Movement is Medicine

Susan Milani, DO and Jordan Keys, DO
Convocation 2020
Goals:
- Have an understanding of how movement from birth until walking can play a critical role in postural muscle balance
- Identify ways that we can test for and retrain these muscle imbalances and movement patterns

Objectives:
- Identify the muscles involved in upper and lower crossed syndrome
- Identify early movement patterns and sequence from birth to walking
- Identify the role that reflexes play on the development of efficient movement patterns
- Identify the role of the nervous system on muscle balance and postural awareness
- Identify the contributions of early movement patterns in the development of muscle balance
- Discuss the role of proprioception and kinesthetic awareness in the development and treatment of muscle imbalance and postural awareness
Proprioception/Kinesthesia

**Proprioception**
- Position - where the body is in space
- Balance
- Subconscious
- Muscle spindles

**Kinesthesia**
- Awareness
- Movement of the body
- Behavioral - ex: learning to do swing a bat
Posture is Movement
Bonnie Bainbridge Cohen

- A movement artist, dancer, researcher, educator, occupational therapist.
- In 1973, founded the School for Body-Mind Centering, an approach to movement and consciousness.
- Over 60 years of work influencing dance, bodywork, yoga, psychotherapy, infant and child development.
Postural Tone

Provides the foundation for muscle tone

Posture is maintained by tonic muscle contractions acting against gravity and stabilizing the positions of body segments.

Small movements accompany the maintenance of any posture.

1-2 degrees of joint movement.

Dynamic changes based on relation to gravity and internal physical, emotional and cognitive processes and practices.
Postural Tone

- Postural tone changes depending on which surface of the body is in contact with the supporting surface.
- Tone increases on the side in contact with the surface.
- Provides a basis of muscular support.
- Modulates the tone of the muscles on the opposite side of the body that are needed to contract and move away from the surface against the pull of gravity.
Postural Tone-Flexion

In prone, the flexor tone of the muscles on the front of the body increases.

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Postural Tone
Flexion/Prone

When lying on the belly and lifting the head and torso, the underlying tone of the flexors modulates the contraction of the extensors of the back.

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In supine, the tone of the extensors on the back of the body increases.

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Postural Tone-Extension Supine

When lying on the back and lifting head and torso, the underlying tone of the extensors modulates the contraction of the flexors on the front.

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Postural Tone

- Automatic changes in postural tone in response to supporting surface and gravity produce easier, freer and efficient movement.
- Without the modulating the tone of opposite side, there will be excessive tone.
- Movement will be effortful, constrained, less efficient.

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Overview
Development Movement

- Spinal
- Homologous
- Homolateral
- Contralateral

- Yield and Push
- Reach and Pull
Spinal

- Base for development of limb patterns
- Movement is initiated by the spine
- Yield and Push pattern
- Reach and Pull pattern

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Spinal-Yield and Push for the Tail and Head

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Spinal Reach and Pull from the Head and Tail

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Homologous-Yield and Push

- Two-limbed (two upper and two lower)
- Establish symmetry
- Midline orientation
- Broad base of support

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Homologous-Yield and Push

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Homologous- Reach and Pull

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Balance of Flexion and Extension
Spinal and Homologous Support

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Crossed Syndromes
Vladimir Janda, MD

• Combined therapy and medicine in a hands-on approach; one of the earliest to practice physical medicine and rehabilitation.

• Published more than 16 books and 200 papers.

• Defined crossed syndromes in 1979.

• Emphasized that the sensorimotor system, composed of sensory system and motor system, could not be functionally divided.

• He emphasized the importance of proper proprioception.

Paradigm Shift in Musculoskeletal Medicine

• Structural:
  • Rooted in anatomy and biomechanics.
  • Damage to physiologic structures.
  • Diagnosed with imaging or surgery.
  • Repaired through immobilization, surgery and rehabilitation.

• Functional:
  • Impairment in the ability of a structure or physiological system to perform its job.
  • Manifests in the body through reflexive changes.
  • Imaging often of no use.
  • Identify cause of pathology (rather than focus on pathology itself).
  • Focuses on true function of the muscle (coordinated movement and stabilization).
Muscle Balance

• Relative equality of muscle length or strength between an agonist and an antagonist; **this balance is necessary for normal movement and function.**

• Necessary because of **reciprocal nature** of human movement (opposing muscle groups must coordinate).
Muscle Imbalance Paradigm

• **Biomechanical:**
  • Repetitive movement and posture.
  • Joint motion is altered when a particular synergist becomes dominant at the expense of the other synergist.
  • Abnormal stresses on joints.
  • Treatment: Shortening the longer muscles and strengthening the weaker muscles.

• **Neurological:**
  • Muscles are predisposed to become imbalanced because of their role in motor function.
  • Certain muscle are prone towards tightness or shortness and others prone towards inhibition.
  • Natural reflexes present for balance and function.
  • Tonic vs. Phasic Muscles.
Postural Stabilization

Figure 2.3  The inverted cone of postural stability.

Figure 2.4  The postural stability loop.

Figure 2.5  Balance strategies: (a) ankle, (b) hip, and (c) step.
### Tonic Nervous System
- Older phylogenetically
- Dominant
- Repetitive or rhythmic activities
- Withdrawal reflex

### Phasic Nervous System
- Younger phylogenetically
- Postural stabilizers
- Acts against gravity
### Tonic and Phasic Nervous System

<table>
<thead>
<tr>
<th>Age</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal Posture</td>
<td>Maintained by tonic (flexor) muscle; reciprocal inhibition against extensors</td>
</tr>
<tr>
<td>1 month of age</td>
<td>Tonic and phasic system of the neck are co-activated (baby raises head). Phasic system acting against tonic.</td>
</tr>
<tr>
<td>4 months of age</td>
<td>Sagittal plane motor programming in place, allowing baby in the supine position to flex knees/hips with stable pelvis.</td>
</tr>
<tr>
<td>5-7 months of age</td>
<td>Trunk rotation is evident as the oblique muscular chain is activated</td>
</tr>
<tr>
<td>3 years old</td>
<td>Tonic/Phasic chains in extremities develops until upright posture is functional.</td>
</tr>
</tbody>
</table>
### Tonic and Phasic Nervous System

<table>
<thead>
<tr>
<th>Coactivation Chains</th>
<th>Upper Quarter</th>
<th>Lower Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional Movements</strong></td>
<td>Prehension, grasping, reaching</td>
<td>Creeping, crawling, gait</td>
</tr>
<tr>
<td><strong>Tonic Chain</strong></td>
<td>Flexion, internal rotation, adduction, pronation</td>
<td>Plantarflexion, inversion, flexion, internal rotation, adduction</td>
</tr>
<tr>
<td><strong>Phasic Chain</strong></td>
<td>Extension, external rotation, abduction, supination</td>
<td>Dorsiflexion, eversion, extension, external rotation, abduction</td>
</tr>
</tbody>
</table>
Tonic and Phasic Nervous System

Proper balance critical for normal gait and posture.

Integration and the two systems and upper and lower body is responsible for reciprocal locomotion.

Imbalance in one system can lead to postural compensation and adaptive changes in the opposing system, leading to muscle imbalance (UCS and LCS).
## Muscle Imbalance (UCS and LCS)

![Table of muscle imbalances in the upper and lower crossed syndrome](https://erikdalton.com/blog/vladimir-jandas-patterns-of-upper-and-lower-crossed-syndrome/)

<table>
<thead>
<tr>
<th>Typical muscle imbalances in the upper crossed syndrome</th>
<th>Typical muscle imbalances in the lower crossed syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tight, facilitated</td>
<td>Weak, inhibited</td>
</tr>
<tr>
<td>Pectoralis</td>
<td>Longus capitis &amp; colli</td>
</tr>
<tr>
<td>Upper trapezius</td>
<td>Hyoids</td>
</tr>
<tr>
<td>Levator scapulae</td>
<td>Serratus anterior</td>
</tr>
<tr>
<td>Sternumcleidomastoid</td>
<td>Rhomboids</td>
</tr>
<tr>
<td>Anterior scalenes</td>
<td>Lower &amp; middle trapezius</td>
</tr>
<tr>
<td>Suboccipitalis</td>
<td>Posterior rotator cuff</td>
</tr>
<tr>
<td>Subscapularis</td>
<td></td>
</tr>
<tr>
<td>Latissimus dorsi</td>
<td></td>
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<th>Tight, facilitated</th>
<th>Weak, inhibited</th>
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<tbody>
<tr>
<td>Iliopsoas</td>
<td>Rectus abdominis</td>
</tr>
<tr>
<td>Rectus femoris</td>
<td>Gluteals</td>
</tr>
<tr>
<td>Hamstrings</td>
<td>Vastus medialis</td>
</tr>
<tr>
<td>Lumbar erectors</td>
<td>Vastus lateralis</td>
</tr>
<tr>
<td>Tensor fascia latae</td>
<td>Transversus abdominis</td>
</tr>
<tr>
<td>Thigh adductors</td>
<td></td>
</tr>
<tr>
<td>Piriformis</td>
<td></td>
</tr>
<tr>
<td>Quadratus lumborum</td>
<td></td>
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</tbody>
</table>
Muscle Imbalance (UCS and LCS)

Figure 4.2 (a) UCS and (b) common posture in UCS.
And Now Back to Sitting....
Resources

