Anatomical Chains

Andrew T. Kim
Kaiser Permanente Spine Fellow-2019
Objectives

- Why
- Types
- Formation
- Approach
Chains?

- Muscles do not function as independent units
Types of Chains

- Biomechanical
- Neuromuscular
- Myofascial
Biomechanical Chain

○ Structure, motion, and function of a task
  ○ Timing and force along the chain will determine the performance of the task
    ■ I.e. throwing or squatting
Neuromuscular Chain

- Janda → NM chains from a developmental kinesiology perspective
  - Tonic (Flexor) vs Phasic (Extensor) system
  - As neurodevelopmental progresses, these chains co-activate for tasks:
    - Reaching
    - Grasping
    - Creeping
    - Crawling
    - Gait
Tonic vs Phasic Chains

- **Upper Chain**
  - Tonic/Flexor
    - Shld flexion, IR, ADD, pronation
  - Phasic/Extensor
    - Shld extension, ER, ABD, supination

- **Lower Chain**
  - Tonic/Flexor
    - Hip flexion, IR, & ADD + ankle PF, INV
  - Phasic/Extensor
    - Hip extension, ER, & ABD + ankle DF, EV

- **Functional tasks**
  - Reaching
  - Grasping
  - Creeping
  - Crawling
  - Gait
Myofascial Chain

- Fascia - contains contractile cells, free nerve endings, and mechanoreceptors
- Tensegrity-like, bodywide network
- Connective tissue
  - Surrounding the skeletal muscles has contractile features - 40%
  - Can modify both water content and its stiffness in response to mechanical stimuli
Systematic review: What is evidence-based about myofascial chains?

- Strong evidence
  - Superficial Back Line
  - Back Functional Line
  - Front Functional Line
- Moderate evidence
  - Spiral Line
  - Lateral Line
- Weak evidence
  - Superficial Front Line
Myofascial Back Chains

- Superficial back line
- Back functional line
- Front functional line
Myofascial Back Chains

○ **Superficial back line**
  ○ Galae aponeurotica/scalp fascia, erector spinae, thoracolumbar+sacral fascia, sacrotuberous ligament, hamstring muscle, gastrocnemius, achilles tendon, plantar aponeurosis and short toe flexors

○ Back functional line

○ Front functional line
Myofascial Back Chains

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- **Back functional line**
  - Latissimus dorsi, thoracolumbar+sacral fascia, contralateral glut max, vastus lateralis, subpatellar tendon

- **Front functional line**
Myofascial Back Chains

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○ Front functional line
  ○ Pec major (lower edge), lateral sheath of rectus abdominus, adductor longus
Myofascial Chain

○ Superficial back line
  ○ Galae aponeurotica/scalp fascia, erector spinae, thoracolumbar+sacral fascia, sacro-tuberous ligament, hamstring muscle, gastrocnemius, achilles tendon, plantar aponeurosis and short toe flexors

  ○ Self-massage of the plantar foot increased hamstring extensibility

○ Wilke et al 2016
  ○ Stretching the calf and hamstrings enhanced C/S mobility in the sagittal plane

○ Montecinos-Cruz et al 2015
  ○ Anterior pelvic tilt in long sitting demonstrated gastrocnemius fascia to displace in the cranial direction
Myofascial Back Chains

- **Back functional line**
  - Latissimus dorsi, thoracolumbar+sacral fascia, contralateral glut max, vastus lateralis, subpatellar tendon
- Carvhalais et al 2013
  - Passive lengthening of lat dorsi caused an altered hip position and mechanical stiffness of hip muscles
Myofascial Back Chains

- **Front functional line**
  - Pec major (lower edge), lateral sheath of rectus abdominus, adductor longus
    - Groin pain in athletes (athletic pubalgia) → strength imbalances between adductor longus and lower abdominal muscles
Approach

○ Functional approach
  ○ Find the key chain involved in the movement
    ■ Identify the “overactive link” → Inhibit
    ■ Identify the “weakest link” → Facilitate

○ Referred pain
  ○ I.e. myofascial TrP of the calf →
    sole of the foot and to dorsal thigh (Travell et al)
Future Research

- Concrete tailored interventions for pts with pain/impairments
- Non-anecdotal
References