper balance, sense of body awareness, alignment, posture and coordination. At the beginning of an infant's life, the head is heavy and difficult to move against gravity.

However, as the infant develops and grows, he/she will begin to move the head against gravity and go through developmental milestones such as rolling, lifting the head off the ground, sitting, crawling, standing, walking and running. The TLR is one of the critical primitive reflexes that influences these milestones.

### 2. ROLLING

Rolling is one of the milestones babies start to practice as early as 3 to 4 months of age. The beginning phase for rolling can be seen when the baby starts to lift its head and shoulders off the floor during tummy time and rocks from side to side. Or, when placed on their back, they lift their legs off the floor and rock from side to side, initiating segmental rolling either from the upper or lower body. These repetitive movements help develop muscle tone and coordination, and prepare the baby for rolling, creeping, standing and walking.

## B. BENEFITS OF THE TONIC LABYRINTHINE REFLEX (TLR) HEAD CONTROL



### 3. MUSCLE TONE

Muscle tone is the resistance of a muscle to active or passive stretch or the overall tension of the muscle.

Muscle tone has three main functions:

1. Assists in maintaining posture.
2. Stores up energy and releases the stored energy during movements.
3. Displays a "spring" like property to dampen jerky movements, and produce a smooth and coordinated action.

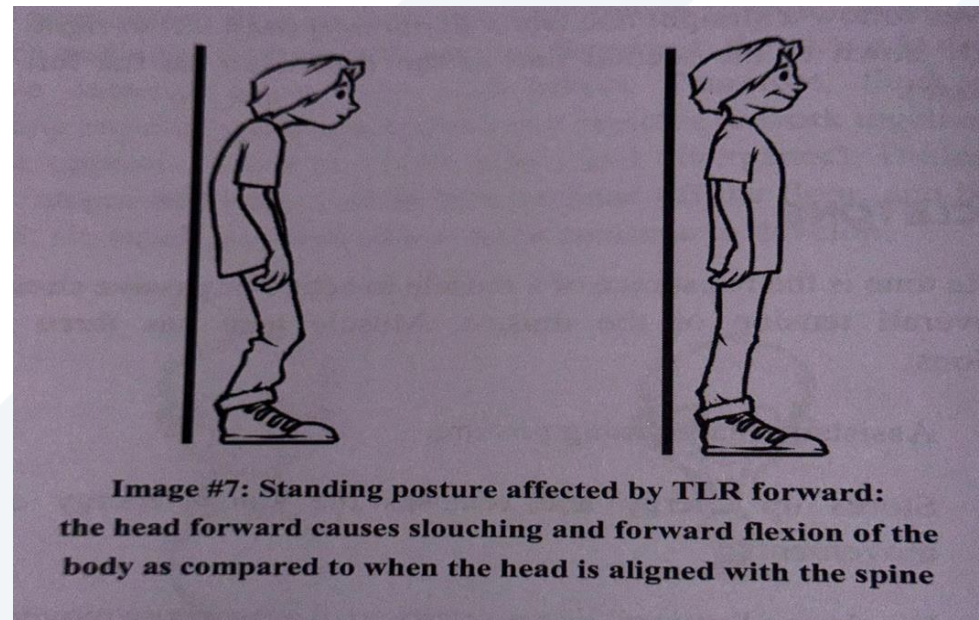
### 4. VISUAL SKILLS

### 5. VESTIBULAR SKILLS

### 6. POSTURE

## B. BENEFITS OF THE TONIC LABYRINTHINE REFLEX (TLR) HEAD CONTROL

The TLR influences the whole body flexion and extension, separation of the front and back of the body, muscle tone, head-righting skills and upright posture. To have an upright posture, both agonist and antagonist muscles have to work in unison to keep the head and body up. When the TLR is not fully developed or integrated, muscle tone and posture will be affected, and holding the head in a neutral spine position will be difficult.



## AN OVERVIEW OF THE BENEFITS OF THE TONIC LABYRINTHINE REFLEX (TLR):



- Assists with the birthing process
- Assists with cross-lateral movements in early development, such as rolling, crawling, sitting, kneeling, standing and walking
- Assists with head-righting, specifically with flexion and extension
- Influences muscle tone, neck control and core stability developments
- Assists with changes in position (gravitational pull) by helping the body balance and create stability
- Influences muscle-ligaments and tension between the front and back of the body
- Contributes to whole body movement coordination
- Assists with proper space orientation, sense of direction, distance from self, velocity
- Contributes to the coordination of opposing muscles (i.e, agonist and antagonist muscles)



## AN OVERVIEW OF THE BENEFITS OF THE TONIC LABYRINTHINE REFLEX (TLR):



- Contributes to the organization and perception of binocular vision (the ability to see with both eyes equally)
- Supports binaural hearing (the ability to hear with both ears equally)
- Assists with near-to-far and far-to-near visual tracking (i.e., convergence and divergence)
- Influences the auditory processing system (hearing)
- Influences the vestibular system, which affects balance, spatial orientation and posture
- Assists with fine motor skills and eye-hand coordination
- Assists with speech and language development
- Influences the learning process and skills
- Influences static and dynamic postures
- Influences gross motor coordination

## C. RETAINED TONIC LABYRINTHINE REFLEX (TLR):SIGNS, SYMPTOMS AND BEHAVIORS



When the TLR is active (retained) in the body past the integration stage, it creates delays in a child's fine motor and gross motor skills, auditory processing, visual processing, vestibular skills, proprioception, and focus and attention skills.

### **SIGNS AND SYMPTOMS OF A RETAINED TONIC LABYRINTHINE REFLEX (TLR)**

#### **GROSS AND FINE MOTOR DEVELOPMENT CHALLENGES:**

- Dislikes physical activity
- Poor balance
- Poor motor planning and coordination
- Poor muscle tone; fatigues easily when lifting arms overhead
- Poor seated posture; prefers to lean on or rest head on arm
- Poor head control
- Poor balance when looking up or down; walking up/down stairs can be difficult
- May have difficulty with cross-lateral skills causing coordination problems; may have stiff and jerky movements

# SIGNS AND SYMPTOMS OF A RETAINED TONICLABYRINTHINE REFLEX (TLR)

- May exhibit mixed dominance; interchanges use of left and right hand, foot, eye, ear for same tasks
- Fatigues easily; lifting arms (e.g., writing) is exhausting
- Poor alignment skills; finds working with math columns difficult
- Dyspraxia tendencies



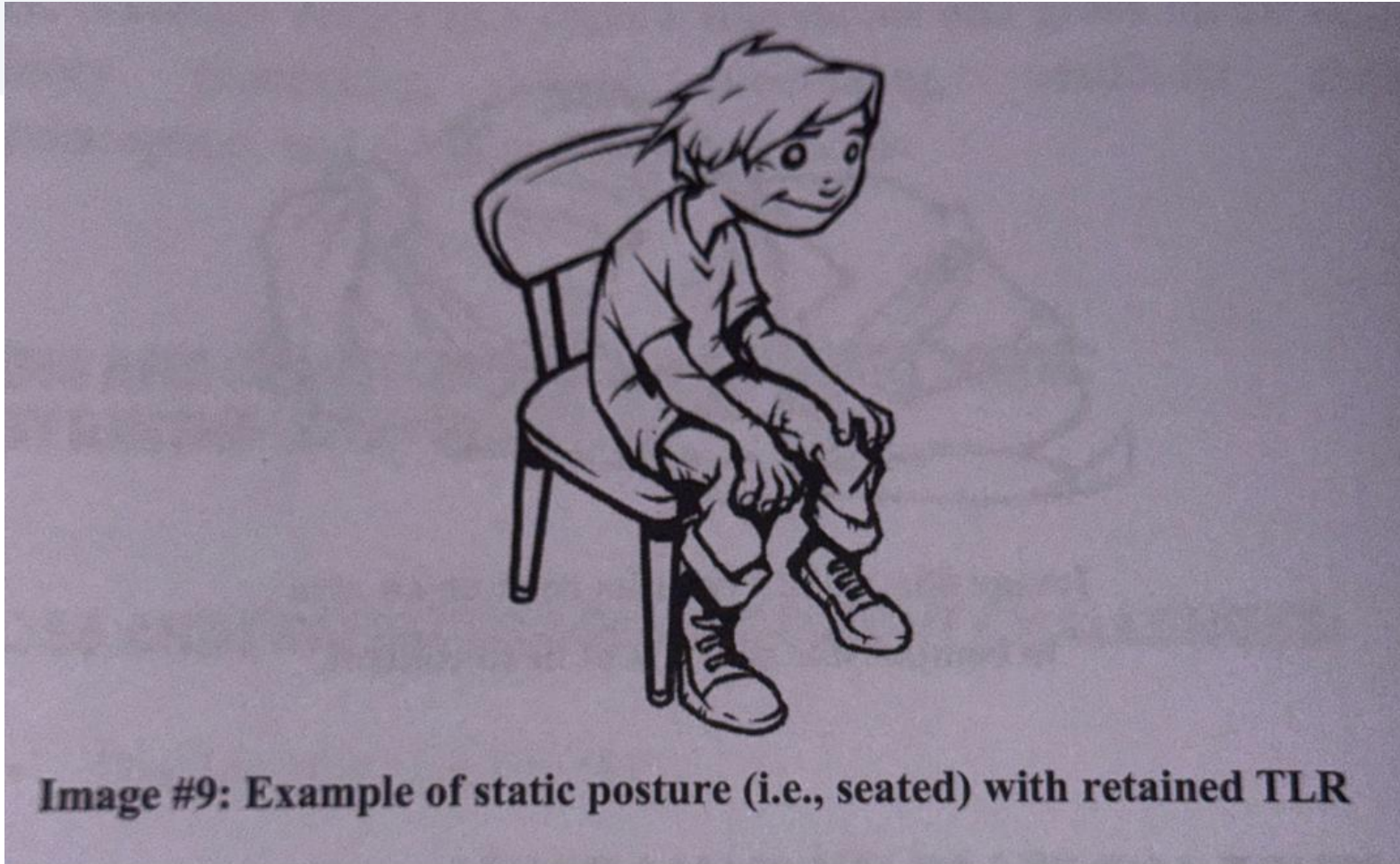
**Image #8: A child rests its head on an arm  
to compensate for lack of head control.**

# SIGNS AND SYMPTOMS OF A RETAINED TONICLABYRINTHINE REFLEX (TLR)



## **POSTURE AND STABILITY CHALLENGES:**

- Tense muscles, stiffness, rigidity and hypertonic (influence of TLR backwards)
- Weak muscle tone; slouched, stooped posture and hypotonic (influence of TLR forward)
- Poor muscle tone and overall posture
- Slouching seated or standing posture
- Preference for toe walking
- Head appears heavy; tilts head to front or back Poor standing posture (e.g., chin forward, body flexed, shoulders raised, slouched back, etc.)
- Poor standing posture (e.g., head slightly extended, toe walking, back extended, etc.)
- Poor seated posture; will rest head on desk because head feels heavy; wraps legs around chair legs, etc.



# SIGNS AND SYMPTOMS OF A RETAINED TONICLABYRINTHINE REFLEX (TLR)



## VISUAL SKILLS CHALLENGES:

- Poor spatial awareness (e.g., disorganized, forgetful, losing track of time, etc.)
- Difficulty with visual motor skills
- Bumps into things and people when moving around
- Poor visual perception (e.g., words appear to run together with no spaces in between; letter reversals, etc.)
- Poor spatial perception (e.g., difficulty judging space, direction, distance)
- Difficulty reading (e.g., takes longer; poor comprehension; frustration and avoidance of reading)
- Poor eye movement (e.g., difficulty with near-to-far and far-to-near vision)
- Difficulty with math and working with math columns
- May experience motion sickness; vertigo
- Fear of heights

# SIGNS AND SYMPTOMS OF A RETAINED TONICLABYRINTHINE REFLEX (TLR)



## **AUDITORY SKILLS CHALLENGES:**

- Difficulty with speech and articulation
- Poor auditory processing (e.g., challenges with multiple instructions and verbal learning)
- Poor sequencing skills, which effects speech, spelling and composition
- Difficulty with spelling and composition
- Difficulty following multiple instructions; struggles with verbal learning

## **ATTENTION AND CONCENTRATION CHALLENGES:**

- Difficulty holding still and concentrating
- Difficulty paying attention when head is down (e.g., at a desk or reading)
- May appear disconnected to feelings
- Frustration; low self esteem; lack of interest in school
- Difficulty understanding cause and effect (e.g., may make the same mistakes repeatedly)
- Disorganized and forgetful
- Loses track of time that results in incomplete, missing or late assignments

# TESTING AND SCREENING FOR TLR



## B. SCREEN 1: HEAD PENDULUM STANDING

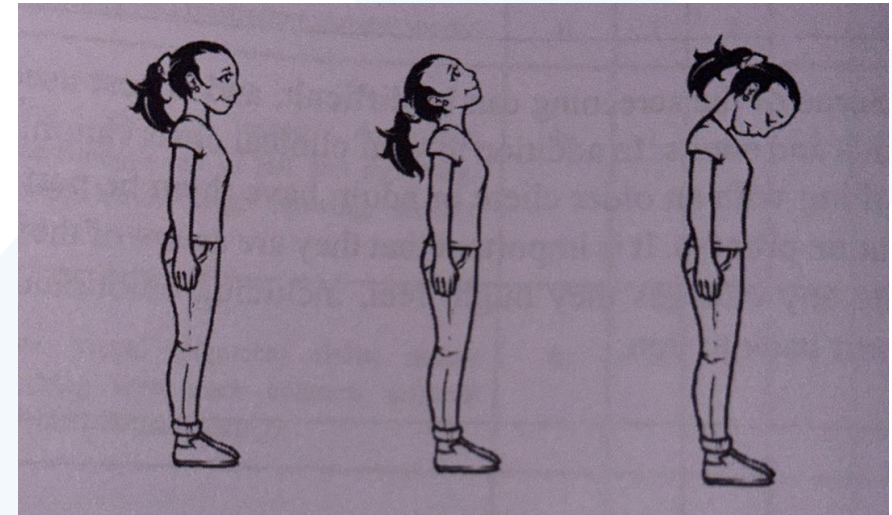
MATERIALS: None

1. Have the client stand with both feet flat on the floor.
2. Ask clients to raise their head and look up for 5-7 seconds while maintaining balance.
3. Observation:

When the head looks up (extension), the body might:

- Jerk backwards
- Extend the back
- Stiffen
- Extend arms, hands and legs

Note: These movements can be slight, so make sure to observe carefully



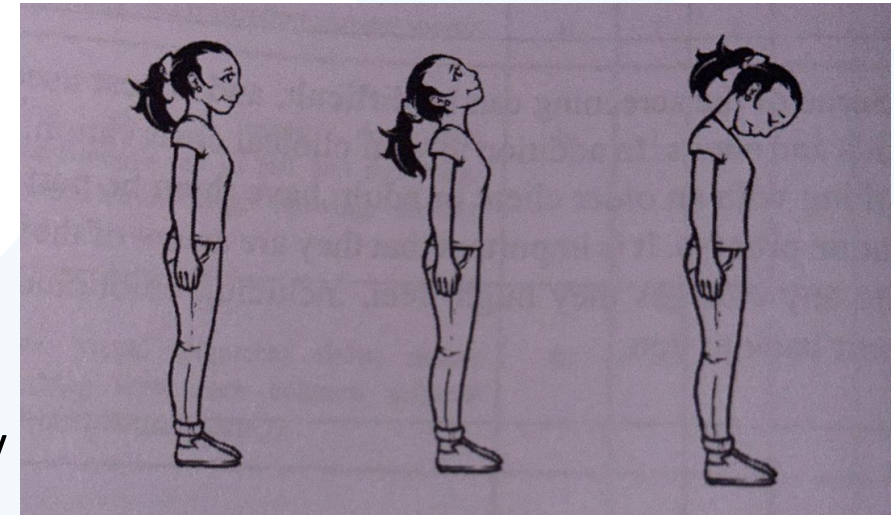
## B. SCREEN 1: HEAD PENDULUM STANDING

4. Go back to starting position.
5. Ask client to look down on the floor for 5-7 seconds while maintaining balance.
6. Observation:

When the head looks down (flexion), the body might:

- Flex forward
- Collapse forward
- Lose balance; fall forward
- Flex arms, hands and legs

Note: These movements can be slight, so make sure to observe carefully



## B. SCREEN 1: HEAD PENDULUM STANDING



### **EYES CLOSED\***

After the client is able to lift their head up and down, and adequately maintain balance, you can further test their balance by repeating the activity with eyes closed.

### **OBSERVATIONS**

Can they maintain balance while moving the head up and down?

Can their head move independent of the rest of the body?

Are they relaxed and maintaining steady breathing?

Are there any parts of the body flexing and extending?

Were there shoulder movements and tension?

# B. SCREEN 1: HEAD PENDULUM STANDING



## SIGNS OF TLR RETENTION

- Loss of balance and falling
- Disorientation; fear of falling
- Anxiousness and sweating
- Nausea
- Unable to look up and maintain head extension

When the head looks up (extension), the body might:

- Jerk backwards
- Extend the back
- Stiffen
- Extend arms, hands and legs

When the head looks down (flexion), the body might:

- Flex forward
- Collapse forward
- Lose balance; fall forward
- Flex arms, hands and legs

**Note: These movements can be slight, so make sure to observe carefully**

## B. SCREEN 1: HEAD PENDULUM STANDING



Signs the TLR is integrated well:

- Able to maintain balance and stability
- Able to move head with ease, independent of the rest of the body
- Shoulders, neck and face stay relaxed
- Breathing is relaxed (no tension)

## C. SCREEN 2: HEAD PENDULUM WITH STRAIGHT ARMS

**MATERIALS: None**

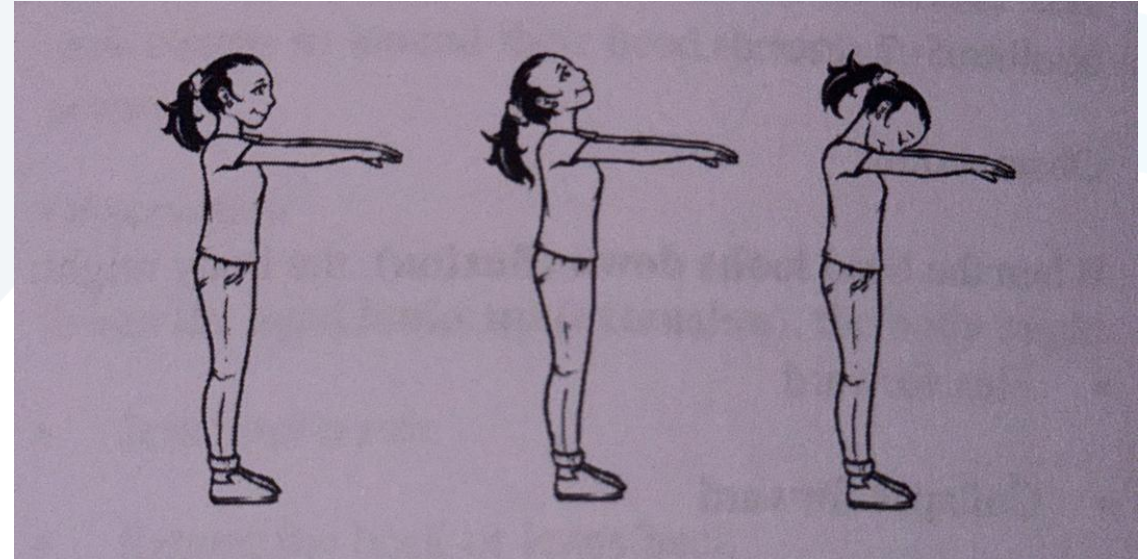
### **OPTION 1: ARMS SHOULDER HEIGHT (IN FRONT)**

1. Have the client stand with both feet flat on the floor and both arms straight, in front at shoulder height.
2. Ask clients to extend their head to look up and hold for 5-7 seconds while maintaining balance.
3. Observation:

When the head looks up (extension), the body might:

- Jerk backwards
- Extend the back
- Stiffen
- Extend arms, hands and legs
- Extend arms up with the head
- Have arms that fatigue quickly and change positions

Note: These movements can be slight, so make sure to observe carefully



## C. SCREEN 2: HEAD PENDULUM WITH STRAIGHT ARMS

**MATERIALS: None**

### **OPTION 1: ARMS SHOULDER HEIGHT CIN FRONT)**

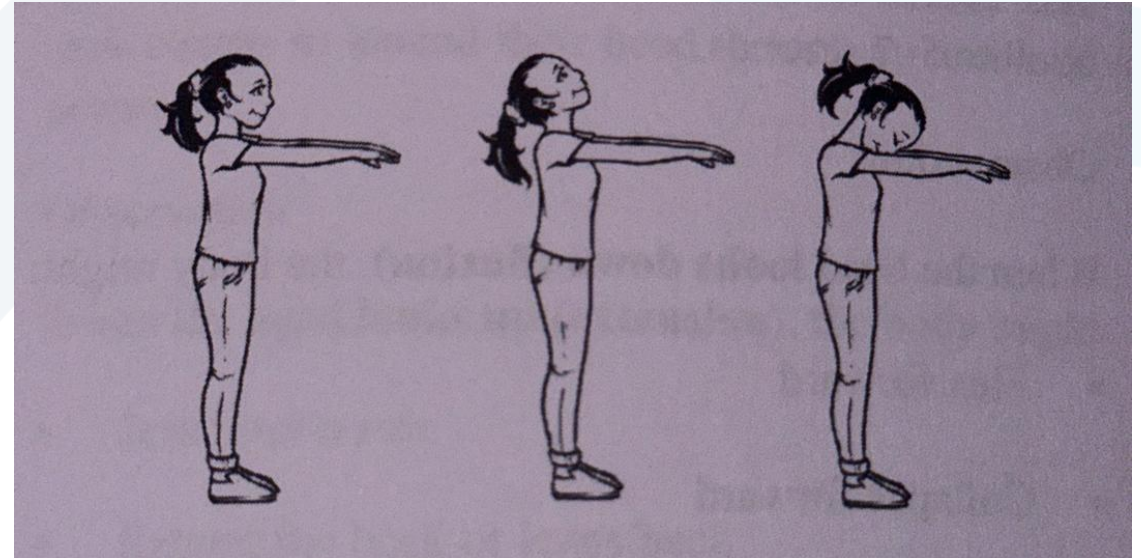
4. Go back to starting position.5.

Ask clients to flex their head to look down on their feet for another 5-7 seconds.

6. Observation:

When the head **looks down (flexion)**, the body might:

- Flex forward
- Collapse forward
- Lose balance; fall forward
- Flex arms, hips, and legs
- Flex arms up with the head
- Have arms that fatigue quickly; have difficulty keeping arms parallel to the floor



## C. SCREEN 2: HEAD PENDULUM WITH STRAIGHT ARMS

### OPTION 2: ARMS OVERHEAD (STRAIGHT UP)

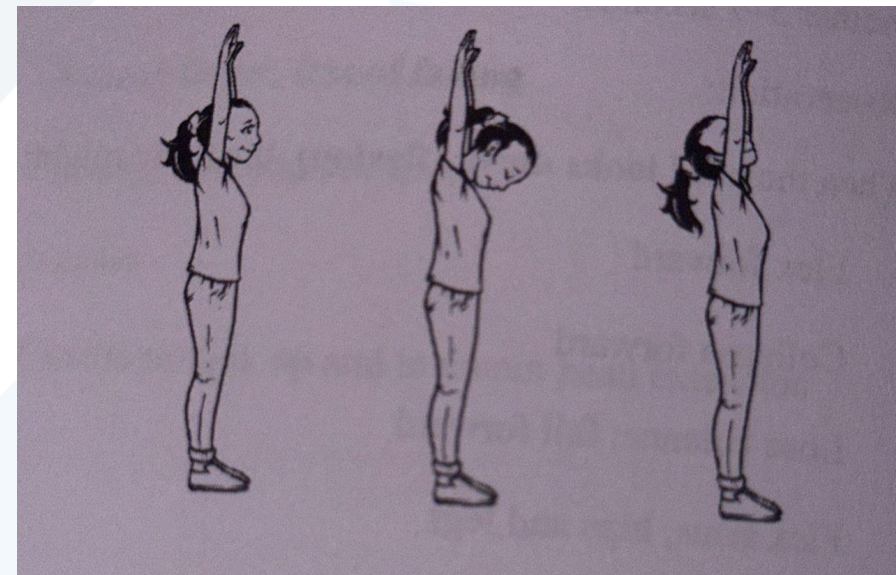
1. Have the client stand with both feet flat on the floor and both arms straight, over their ears.
2. Ask clients to extend their head to look up and hold for 5-7 seconds.

### 3. Observation:

When the head **looks up (extension)**, the body might:

- Jerk backwards
- Extend the back or leans back
- Stiffen
- Extend arms, hands and legs
- Extend arms further with the head

Note: These movements can be slight, so make sure to observe carefully





## C. SCREEN 2: HEAD PENDULUM WITH STRAIGHT ARMS

### OPTION 2: ARMS OVERHEAD (STRAIGHT UP)

4. Go back to starting position.

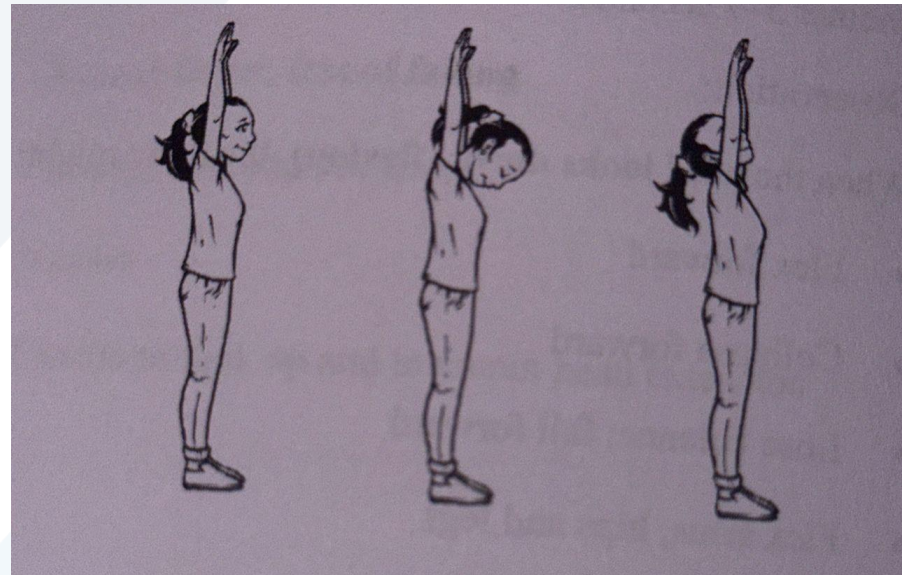
5. Ask clients to flex their head to look down on their feet for another 5-7 seconds.

6. Observation:

When the head looks down (flexion), the body might:

- Flex forward
- Collapse forward
- Lose balance; fall forward
- Flex arms, hips and legs
- Begin to drop arms down
- Have arms that fatigue quickly; have difficulty keeping arms straight over the head

Note: These movements can be slight, so make sure to observe carefully.



## C. SCREEN 2: HEAD PENDULUM WITH STRAIGHT ARMS

### **OBSERVATIONS**

- Can they maintain balance and ease of movement?
- Can their head move independent of the rest of the body?
- Are they relaxed and maintaining steady breathing?
- Are there any parts of the body flexing and extending with head movement?
- Are they unable to keep arms straight?
- Can they maintain muscle tone and strength?
- Are they fatigued easily?

### **SIGNS OF TLR RETENTION**

- Loss of balance and falling
- Disorientation; fear of falling
- Anxiousness and sweating
- Nausea
- Unable to look up and maintain head extension

## ACCOMMODATIONS

A child with a retained TLR may have delayed motor coordination skills, visual perception, postural control, attention and concentration. For a classroom or workstation, choose one or more of the following accommodations to meet the child's needs:

1. Place materials to copy on the child's desk to minimize head movement during copying.
2. Allow working in different positions. Do not focus on the upright seated position when you are focusing on education.

Allow the child to be comfortable and not expend a lot of energy to maintain postural balance. Instead, provide a variety of options, such as:

- a. Standing at a desk to write.
- b. Laying down on the floor to read.
- c. Using a wedge to lift hips more than 90 degrees while seated.
- d. Using a slanted board to elevate working materials and keep the head straighter.

### 3. Break down verbal instruction:

- a. Provide written instruction for review.
- b. Have the child repeat the first instruction before adding additional instructions.

## ACCOMMODATIONS

4. For movement activities, accommodate right- and left-side confusion by providing the following:
  - a. Visual cues to help differentiate the right and left sides of the body
  - b. A picture or video to imitate.
  - c. A breakdown of the steps.
5. Provide movement breaks from the exercises described in this book to help promote TLR integration.
6. Do not force games and sports; the child may not be ready for advanced movements without breaking down the steps.
7. If reading is difficult, try the following strategies:
  - a. Have the child track letters with fingers.
  - b. Use a ruler or visual cues under the line the child is reading.
  - c. Cover all text except the line being read

## ACCOMMODATIONS

