Spine Stabilization
Function of the Spine

- Protect spinal cord and nerve roots
- Adequate support, stability, load bearing
- Transmit compressive and shearing forces
- Allows multi-planar motion
What is spinal instability?

- Loss of joint stiffness
- Increased mobility of abnormal spinal motion
- Changes in segmental translation

- Segmental Instability:
  - Failure of passive restraint
    - Intervertebral disc
    - Ligaments
    - Facet Capsules
What is spinal instability?

- Clinically??
- Pain!
What is spinal instability?

- Panjabi 1992
  - Muscles are necessary to stabilize the spine to carry out function
Neutral

- Posture of the spine in which overall stresses in the spinal column and muscular effort to hold the posture are minimal

- Concept of Neutral “zone” developed to explain spinal motion that is produced with minimal resistance (high flexibility and laxity)
Clinical Instability

- A decrease in the ability of the entire system (passive, active, neural) of the spine to maintain a neutral “zone” within limits. Results in pain and disability.
Spinal Stabilization

• Goal: Decrease “zone” of movement; increase stiffness and resistance to movement
Potential Causes/ Contributors

• Passive
  • Films: excessive translation
  • Spondylolisthesis
  • Spurs/ DJD
  • High Intensity zones on MRI of discs
  • DDD

• Active
  • Decreased MF of TrA
  • Decreased PF
  • Decreased Gluteals
  • Decreased Diaphragm

• Neural
  • Changes in Muscle Timing
  • Changes in Pattern Recruitment
  • Changes in Muscle Activation and spinal Stiffness determined by biomechanics testing
  • Changes in kinematic patterns of movements and observation
Who needs stabilization?

- Kind of disorder?
  - “giving out”
  - “don’t trust my back”
  - Fear of bending, flexing, lifting, even if associated with pain
  - “post-surgical”
  - Decreased function, sedentary
Who needs stabilization?

- History
  - Onset/development
    - Increasing intensity, frequency, referral?
  - Progression
  - Other treatment
  - Diagnostics
Who needs stabilization?

- Disc
- Facet
- S.I. Joint
- NR Pain
Stabilization: Stages

• #1 Local Segmental Control: protection of joints without addition of load or weight bearing function

• #2 Closed Chain Segmental Control: integrate local muscles and WB. Kinetic chain.

• #3 Open Chain Segmental Control: Open chain movements added (added UE/ LE movements)
Testing

- Aberrant motion with trunk ROM
- Generalized Ligamentous Laxity scale
- Passive Intervertebral Motion Testing
- Posterior Shear Test
- Prone Instability Test
Testing: Role of the Diaphragm

- May be the largest contributor to intra-abdominal pressure necessary for spinal segmental stabilization (Hodges, Butler 1997)
- Attachment directly to spine
- Interdigitation with TrA, MF, and PF
Testing: Role of the Diaphragm

• Dome shaped muscle
• Major function is inspiration contraction of the central tendon down and forward should cause lateral rib expansion and reduce intrapeural pressure
  • Pelvic Floor lets go or drops
• When the diaphragm descends the abdominal muscles contract and the ribs are pulled lower.
  • Pelvic floor contracts or lifts
• Activity of the abdominal muscles depends on this interrelationship!
Diaphragmatic Breathing

- Hooklying
- 90/90
Testing: Lower Abdominals

- Abdominal Testing
  - Sahrmann
Sahrmann Exercise #1

Lie on the floor with the knees bent.

• Perform the Basic Breath
• Keeping one knee bent, slowly slide the other leg out until it's parallel and just a few inches off the floor.
• Bring the leg back and repeat on the other leg.
• Once you're able to complete 20 reps on each leg, without losing the abdominal contraction, move to the next exercise.
Sahrmann Exercise #2

- Lie on the floor with the knees bent.
- Perform the Basic Breath and lift one knee towards the chest.
- Straighten the leg so that it is parallel and about 2-3 inches off the floor.
- Bring the leg back to start and repeat with the other leg for 5 or more reps.
- Once you're able to complete 20 reps on each leg, without losing the abdominal contraction, move to the next exercise.
Sahrmann Exercise #3

- Perform the Basic Breath as you bring the knees up to a 90-degree angle.
- Keep one leg bent and lower the other leg towards the floor, tapping the floor with your toe.
- Complete 1-5 reps on the same leg and then switch sides.
- Once you're able to complete 20 reps on each leg, without losing the abdominal contraction, move to the next exercise.
Sahrmann Exercise #4

- Perform the Basic Breath as you bring the knees up to a 90-degree angle.
- Keep one leg bent and extend the other leg out until it's parallel, but not touching the floor.
- Repeat on the other leg, working up to 10 reps on each side.
- Once you're able to complete 20 reps on each leg, without losing the abdominal contraction, move to the next exercise.
Sahrmann Exercise #5

- Perform the Basic Breath and bring the legs into the chest.
- Straighten both legs so that they're perpendicular to the floor.
- Slowly lower both legs towards the floor, going as far as you can without arching the back.
- Repeat for 5-10 reps, working up to 20 reps.
Stabilization

• BKFO
• Alt UEs
• Pullovers
• Q-ped Rock
  • Alt UEs, LEs
• Pertebations

• Higher Level
  • Hooklying Marches
  • Seated Marches
  • Deadbugs
  • SLR
  • Hip circles, Vs
Stabilization

- Dynadisk Balance
- Crossovers
- Body Blade
- Rows
- Step Extensions
- T-ball pullovers
- T-ball raises
- Wall squats
- Plyotoss
- D1/D2 flex/ext
Testing: Gluteals

- Prone hip extension
  - Relative stiffness
  - Muscle recruitment patterns
Gluteals

- Clams
- SL Abd
- Prone Hip Ext/ Glut Max
- X-walks

- Higher Level
  - Super Man
  - Clams with TB
  - Q-ped UEs/ LEs
  - Q-ped Hip Abd/Ext