5th Annual Health Care Provider Conference

Promoting Health Care

May 8, 2009 • Hilton Metrotown, Burnaby, BC
Assessment, treatment and predictability of low back, pelvic and hip Injuries

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Objective:

To provide an evidence based assessment tool for predicting low back, pelvic and hip injuries.
Short-term disability, long-term disability, and fatal claims first paid in 2007 by type of injury

- Back strain: 22.4%
- Other strain: 32.3%
- Cut: 11.5%
- Contusion: 11.1%
- Fracture: 7.1%
- Dislocation: 0.6%
- Electrical shock/electrocution: 0.1%
- Hemia: 0.8%
- Concussion: 1.9%
- Burn: 1.6%
- Occupational disease: 5.9%
- Multiple injuries: 0.1%
- Traumatic tenosynovitis, bursitis & related: 2.0%
- Other injuries: 0.1%
- Amputation: 0.4%

1 Due to rounding, numbers don't add up to 100 percent.
What do we need to assess?

**Extrinsic**
- Work place
- Closed vs open environment
- Equipment
- Contact vs non contact
- Shift work
- Fitness & Training

**Intrinsic**

**Previous Injury** (Engebresten 08, Arnason 04, Emery 01, Favid 04)

**Age** (Emery 01)

**Sport Duration** (Emery 01)

**ROM - Hip Abduction** (Arnason 04)
  - **Hip Rotation** (Verrall 05, 07)

**Strength** - **Abduction force** (O’Connor 04)
  - **Adduction force** (Tyler 01)

**Biomechanics** (Garret 87, Ekberg 88, Williams 00, Hoogendorn 00)

**Psychosocial**
<table>
<thead>
<tr>
<th>Non-Modifiable</th>
<th>Modifiable</th>
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</thead>
<tbody>
<tr>
<td><strong>Age</strong> - 39 average (WorkSafe 07)</td>
<td><strong>fitness</strong> *</td>
</tr>
<tr>
<td><strong>Sex</strong> - 69:31 (WorkSafe 07)</td>
<td><strong>Strength &amp; endurance</strong></td>
</tr>
<tr>
<td><strong>Previous Injury</strong></td>
<td><strong>ROM</strong> *</td>
</tr>
<tr>
<td><strong>Activity Duration</strong></td>
<td><strong>Balance</strong> *</td>
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<td></td>
<td><strong>Biomechanics</strong> *</td>
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<td><strong>ergonomics</strong> *</td>
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<td><strong>education</strong> *</td>
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<tr>
<td></td>
<td><strong>4% of prevention hrs (WorkSafe 07)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>psychosocial</strong></td>
</tr>
</tbody>
</table>
We treat the victim but need to find the criminal!
Stability - the ability of a system or systems to resist / control (optimal) motion

Panjabi, 1992 Spinal Stability Model
Stability

Neutral Zone – minimal resistance to a joint

The NZ can increase with injury, degeneration and/or weakness of the stabilizers

Panjabi, 1992 Spinal Stability Model
Stability

Form Closure - (passive)

No extra forces
- shape
- friction
- ligamentous

Snijders et al 1993a
Stability

**Force Closure** - (active)

Extra forces
- friction
- intra-articular compression

Dynamic
- neural
- myofascial - tonic | phasic

Force Closure is needed to control
- compression
- torsion
- shear

Snijders et al 1993a
Stability

The key is to provide appropriate activation (initiation / sequencing) of the force closure mechanisms to prevent injury to the core area.

We cannot change the anatomy but we can change how it works!

The Integrated Model of Function

Form Closure  Force Closure
Motor Control  Emotions Awareness

Mobility - the ability of a system or systems to allow / produce (optimal) motion
Mobility

Any restriction within the Mobility System will alter a movement pattern leading to a repetitive breakdown or misfiring either at or away from the site of dysfunction.
Functional Stability

Core Activation

**Local System**

*Inner unit* = central control

**Global System**

*Outer unit* = assist central control

(Bergmark, 89)
Functional Stability

Inner Unit (local system)

The goal is to achieve an optimal neutral position and maintain it!

Functional Stability

Local System (inner unit)

CNS - anticipatory stabilizers

**local system** • contracts prior to upper/lower limb movement regardless of direction

**global system** • contracts later and is direction dependant

Research

- **Tr A Delayed in LBP** (Hodges, Richardson, 1996)
- **Tr A Delayed in Groin Injuries** (Cowen et al, 2004)
- **Altered Motor Control with SIJT Pain** (O'Sullivan et al, 2002)
Functional Stability

Outer Unit (global system)

Posterior Oblique System (Posterior Sling)
- force closure
- contra lateral motion
- load transfer during rotation and gait

Vleeming 1995a
Functional Stability

Outer Unit (global system)

Anterior Oblique System (Anterior Sling)

- phasic to initiate motion
- Tr A for stabilization
- contra lateral motion

Snijders et al 1995
Functional Stability

Outer Unit (global system)

Deep Longitudinal System

- load transfer
- compression
- sacral control (biceps femoris)

Gracovetsky 1997
Functional Stability

Outer Unit (global system)

Lateral System

- standing and walking
- inhibited with pelvic dysfunction

Gracovetsky 1997
Functional Stability

Functional Outer (global) Systems

Vleeming 1995a  
Snijders et al 1995  
Gracovetsky 1997
Injury

- weakness
- insufficient recruitment
- timing (sequence) errors

Compensatory movement strategies will result in a decompensation of the low back, pelvis or hip and ultimately any other distal areas.

May present as a repetitive strain or acute pathology.
Prehabilitation
Training that utilizes rehabilitation techniques prior to injury.

**Sequence for Success**
- Core Activation
- System Mobility
- Train the Systems

Optimal motion control occurs proximal to distal
Assessment - Functional Stability

Assessment - Orthopaedic and Neurological scans to be complete first.

Core Activation Scan

ASLR test

Supine - raise leg to 30°

Poor Stability

Good Stability
Athletes with groin pain for at least one month who had increased pain with resisted isometric adduction

- 39% +ve ASLR test ...... then retested with a SI belt
- all 39% had – increased strength, decreased pain, –ve ASLR test

Therefore it is possible to treat adductor strains that have a +ve ASLR test by stabilizing the pelvis

(Mens 06)
Assessment - Functional Stability

4 point

Poor Stability

Good Stability
Assessment - Functional Stability

Standing - throwing stance

a) Rhythmic Stabilizations
Assessment - Functional Stability

Standing

b) Gillet (Stork Test) - single hip lift to 90°

(Lee 2004)
Treatment - Functional Stability

Must teach inner unit activation first then look to initiate and maintain the activation while increasing functional movement.

Assess the quality and quantity of stability and motion.
Assessment - Mobility System

Injury

Dysfunctional Movement
Assessment - Mobility System

Lower Extremity Diagonal Chain Stretch

a) Flexion

b) Extension
Assessment - Mobility System

Sitting

a) Flexion

b) Extension
Labral Tears of the Hip

Test

Ten patients with labral tear diagnosed and treated arthroscopically

pain with IR and 90° hip flex – 7

pain with axial compression, adduction and 90° hip flex – 10

tenderness posterior to greater trochanter - 8

(Hase T, 99)
Labral Tears of the Hip

Test

Internal rotation-flexion-axial compression was sensitive – 75% but not specific 43%.

Thomas Test was neither sensitive nor specific

(Narvani AA, 03)
Figure 8.41  Overactivation of the deep external rotators of the hip pulls the greater trochanter posteriorly (large arrow) and forces the femoral head anteriorly. (Reproduced with permission from Lee 2001a.)
Treatment - Mobility System

If a mobility restriction is found then it can be mobilized in the same position with PNF techniques and joint mobilization

Treatment must not compromise the inner unit stability position.
Train the Systems (proximal to distal)

Function

a) Skating
Train the Systems (proximal to distal)

Function

b) Shooting
Train the Systems (proximal to distal)

Function

c) Goaltending

(McKechnie & Celebrini)
Change Movement Behavior

- Downtrain Dysfunctional Global Patterns
- Isolated Recruitment of Local System
- Integrate Coordination & Timing of Local & Global systems
- Functional Integration of Local & Global Systems

- Re-educate Neutral Spine Position
- Train Co-contraction & Endurance of Local System
- Target Specific Global Muscle Weakness / Restore Muscle Length

(Lee 2004)
Summary

Training optimal movement patterns will aid in the prevention of low back, pelvic, groin and hip injuries and provide a basis for effective performance.

Sequence for Success

- Core Activation
- System Mobility
- Train the Systems
Beever’s Axiom:

“The brain knows nothing of individual muscle action but only knows of movement”

(George Beevor, 18th Century)
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