

## Brief Abdominal Anatomy and Activity Overview

**Rectus Abdominis:** attaches from sternum and distal ribs and runs inferiorly to the pubic symphysis and superior pubic rami. Serves to flex the lumbar spine but offers nil segmental stability. That is why crunches rarely help back pain.

**Obliques:**

**EO:** attaches from distal ribs to iliac crest and inguinal ligament

**IO:** attaches from conjoint tendon, inf ribs and runs towards iliac crest inguinal lig and TLF

Serve to rotate the lumbar spine (generally). EO and IO have only a mild influence on segmental stability

**TVA:** attaches from TLF, inguinal lig, diaphragm and merges with IO to form conjoint tendon. Serves to increase intra-abdominal pressure thus providing intersegmental stability of the spine. Shares neuro innervation with pelvic floor and multifidus musculature

**Multifidus:** attaches between vertebra and therefore have a large part in intersegmental stability.

**Gluteus Maximus:** primary action is to extend the hip (if thigh is fixed then acts to post tilt the pelvis)

**Gluteus Minimus:** Primary action is abduction of the hip ( or stabilisation of the pelvis, prevention of contralateral drop when thigh is fixed such as in stance phase). Secondary action is external rotation when the hip is in flexion

Other muscles of note include the muscles of the **pelvic floor** which serves to provide the floor/base of the abdo cavity. With a weak pelvic one cannot increase their intra abdominal pressure to stabilize the spine. Also of note is the **diaphragm** which in addition to powering respiration serves as the roof of the abdom

## Core Stability Programming

1. Understand individual muscle action based on anatomical origin and insertion (thankfully this is done for us by anatomy texts)
2. Understand combined muscle activations and their effect on movement. Paul Chek's work on myofascial slings is quite useful here.

E.g. Lateral sling whereby the glute medius and adductors work in coordination with the contralateral QL to provide stability on the coronal plane (This is another lecture on its own).

3. Determine area/plane of deficiency.....
4. Learn to activate appropriate muscles (often, other muscles that have a poor mechanical movement will be compensating for weak muscles)
5. Learn to design exercises or evaluate exercises for their effectiveness at activation of weak muscles in coordination with surrounding musculature contraction. Also consider ROM and myofascial slings.
6. Learn to design exercises or evaluate exercises for their effectiveness in activating weak muscles in coordination with surrounding musculature contraction in the performance of a functional or specific movement.

## Core and Hip Stability Assessment Tests

- **ASLR:**
  - Assess general pelvic stability, rotation, pelvis tilt, lumbar extension, excessive abdo recruitment
  - Gives an indication of core stability in the sagittal plane i.e. weak TVA, multifidus
- **Trendelenburg:**
  - Gives an indication of hip stability in the coronal plane i.e. lateral sling, weak glute med. Can also give an indication of stability in other planes
  - Part One: One leg stand
  - Part Two: One leg squat
  - Part Three: One leg hop
- **Squat:**
  - Gives an indication of both of the above
  - Anterior pelvic tilt suggests weak TVA, rectus abdominus, glutes
  - Posterior pelvic tilt suggests weak lumbar erectors
- **Standing Postural Assessment:**
  - Allows broad estimate of muscle tightness/weakness
  - Kyphotic/lordotic postures
  - Swayback postures

# Sample Core and Hip Stability Exercise Progressions

## Level One: VIP

- Pelvic position awareness drills (ant/post and lateral tilt)
- TVA/PF/Multifidus activation
- TVA + fallout
- TVA + leg lift
- TVA + leg lift (and extend)
- 4 point arm, leg (opp arm + leg) lift
- Clamshell
- Bridge

## Level Two:

- kneeling plank
- free squat (unloaded)
- bridge plus leg lift
- kneeling side plank
- ball supermans
- hip hitch

## Level Three:

- stationary lunge (progress with step back)
- Bulgarian split squat
- Plank
- Side plank
- Back extension
- 1 arm cable row
- 1 arm cable press
- Bent over row (light)
- Romanian Deadlift (light)

## Level Four:

- Walking Lunge
- 1 Leg Squat
- Side plank (star)
- Plank plus leg lift (plus ball, BOSU, balls, etc)
- 4 point opp arm/leg lift (from push up position)
- Woodchopper
- Cable push pull
- Loaded exercises from previous levels

## Level Five:

- Kettlebell swings
- Olympic lifting clean/snatch
- Plank rotations
- Various bounding plyometrics