THE FLOPPY INFANT –
Physical therapy strategies for management

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HYPOTONIA – Is commonly known as floppy baby syndrome is a state of low muscle tone. The amount of resistance to stretch in a muscle is low, often involving reduced muscle strength.
HYPOTONIA

CAUSES

Congenital

Genetic disorders

- Downs syndrome
- Ehlers Danlos syndrome
- Fragile X syndrome
- Pituitary Dwarfism
- Marfans syndrome
- Spinal muscle atrophy
- Williams syndrome
- Dejerine – Scottas disease (HSMN – III)
- Centro nuclear myopathy
CAUSES

Developmental disability

- Cerebellar ataxia
- Sensory processing disorder
- Developmental coordination disorder
- Hypothyroidism
- Hypotonic CP
- Teratogenesis in utero exposure to benzodiazepines

Acquired

Genetic

- Muscular dystrophy
- RETT syndrome
- Spinal muscle Atrophy
- Traumatic brain injury
CAUSES

Infection
- Encephalitis
- GBS
- Meningitis
- Polio Myelitis
- Sepsis
- Infantile acrodynia (mercury poisoning)

Auto immune disorders
- Celiac disease
- Myasthenia Gravis
- Abnormal Vaccine reaction
HYPOTONIA

Muscle
- Muscular dystrophy

Neuromuscular junction
- Myasthenia gravis

Nerve
- Polyneuropathy

CNS
- CP
CLINICAL PRESENTATION

Signs and Symptoms of Hypotonia

- Difficulty maintaining head control
- Difficulty sitting upright without significant lean or support
- Difficulty in feeding and swallowing
- Weak cry and cough
- Slow to attain motor milestones
- Difficulty transitioning in and out of positions
- Clumsy or inefficient movement patterns
- Global Developmental delay
- Difficulty with hand eye coordination
- Prefer to observe rather than participate
- Low frustration tolerance with physically challenging tasks
Hypotonia Can Manifest As Deficits in

**Sensory Processing** in which the vestibular, proprioceptive and/or tactile systems fail to alert the brain of changes in body position.

**Praxis or Motor Planning** in which the body is unable to formulate the proper motor response.

**Balance** with the body unable to sustain co-activation of muscle groups working against gravity both statically and dynamically.

**Coordination** with difficulty coordinating upper and lower body movements or visual system to produce fluid and efficient movements.
Neurologic tone is the manifestation of periodic action potential from motor neurons. It is the intrinsic property of the nervous system. Muscle tone is the inherent ability of the muscle to respond to stretch.

Postural tone – Passive resistance to movement of axial muscles

Phasic Tone – Passive resistance to the movement of extremities

Low tone – initiation of contraction is slow, contract slowly in response to stimulus and cannot sustain contraction for long.
EXAMINATION

Diminished resistance to passive movement is felt and the muscles may feel abnormally limp on palpation

Ventral suspension – Head should stay at the same plane as the back, extremities should have some flexion tone, the back should show some resistance against gravity

Popliteal angle
- 0-3 months: 80-90 degrees
- 3-6 months: 90-110 degrees
- 6-9 months: 110-150 degrees
- 9-18 months: 150-160 degrees

Scarf sign
- Normal: elbow between bilateral midclavicular line
- Low: crosses the ipsilateral midclavicular line and reaches the contralateral side
- High: elbow does not cross the ipsilateral midclavicular line

Heel to Ear test
- Level of maturity: heel up to ear, nose, chin, nipple, umbilical region, femoral crease
EXAMINATION

Traction response

Normal infant – lifts the head immediately with the body, on attaining the sitting position the head is erect. The examiner feels the infant is pulling back against the traction and flexion of elbow, at the knee and ankle is noticed.

More than minimal head lag and failure to counter the traction force by flexion of limbs indicates Hypotonia.
MANAGEMENT APPROACHES

➢ Neuro developmental approach
➢ Roods approach/ sensory motor approach
➢ Motor learning/ Task oriented approach
➢ Biomechanical Approach
OBSERVATION

Posture in Positions - Supine
- Look for thoracic kyphosis and flattening of rib cage with more horizontal orientation of ribs
- Frog leg position in supine
  Ability to maintain midline position of head

Initiation and Inhibition
- Do they reciprocally move LEs/UEs against gravity
- Can they bring hands to midline
- Do they initiate rolling from supine to prone
- Can they track toys visually
- Can they transition from supine to sitting

Quality
- Do they roll with trunk dissociation or log rolling
- Do they come up to sitting with trunk rotation pushing up from ground or through sagittal plane only
- Head lag during pull to sit
Posture - Supine
OBSERVATION

Posture in Positions - Prone
- Use cervical hyperextension to lift head in prone
- Frog leg position in prone
- Hyperextension of elbows when pushing up in prone

Initiation and Inhibition
- Push up through hands in prone
- Reach for toys in prone
- Do they initiate rolling prone to supine
- Do they transition from prone to sitting
- May initiate movement with phasic bursts of muscles

Quality
- Dissociation of trunk when rolling prone to supine
- Weight shifting when reaching for toys in prone
- Prone to sitting through straight plane movements with minimal rotation
Posture - Prone
OBSERVATION

Posture in Positions - sitting
How do they prefer to sit: W-sitting; Long sitting; Criss-cross sitting
Paraspinal weakness results in total kyphotic posture with posterior pelvic tilt and forward head posture
Hip IR/ER, Look at foot position

Initiation and Inhibition
▪ Reach for toys on the ground or held off the ground
▪ Crossing midline in sitting
▪ Transition between sitting and prone/quadruped

Quality
▪ Transition over hip or with hips in abduction
▪ Place hand down to reach outside BOS
▪ Transfer toy between hands rather than crossing midline
Posture - Sitting
OBSERVATION

Posture in Positions - Standing
- Children assume WBOS and low COM: muscles placed in poor length-tension position
- Bony deformity of forefoot
- Pronated flat foot
- Calcaneal valgus
- Knee valgus
- Hip IR/ER

Initiation and Inhibition
- Squatting and returning to standing
- Reaching in all planes without LOB
- Raise on tiptoes to reach for toys overhead

Quality
- Ankle/hip strategy
- Knee alignment when squatting
- Push-off on metatarsals when raising on tiptoes
Posture - Standing
OBSERVATION

Posture in Positions - Quadruped
- Elbow hyperextension
- Lumbar lordosis
- Hip abduction/ER

Initiation and Inhibition
- Transitioning between sitting and quadruped
- Rocking in quadruped
- Reaching in quadruped
- Creeping over even terrain

Quality
- Weight shift when creeping
- Transition to sitting with increased hip abduction
- Endurance for creeping
Intervention Strategies for Children with Hypotonia

- Rolling
- Independent sitting with good postural alignment
- Independent standing with good skeletal alignment
- Self-initiation of cruising and motivation to move
- Single limb stance
- Transitioning from the ground to standing
- Walking
- Jumping forwards and down
ROLLING

Impairments
- Decreased core strength with elevated rib cage and decreased oblique muscle activation
- Decreased cross-plane movements and trunk dissociation with minimal rotation
- Impaired visual tracking
- Decreased strength of hip flexors for initiating rolling supine to prone
- Decreased cervical spine strength for clearing head
- Decreased tolerance for tummy time
- Decreased UE strength for pushing up through arms
- Impaired motor planning and coordination

Treatment Ideas
- Transitioning supine to sitting through sidelying over ground and on stability ball for oblique activation
- Lateral head righting for clearing head against gravity when rolling
- Active and passive trunk rotation and dissociation
- Reaching for knees/feet in supine
- Prone positioning and reaching on stability ball
- Reaching for toys in supine and across body
- Kinesiotaping to activate obliques
INDEPENDENT SITTING

Impairments
- Decreased muscle strength and endurance in postural muscles
- Decreased muscle tone in trunk and extremities
- Increased joint mobility and ligamental laxity
- Vision deficits
- Delayed righting and protective reactions

Treatment Ideas
- Sitting with neutral pelvic alignment
- Adaptive equipment for promoting upright posture
- Manual cuing to promote upright posture and pelvic alignment when sitting
- Propped sitting for decreasing posterior pelvic tilt
- Sit on ball: work trunk flexors and extensors
- Pivoting in prone for weight shifting and oblique strengthening
- Head and trunk righting
STANDING

Impairments
- Decreased muscle strength and endurance
- Decreased muscle tone in trunk and extremities
- Increased joint flexibility
- Poor static balance: Hypo functioning vestibular, vision, or somatosensory systems
- Poor proprioceptive sense
- Poor tactile input in foot

Treatment Ideas
- Sit on ball: work trunk flexors and extensors
- NMES to gastrosoleus, gluteus max
- Kinesiotaping to align scapula and decrease rounded shoulders
- Side bridges, lateral step ups for gluteus Medius strengthening
- Work gluteus max and latissimus simultaneously for increasing core stability
- Practice equilibrium strategies
- Ankle weights for increasing proprioception
- Orthosis to prevent hyperextension
MOTIVATION TO MOVE

Impairments
- Poor cognitive skills
- Poor motor planning (may look like weakness)
- Decreased vision, hearing, or touch
- Poor LE dissociation and coordination decreased muscle strength of hip muscles
- Poor stability of pelvis: decreased strength of pelvic muscles
- Decreased lateral weight shifting

Treatment ideas
- Pair 2 senses (vision and auditory)
- Give hands-on help to move through sequence and then decrease assistance
- Facilitation to weight shift laterally
- Lateral stepping up/down a bench
- Sit to/from stand transitions with facilitation to maintain hips in neutral
- Use of aids for assistance
SINGLE LEG STANCE

Impairments
- Poor stability of pelvis
- Decreased strength of pelvic muscles (hip and abdominal)
- Increased joint flexibility
- Poor static balance
- Hypo functioning vestibular, vision, or somatosensory systems
- Poor proprioceptive sense
- Poor tactile input in foot

Treatment Ideas
- Step on/over step stool as part of cruising
- Play in and half kneeling position
- Side bridges, lateral step ups for gluteus Medius strengthening
- Work gluteus maximus and latissimus simultaneously for increasing core stability
- Strengthen ankle muscles
Transition from ground to standing

**Impairments**
- Poor stability of pelvis
- Decreased strength of pelvic and hip muscles
- Decreased cross-plane movements
- Increased joint mobility and ligamental laxity
- Poor motor planning
- Impaired weight shifting

**Treatment Ideas**
- Step on/over Step stool
- Play in half kneel position
- Side bridges, lateral step ups, for gluteus med strengthening
- Bridges, squats, and lunges for gluteus strengthening
- Lunges, wall squats for quad strengthening
- Strengthen ankle
- Stand through bear crawl initially and work towards standing through half kneel
Impairments
- Poor cognitive skills
- Poor motor planning (may look like weakness)
- Decreased vision, hearing, or touch
- Poor LE dissociation and coordination
- Decreased muscle strength of hip muscles
- Poor stability of pelvis: decreased strength of pelvic muscles
- Decreased lateral weight shifting

Treatment ideas
- Pair 2 senses (vision and auditory)
- Give hands-on help to move through sequence and then decrease assistance
- Hitting ball with side of foot in standing
- Play in tall kneel /half kneel
- Lateral stepping up/down a bench
- Sit to/from stand transitions with facilitation to maintain hips in neutral
- Use of appropriate orthosis
- Use of mobility aids to train ambulation
JUMPING FORWARDS AND DOWN

Impairments
- Decreased concentric strength in hip extensors, quads, and plantar flexors
- Decreased eccentric hip extensor and quad strength during landing
- Decreased power generation
- Hypermobility of joints
- Poor motor planning and coordination

Treatment Ideas
- Jumping into deep squat to prevent genu recurvatum
- Squat jumps for increasing power generation
- Rapid sit to stands for increasing power generation paired with slow stand to sit transitions for improving eccentric control
- Squatting and raising on tiptoes for improving motor planning
- Facilitation for push-off when raising on tiptoes
- Running for increasing power in gastrosoleus for push-off
- Hip abductor strengthening for decreasing stress on medial knee during landing
Orthosis and mobility aids
HYDROTHERAPY

- It uses the beneficial effect of buoyancy which puts less mechanical stress on the joints
- Buoyancy enable children to move independently
- Combined with reduction in gravity, decreases the compressive force on weight bearing joints
THERAPEUTIC HORSE BACK RIDING - HIPPOTHERAPY

- Rhythmic three dimensional movement – replicates movement of human pelvis
- Provides normal sensory motor experience
- Riding horseback continuously changes the relationship between riders COM and their BOS therefore improving coordination and challenging balance
- Facilitation done by changing the horse’s strides, velocity and direction
- Helps in stimulating righting and equilibrium reactions
- Position of pelvis helps in thoracic and pelvis alignment
REBOUND THERAPY

- Provides sensory integration of kinesthetic, visual and vestibular input.
- The vestibular response is heightened because of vertical motion of body in the trampoline
- Feeling weightless puts less pressure on joints than in land based exercises
- Helps in low tone by providing persistent stimulatory pressure to the skin
Neuromuscular Electrical Stimulation (NMES) can also be used to “activate hypotonic muscles, improve strength, and generate movement in paralyzed limbs while preventing disuse atrophy.

NMES should ideally be combined with functional training activities to improve outcomes (Fenichel GM, 2005)
PRINCIPLES

▪ Never let deformity to develop
▪ Maintain proper joint alignment
▪ Use multiple sensory input
▪ Check/ do not allow all compensatory strategies
▪ Stabilization
▪ Prevent postural asymmetry
▪ Increase balance and safety
Thank you