Anatomical Chains

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Objectives

- Why
- Types
- Formation
- Approach

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Chains?

- Muscles do not function as independent units

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Types of Chains

- Biomechanical
- Neuromuscular
- Myofascial

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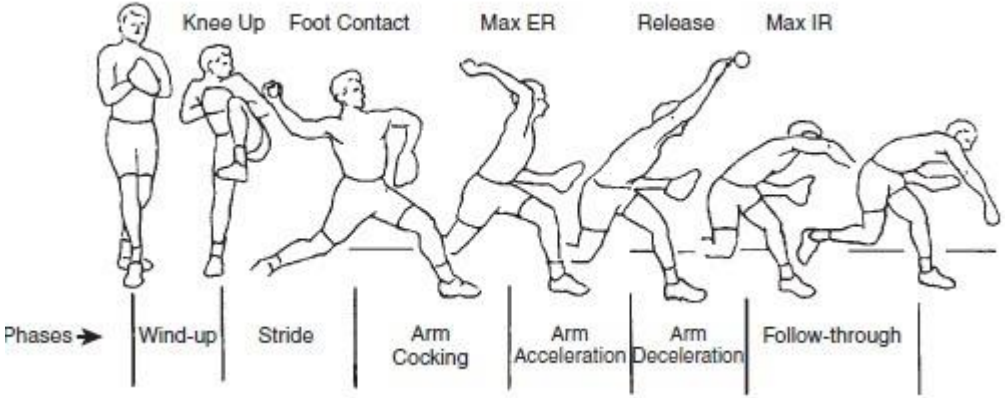
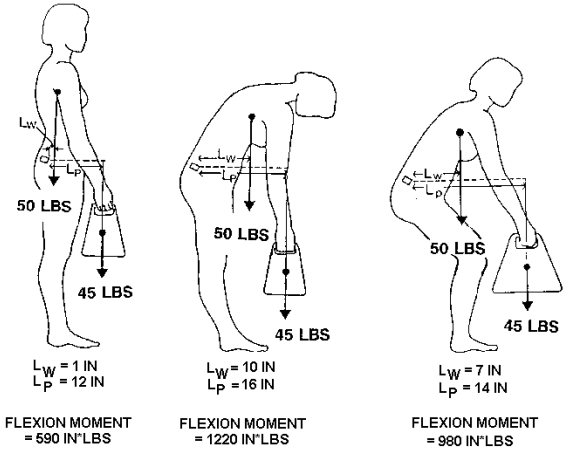
Biomechanical Chain

- 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





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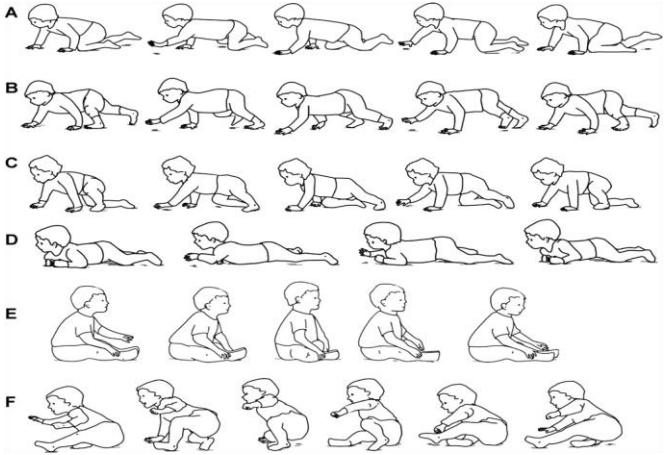
Neuromuscular Chain

- 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



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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

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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

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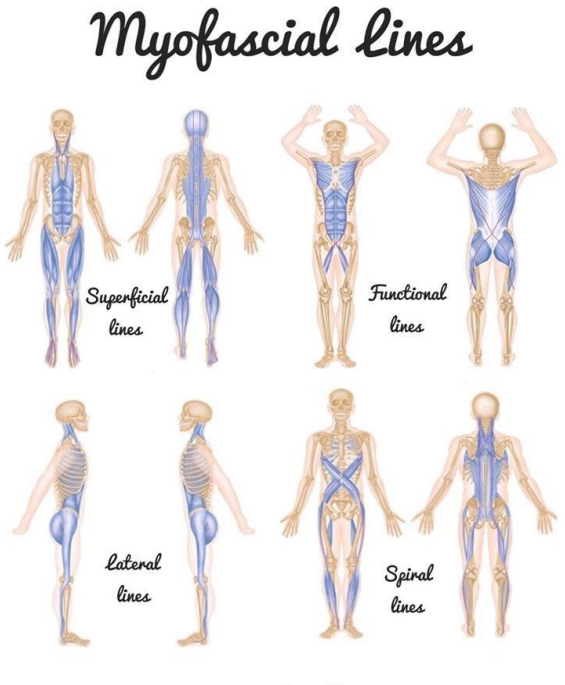
Myofascial Chain

- 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



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Myofascial Back Chains

- Superficial back line
- Back functional line
- Front functional line

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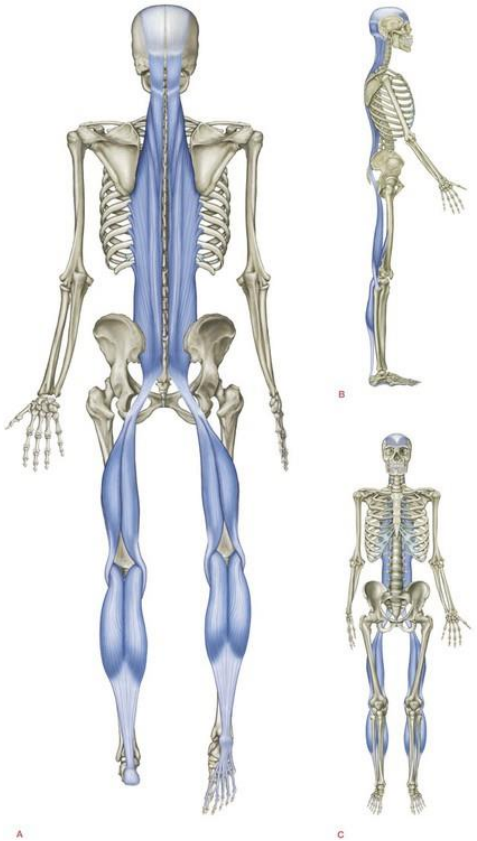
Myofascial Back Chains

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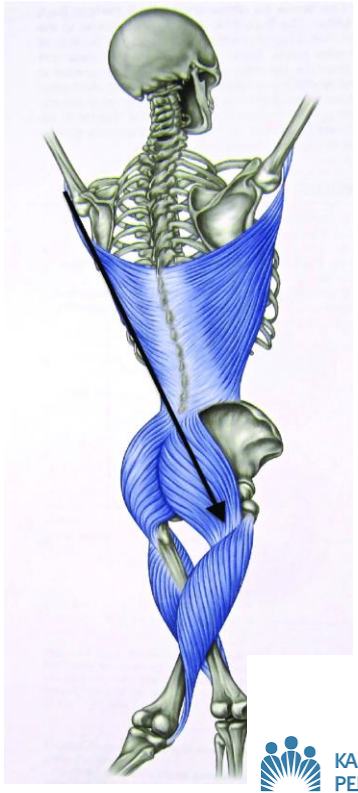
- **Back functional line**
  - **Latissimus dorsi, thoracolumbar+sacral fascia, contralateral glut max, vastus lateralis, subpatellar tendon**
- Front functional line



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Myofascial Back Chains

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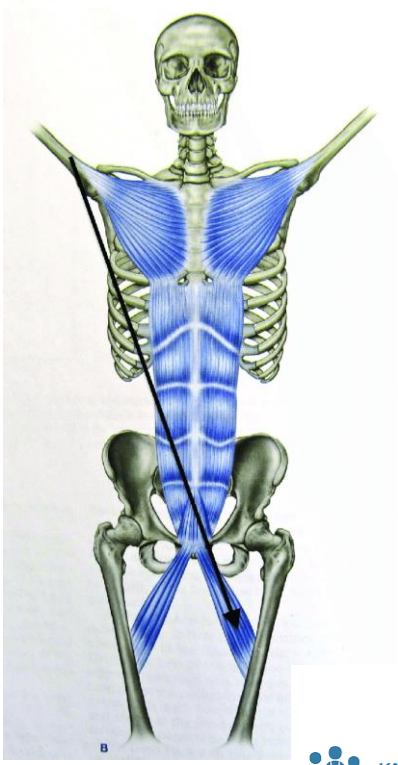
- Back functional line
  - Latissimus dorsi, thoracolumbar+sacral fascia, contralateral glut max, vastus lateralis, subpatellar tendon
- **Front functional line**
  - **Pec major (lower edge), lateral sheath of rectus abdominus, adductor longus**



Myofascial Chain

- **Superficial back line**
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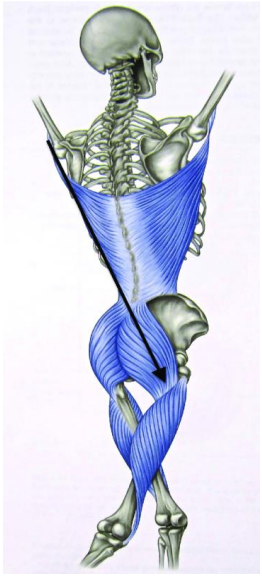
- Grieve et al 2015 & Patel et al 2016
  - Self-massage of the plantar foot increased hamstring extensibility
- Wilke et al 2016
  - Stretching the calf and hamstrings enhanced C/S mobility in the sagittal plane
- Montecinos-Cruz et al 2015
  - Anterior pelvic tilt in long sitting demonstrated gastrocnemius fascia to displace in the cranial direction

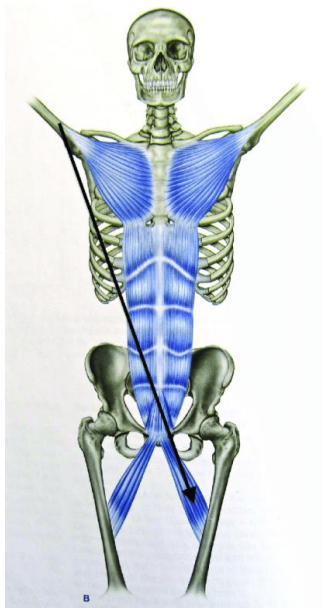
Myofascial Back Chains

- **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



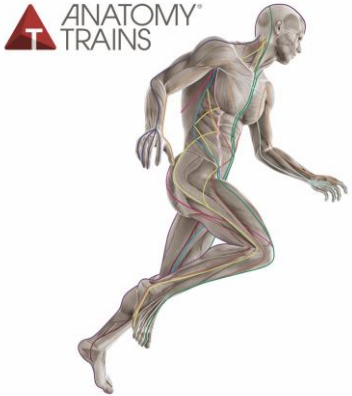
Myofascial Back Chains

- **Front functional line**
  - **Pec major (lower edge), lateral sheath of rectus abdominus, adductor longus**
  - Fricker et al 1991, Anderson et al 2001, Morales-Conde et al 2010, Choi et al 2011
    - 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)



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Future Research

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

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