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Session 305: Primitive Reflex Integration: Disassociating the Head from the Body
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What are Primitive Reflexes?  Correlations to Theories?  Research?
Neural connections are either made or dissolved depending on the stimulation received.

- Hebb's Axiom – what wires together fires together
- Dr. Norman Doidge
- Dr. Michael Merzenich
- Dr. Paul Bach y Rita – activity dependent neuroplasticity
ACTIVITY-DEPENDENT PLASTICITY

- During engagement in activity,
- Signaling molecules (e.g., dopamine, glutamate)
- Facilitate synapsing (excitatory or inhibitory)
- Which alters gene expression and allows the brain to rewire itself.

NEUROPLASTICITY AND THERAPY

- Analyze movement to determine foundational skill levels
- Engage in movement to achieve activity-dependent plasticity
- Activity-dependent plasticity maximizes a child’s potential in function and activities of daily living

THEORETICAL FRAMEWORKS SUPPORTING PRIMITIVE REFLEX INTEGRATION THEORY
THEORIES

- Rood Approach
- NDT/Bobath: Neuro-Developmental Treatment/Bobath
- PNF: Proprioceptive Neuromuscular Facilitation
- Brunnstrom Approach

ROOD APPROACH

- Theoretically based on the Reflex and Hierarchical Model of Motor Control and provides the origins for many of the facilitation techniques used today
- Focuses on sensory stimulation and ontogenetic motor development (normal progression of motor skills along the developmental continuum)
- Cutaneous stimulation – light touch, brushing
- Proprioceptive stimulation – heavy joint compression, quick stretch, tapping, vestibular stimulation, vibration, neutral warmth, light joint compression
- Reflexes are used to influence muscle tone and facilitate typical movement patterns

NDT/BOBATH

“NDT is a holistic and interdisciplinary clinical practice model informed by current and evolving research that emphasizes individualized therapeutic handling based on movement analysis for habilitation and rehabilitation of individuals with neurological pathophysiology. An in-depth knowledge of the human movement system, including the understanding of typical and atypical development, and expertise in analyzing postural control, movement, activity, and participation throughout the lifespan, form the basis for examination, evaluation, and intervention. Therapeutic handling, used during evaluation and intervention, consists of a dynamic reciprocal interaction between the client and therapist for activating optimal sensorimotor processing, task performance, and skill acquisition to enable participation in meaningful activities.”

NDT/BOBATH

- Re-learning normal movement patterns with a focus on the quality of movement
- Focuses on alignment and symmetry
- Focuses on mastering forward flexion with rotation in order to break up extensor tonal patterns
- Focuses on weight shift using our own natural body forces
- Every point of mobility has a point of stability

PNF

- Focuses on movement patterns that are diagonal and resemble typical movement
- Focuses on the developing sequence of movement and how the agonist and antagonist muscles work together to produce volitional movement
- Uses reflexive movement as a basis for learning more volitional movement following the theory that a child must be able to roll before he can crawl and crawl before he walks
- Uses a multi-sensory approach incorporating tactile, auditory, and visual systems.

BRUNNSTROM APPROACH

- The basic premise is that in typical development, spinal cord and brain stem reflexes become modified during development, and their components are rearranged into purposeful movement by the influence of higher centers. Since reflexes represent normal stages of development, they can be used when the central nervous system has reverted to an earlier developmental stage
- Reflexes should be used to elicit movement when none exists (normal developmental sequence)
- Proprioceptive and exteroceptive stimuli can be used therapeutically to evoke desire motion or tonal change.
EVIDENCE-BASED RESEARCH
Do we have it?

- COPCA and TIP family training program focusing on NDT principles

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COPPA and TIP family training program focusing on NDT principles

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- Provides history of research on primitive reflexes
- "In 64% of cases it is noticed that children overwhelm to unexpected noises, this opens up the opportunity for the primitive retained reflex, Moro."
- "In 64% of cases, mothers noted that the child holds a pencil in a strange manner - this indicates the presence of the primitive Palmar and Suckling reflex."
- "In 36% of cases, the child makes multiple mistakes when copying from the board. This is indicative of the presence of unbridled primitive reflexes, STNR and ATNR."
- "In 79% of cases children have had problems with reading and writing."
- "86% have had difficulty tying shoelaces or dressing themselves; showing the presence of the Palmar and sucking reflexes."

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A. J. Ayres, in her theory of sensory integration, paid attention as well to the selected primitive reflexes, which, in accordance with her opinion, may disturb development, but do not produce symptoms as strong as in spastic diplegia. For that very reason, they may be less intensified.

"...primary reflexes and postural reflexes develop also such mental functions as: lateralization; visual perception, aural perception and the coordination of them, exerting influence upon emotional development."

"In school-age children with learning difficulties, primitive reflexes occur in their vestigial form. Those reflexes do not decrease simultaneously with the passage of time, and it rather seems that they have become more intensified."
“The data indicated that, in early infancy, an absent Moro or plantar grasp response may be predictive for adverse developmental outcome. After early infancy, persistence of the Moro response and asymmetric tonic neck reflex was clinically significant. Prediction of a delayed emergence of the parachute reaction increases with age. Abnormal performances on the pull-to-sit maneuver and vertical suspension test have predictive significance throughout infancy.”

WHAT ARE PRIMITIVE REFLEXES?
Innate, typical, and involuntary movement patterns

Teach developmental sequence of movement

The body learns through the experience the movement provides

The child acquires higher level motor skills, which, in turn, support higher level executive functioning skills

A given reflex opens and activates the neural pathways, conducting the impulse to the different structures in the brain – in other words, it facilitates activity dependent plasticity

WE KNOW THAT THEY EXIST
WHERE DO THEY GO?
MEDICAL PROFESSIONALS EVALUATE....
CHECK THEM OFF....
.....and then?
TYPICAL DEVELOPMENT

Primitive reflexes facilitate movement and engagement in the environment

Activity dependent plasticity (primitive reflex movement patterns) establishes mature neural connections

Promotes integration of primitive reflexes at the appropriate ages - rewires/fine tunes neural pathways and movement patterns

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When that does not happen....

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REFLEXES ASSOCIATED WITH HEAD CONTROL AND DISASSOCIATION OF HEAD FROM BODY
Hands Pulling Reflex
Tonic Labyrinthine Reflex
Symmetric Tonic Neck Reflex
Asymmetric Tonic Neck Reflex

HANDS PULLING REFLEX

- Symmetrical Firing
- Elbow flexors
- Shoulder flexors
- Scapula Protraction
- Neck Flexors
- Abdominal Flexors
- Knee Flexion
HANDS PULLING REFLEX

- Poor co-contraction – unstable shoulder girdle and extended arms
- No neck flexion/head lag
- Chin Retraction
- Extension T4-T8
- Pelvic extension
- Hip/knee extension

EFFECTS OF NON-INTEGRATION

- Poor muscle tone
- Poor hand-mouth and hand-eye coordination
- Delayed manual skills – tool use
- Poor head righting and ocular motor skills
- Impact on integration of Moro, TLR, STNR, ATNR
TONIC LABYRINTHINE REFLEXES

- Labyrinth of inner ear responds to movement
- Head extension brings about extension of the back, arms and legs
- Head flexion brings about flexion of the back, arms and legs
- Balances the relationship between agonist and antagonist muscle groups

TONIC LABYRINTHINE REFLEX

- TLR forward:
  - Develops at 12 weeks in utero
  - Integrates around four months
TONIC LABYRINTHINE REFLEX

- TLR backward:
  - Develops at the time of delivery
  - Integrates gradually within 7 weeks through 3.5 years old

DEVELOPMENTAL IMPLICATIONS

- Muscle tone
- Formation of antigravity and stability mechanisms
- Integration of vestibular and visual systems:
  - Stable head position – strong neck musculature – stable ocular motor mechanisms
- Delays progress of integration of additional reflexes – Moro, Landau, STNR

EFFECTS OF NON-INTEGRATION

- Poor posture
- Low muscle tone
- Poor ocular motor control
- Poor body awareness and perception; difficulty judging space, distance, depth, and velocity
- Difficulty with head and leg coordination
- Walk, run, or jump with jerky or stiff movements – if extensors dominate
- Possible challenges with stairs/escalators
- Motion sickness
- Poor sense of time, sequencing, and organizational skills
TLR: ERECT TEST

- Stand with feet together
- Arms down at sides
- Ask child to look forward, hold; then tilt head back into extension; hold.
- Repeat at comfortable rate 3-4 times
- Repeat with eyes closed

TLR: ERECT TEST

- Observe posture
  - Amount of neck extension
  - Increased lordosis
  - Shoulders forward
  - Loss of balance
  - Change in muscle tone at back of the knees
  - Gripping with the toes
  - Dizziness or nausea
SYMMENTRICAL TONIC NECK REFLEX (STNR)

Emerges 5-8 months
Inhibited 9-11 months
While on all fours:
- Neck extension results in UE extension and LE flexion
- Neck flexion results in UE flexion and LE extension

DEVELOPMENTAL IMPLICATIONS
- Purpose: precursor to crawling
- Supports integration of TLR
- Supports distribution of muscle tone in upper and lower halves of the body
- Coordination of head with hands, arms, and upper back
- Disassociation of upper and lower body
- Allows child to sustain quadruped and rock back and forth
- Start of accommodative function – expands peripheral and distance vision
EFFECTS OF NON-INTEGRATION

- Child does not crawl, bottom shuffles, or crawls with poor quality
- Poor posture
- Slumping in desk
- Clumsiness
- Poor visual accommodation
- Poor eye-hand coordination
- Academic issues: reading, writing, art, music

EFFECTS OF NON-INTEGRATION

- Difficulty with bilateral movements – if one hand works, the other helps by moving too
- Difficulty with copying tasks
- Problems with attention and concentration
- W-sitter
- Social issues – frustration; avoidance

STNR - TESTING

- Position in quadruped
- Ask child to slowly move head to look down “between your legs”
- Hold 5 seconds
- Slowly move head upwards “as if looking at the ceiling”
- Repeat up to 6 times
ASYMMETRIC TONIC NECK REFLEX

- Stimulated by head position
- Present at birth
- Inhibited between fourth and sixth month
- Extension of arm and leg to the face side
- Flexion of arm and leg to the occipital side

DEVELOPMENTAL IMPLICATIONS

- Asymmetrical cross lateral movements
- Rotation around the sagittal axis
- Foundation for auditory processing and language
- Differentiation of left/right sides of the body and development of limb dominance
- Hemispheric differentiation and specialization of executive functions
- Hand-eye coordination – extension of visual focus
EFFECTS OF NON-INTEGRATION

- Challenges in crossing midline
- Difficulty throwing/catching
- Difficulty tracking through midline
- Difficulty with attention, focus, and memory
- Auditory processing and/or auditory defensiveness
- May have dyslexia or dyscalculia diagnosis
- Learning difficulties: language, reading, spelling, math, handwriting

ATNR: QUADRUPED TEST

- Quadruped
- Extended, yet relaxed, arms
- Head in neutral
- Therapist turns head right
- Hold five seconds
- Turn head left
- Hold 5 seconds
WHAT ARE YOUR GOALS?

- Child has full head control against gravity – measured in supine
- Child can engage in play and functional activities without associated body reactions in response to head flexion/extension or rotation – both in static and dynamic play/functional tasks

ACTIVITIES FOR INTEGRATION

- Facilitate correct activation of all components of the reflex
- Modifications
  - Head Control – add pillow under head to bring in neck flexion
  - Pelvis – place pillow/your leg under pelvis to facilitate full flexion of lower body
  - Work in small ranges first
TREATMENT IDEAS

- “Tug-o-war” – supine; tall kneel
- Rope pull – supine/prone
- Pull/push games (isometric engagement)
- Scooter board
- Airplane
- Prone play
THINK ABOUT THE PATTERN...

- Stimulus: Head
- Break up head flexion/extension from full body flexion/extension
- Activities that dissociate head from body
- Activities that move the body against gravity
- Activities that support both flexor and extensor strengthening
- Activities that promote balance

TREATMENT SUGGESTIONS

- Lay supine and play games that only lift the head
  - Toss/catch a ball
  - Visual perceptual game on the wall
- Sit on scooter, hold noodle/rope bilaterally and hold co-contraction while being pulled forward
- Balance activities
  - Alter head position

TREATMENT SUGGESTIONS

- Tug of war with peanut ball or small toys – in supine flexion and sitting
- Superman and Supine Flexion:
  - Work on controlled breathing
  - Sing/count adapting voice
  - Grade by time
  - Add in pulses
  - Add visual activity: tracking chart, eye spy game
THINK ABOUT THE PATTERN...

- Stimulus: head
- Breaking up the body in the transverse plane
  - Head and arms work together
  - Legs are opposite
- Reverse the pattern
  - Head extends, make arms flex and legs extend

STNR TREATMENT SUGGESTIONS

- Yoga poses
  - Upward dog
- Crawl
  - Hands and feet soccer
  - Push a balloon/ball with nose
  - Go in various directions
  - Accommodation activities in quadruped

STNR TREATMENT SUGGESTIONS

- Dog-Chair
- Cat-cow
- Quadruped push-ups
- Scooching on knees with strong engagement of shoulder girdle
- Scooter board:
  - Propel self on knees
  - Incorporate ball/beanbag/balloons
  - Slalom between cones
THINK ABOUT THE PATTERN...

- Stimulus: head rotation
- Rotation results in:
  - *extension to the side of rotation*
  - *flexion to the opposite side*
- Activities that support playing in the pattern, opposite the pattern, bilateral play at midline and crossing midline

TREATMENT SUGGESTIONS

- Rocking horse (Athena Oden)
- Ball pass around sagittal midline (Kawar zapping robots)
- Bal-A-Vis-X
- Differentiated angels in the snow
- Differentiated crawling patterns and animal walks
- Quadruped – grasp and place rings on feet ipsi- and contralateral.
- Blowing bubbles with bubble wand

Lizard

Cross Crawls