Functional Assessments in Athletes
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Purpose of Functional Assessments
• “Great clinicians perform assessments to uncover the cause of pain, then work to eliminate the cause first, followed by an intervention to reduce the risk of reoccurrence and enhance the robustness of the patient.” - Stu McGill, Phd

• Every system in the body requires movement for optimal function and performance. We are looking at how the body moves.
Biomechanical Assessments

• Detect MSK abnormalities that put athlete at risk of injury

• Virtually any athletic task can become a test

• Provides feedback regarding kinetic chain dysfunctions and clue to compensatory patterns i.e. joint dysfunction, pain, soft tissue dysfunction

• Prevent injuries?
• Aid in development of a comprehensive rehab plan

• Look at motor control, flexibility, strength, proprioception

• Elimination of intrinsic faults prior to coaching technique, training, or rehab

• Assess progress
Assessment

- What are you going to assess?
- What type of athlete are you going to assess?
- What functions are most important to their sport, activity, or position?
- What are of major importance? What are of minor importance?
Micro vs Macro Tissue Injuries

• Macro: Positive ortho tests and imaging

• Micro: Negative ortho tests and imaging, edema?

• Assessment tools need to be sensitive and specific enough to detect micro tissue injury.

• History, palpation
Fascia

- Definition: all collagenous fibrous connective tissues that can be seen as elements of a body-wide tensional force transmission network (First Fascia Research Congress)

A whole body, continuous, 3-D, viscoelastic matrix of structural support.
Regional Interdependence

• The concept that seemingly unrelated impairments in a remote anatomical region may contribute to or be associated with the patient’s primary complaint.

• When challenged the human body will always sacrifice quality over quantity of movement.

Mobility-Stability Continuum

- Michael Boyle and Gray Cook - Joint-by-joint training theory or Mobility Stability Continuum

- Ankles, knees, hips, lumbar spine, thoracic spine, cervical spine, TMJ

- Joints with greatest natural ROM = mobile

- Joints with limited ROM in at least one plane = stable
All joints are multi-plane in nature, but for stability/mobility, if there is one primary motion, then it is considered stable.

Mobility and Stability must coexist to create efficient movement in the human body. They usually occur naturally.
Sitting is the new smoking
Mobility-Stability Model

Compensation and incorrect body mechanics caused by inadequate mobility and stability can produce poor efficiency, require more energy, and increase the chance of dysfunction.

Poor mobility can force stable segments to become mobile segments. i.e. limited hip ROM can cause lumbar spine to become unstable. The L-spine will sacrifice stability to obtain more motion. This abnormal motion in the lumbar spine can be one of the primary reasons for disc and facet injuries in the lower back.
Clinical Audit Process

1. CC (chief complaint)
2. AI (activity intolerance)
3. MS (mechanical sensitivity)
4. AMC (abnormal motor control)
5. Re-set and/or training
6. Reassessment
Hip Hinge

Combined flexion and compression is the quickest way to injure the disc.


Spinal Hinging

- The amount of recovery between episodes of spinal hinging, also, plays a role in whether load exceeds tissue tolerance. When tissue tolerance is exceeded, injury occurs to the internal lamellae of the annulus of the lumbar disc and progresses outward.

- Inner layers of annulus are free of nociceptive neurons. Pain is not felt until compromise reaches well-innervated/vascularized outer layers of the disc or the resultant disc bulge produces mechanical pressure on the nerve roots.
Hip Hinge

Genetics largely determine how often and how much of this activity can be tolerated before injury occurs.


In disc patients, often see tendency to hinge excessively in the lumbar spine vs the hips with forward bending activity.
Ankle Dorsiflexion Test

> 5 degree asymmetry, predictor of injury.

Malliaras, Pl, Cook, J.C., Kent, P. 2006. Reduced ankle dorsiflexion range may increase risk of patellar tendon injury among volleyball players. Journal of Science and Medicine in Sports, 9, 304 - 309.


Overhead Squat Test
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Overhead Squat Test
Single Leg Squat Test

- Pass = 3, Pain = 0
- Can’t squat to 30 deg knee flexion (1)
- Knee valgus (med to great toe)(1)
- Lumbar spine flexion (2)
- Anterior patellar shear (2)
- Trendelenberg sign (2)
- Hyperpronation (2)
Knee Valgus

- Dysfunctional movement mechanics $\rightarrow$ ↑ joint stress and soft tissues of kinetic chain
- Excessive rear foot eversion and hip adduction are risk factors for patellofemoral joint pain

Single Leg Bridge

- Pelvic drop or rotation (1)
- Can’t maintain full hip extension (2)
- Thighs don’t remain parallel (2)
Side Bridge Endurance Test

- Mean endurance times for healthy men and women = 84.5 s

- According to McGill, asymmetry of > 15s could be predictor of LBP.

Flexor Endurance Test

- Normative data for men and women = 134 secs

Back Extensor Test

- Normative data for men and women = 173 secs


- Teenagers with LBP have stronger flexors and weaker extensors compared to controls

Prone Plank Endurance Test

- Test duration should equal 100 secs for both men and women

Hip Rotation

Side-to-side asymmetry prevalent in those with LBP in rotational sports

Hanging Scapular Clocks

Ida Portal
Kneeling Chop
Single Leg RDL
Palloff Press
Bear
Bird Dog
Hip Abduction Test
Single Leg Balance
Quad/Ham Ratio

Hamstring to quadricep strength ratio has been shown to be predictive of ACL injury in female athletes.

Shoulder Rotation Strength Ratio

ER: IR ratio is predictive of in-season shoulder injury in baseball pitchers.

Nordic Hamstring Exercise

- Predicting, preventing, and rehabilitating hamstring injuries.

- Test-re-test reliability higher for bilateral testing compared to unilateral testing.

- Athletes with a hamstring strain in the previous 12 months still show a significant weakness on the injured limb, despite “successful” rehabilitation.

- Nordbord test has good reliability and is able to identify those who have suffered previous hamstring injury within a 12 month time period.

Hamstring Strengthening

- A substantial portion of hamstring strain injuries in running occur in the long head of biceps femoris.

- Nordics have been found to reduce hamstring strain injuries.

- The Nordic exercise, highest eccentric EMG of any of the 10 exercises tested.