Assessment of the Kinetic Chain
a practical approach

Greg Bay PT, FCAMT
Dip Sports Physiotherapy
2010 Olympics Therapy Supervisor
Director CBI Health Fraser Valley

Stability

Neutral Zone – minimal resistance to a joint

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

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

1) Form closure assessment – foot, knee, hip and pelvis
2) Force closure assessment – neural and myofascial

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!

Function

Force Closure

Emotions

Awareness

Form Closure

Motor

Control

The Integrated Model of Function


Functional Stability

Core Activation

Local System

Inner unit = central control

Global System

Outer unit = assist central control

produce

and transfer motion

(Bergmark, 89)

Functional Stability

Local system (inner unit)

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

Functional Stability

Global System (outer unit)

Posterior Oblique System

(Posterior Sling)

• force closure

• contralateral motion

• load transfer during rotation and gait

(Vleeming 1995a)

Functional Stability

Global System (outer unit)

Anterior Oblique System

(Anterior Sling)

• phasic to initiate motion

• Tr A for stabilization

• contralateral motion

(Lee, 2004)

Functional Stability

Global System (outer unit)

Lateral System

• standing and walking

• inhibited with pelvic dysfunction

(Gracovetsky 1997)
Functional Stability

**Global System** (outer unit)

Deep Longitudinal System
- load transfer
- compression
- sacral control (biceps femoris)

Gracovetsky 1997

Deep Longitudinal System

Heel strike – Post Rotation of R Pelvis = tightens R Sacrotuberous Lig + Biceps Femoris contracts + evertors = pelvic stability then connects through Core to thorax and arms

Gracovetsky 1997

Functional Stability

**Functional Global Systems**

Vlaeminck 1995a
Snijders et al 1995

Injury
- weakness
- insufficient recruitment
- timing (sequence) errors

Gracovetsky 1997

Injury

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.

Assessment - Stability System

ASLR Test
look for change in lordosis and/or torsion of the pelvis
raise leg to 30° - compare both sides

Poor Stability
Good Stability

Assessment - Functional Stability

Supine
Assessment - Functional Stability

Standing

Single leg hip lift to 90°

A) static – level – balanced position then add arms = eyes open vs closed

B) dynamic – level – balanced transition 1) walk on spot, 2) weight shift hop (Lee 2004)

Assessment Functional Stability

Stride Test

Foot – knee – hip alignment
Pelvis and shoulders square

"The brain knows nothing of individual muscle action but only knows of movement"

(Deever, 18th Century)

References

References


You don’t have to be a farmer
To be outstanding in your field!