How Important is Core Stability to Lower Extremity Injury and Function?

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Disclosures: None
Outline: How Important is Core Stability to Lower Extremity Injury and Function?

- **Short answer:** Yes, it is quite important
- Functional anatomy
- Kinetic chain
- Injury specific applications
  - Treatment and prevention
- Evaluation tools and techniques
- **Evidence Based Medicine**
What is the Core?

Core Stability

- Rectus abdominis
- Multifidus
- Internal and External Obliques
- Diaphragm
- Pelvic floor
- Transversus abdominus

Hip Stability

- Glutes
- Hip Flexors
- Abd and Adductors

(Kibler, Press and Sciascia 2006)
What is Core Stability?

- “The ability to control the position and motion of the trunk over the pelvis and leg to allow optimum production, transfer and control of force and motion to the terminal segment in integrated kinetic chain activities.” – Wilkerson, et al.

- “Core Stability is the ability of the lumbopelvic-hip complex to prevent buckling and to return to equilibrium after perturbation” – Wilson et al.

- Purpose: maintain integrity of the spinal column, alignment of the pelvis, and to provide a stable base for movement of the extremities

- Primarily maintained by dynamic muscle function
Kinetic Chain

- Important in any sport/activity that involves walking/running

- Internal Corkscrew
  - Rotational or translations abnormalities in any segment effect the entire chain
  - Bottom can effect the top
  - Top Can effect the bottom

- “Impaired proximal function increased the likelihood of uncontrolled joint displacements or unsolicited accessory movements throughout the lower kinetic chain” – Ridder et al
Kinetic Chain: Evidence Based Medicine

- EMG studies show us that the core and hip muscles activation is coordinated with lower extremity muscle activation
  - Multisegmental coordination

- Bobbert et al evaluated jumping activities and showed that knee extension and ankle plantar flexion were strongly related to the rise time of the gluteus medius

- The multifidus and transverse abdominus muscles have been shown to be activated before any lower extremity movements occur
  - Hodges et al
Injury/Condition Specific Applications

- ITB “runners knee”
- PFPS
- ACL Injuries
- Medial Tibial Stress syndrome (MTSS)
- Chronic Ankle Instability (CAI)
- Acute ankle injuries
- Tendinopathy
  - Peroneal
Evidence Based Medicine: Ankle Injuries

- Ipsilateral hip abductors weakness after inversion ankle Sprain
  - Friel et al. Journal of Athletic Training. 2006
  - Following Chronic Ankle Sprains
    - Ipsilateral Hip Ext and Hip ABD weakness
    - Initially after acute injuries altered hip muscle recruitment

- McGuine et al. reported that high school basketball players who sustained acute ankle instability events, demonstrated considerably greater postural sway

- Doherty et al in 2016 showed that those who developed CAI had impaired proximal hip function to those who recovered from their ankle injury
Evidence Based Medicine: MTSS

- Hamstra-Wright et al. BJSM- 2015
  - Meta-analysis of risk factors for MTSS
  - Of the 100+ risk factors noted only 9 were included in the study
    - Those which showed strong correlation
      - BMI
      - Navicular Drop
      - Ankle PF ROM
      - Hip External Rotation ROM
  - Study investigating male military recruits
    - Decreased hip IR was a risk factor for MTSS
    - Excessive ER of hip had increased incidence of tibial stress fractures
Hip Abductor Weakness

- Very clinically relevant for overuse knee injuries

  - Runners with Lower extremity injures demonstrated significantly weaker hip ABD and ER

- Novice runners
Evaluation and Screening tool - Stance

- Stance Exam
  - Hip Level
  - Lumbar Lordosis
  - Trendelenburg sign
Gait Evaluation

- Hip Excursion/Pelvic Level
- Arm Swing
- Cross Over
  - N=3-6cm from midline
  - Causes
    - Poor Core stability
    - Weak Hip ABD
    - STJ Pron leading to pelvic tilt
    - LLD
Gait Eval - Pelvic Level

- Natural excursion during gait
- Look for excess or asymmetry
- Increased movement with increased running speeds
Core/Hip Stability Special Tests

A

B

C

D

X

E

F

G

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K

L

M

N

O

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W

X

Y

Z
Injury-induced neural inhibition of muscle function can produce subtle and persistent performance deficiencies”- Wilkerson et al

- Core and Hip Stability should be included in their rehab program
  - Especially in Ankle sprain

- Knowing your Physical therapist/Athletic Trainer
Injury Prevention

- “A growing body of scientific evidence suggests that clinical tests of core strength and stability can help predict risk of lower extremity injury in athletes”
- Debate over what those factors are specifically
  - 3 year prospective study of Division I football players
  - Preseason screening and injury occurrence
  - Strong predictors of core and lower extremity sprains and strains
    - High exposure to game conditions
    - Low back dysfunction (even if mild)
    - Poor endurance of core musculature
      - Trunk flexion hold
      - Wall sit
- DeRidder et al. AJSM 2017
  - 3 year prospective youth soccer players
  - Hip extension muscle strength as an independent and modifiable risk factor for ankle sprains
Conclusions

- YES! Core Stability is Important
- Core Stability involves more than just the 6-pack
  - Muscle of the entire abdomen, back, pelvis, gluts, hips
- Proper Core and Hip Function is important to the entire kinetic chain
- Proximal instability/weakness/poor neuromuscular control is in important factor in the prevention, treatment, and rehabilitation of lower extremity injuries
  - More research is needed in terms of Cause and Effect
- Core/Hip intervention should be included in your treatment protocol for ankle sprains, Chronic ankle instability, and MTSS
  - Make sure you PTs and ATCs are addressing
- There is a growing body of evidence in the sports medicine literature to support the importance of core stability in lower extremity function and really all gross motor activity
Photo Sources

- Slide 3: http://advantagestrength.com/what-is-core-stability/
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- Slide 13, 14: Ray Feehery, DPM
- Slide 15: http://www.graychiropractic.ca/testing-you-core-part-3/
- Slide 17: https://www.youtube.com/watch?v=dKYXfbBQfLE
Sources

Questions?

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