CORE EXERCISES AND PT

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OBJECTIVES

- Quick Review of Core Anatomy
- Identify the Importance of Core Stabilization and Strengthening Program
- How to Utilize the Biofeedback/Stabilizer to Assess Abdominal Strength
- Discuss the Progression of Mat, Sitting and Standing Core Exercises
Core Muscles

External Oblique

**Origin:** Outer surface of 5th and 12th ribs

**Insertion:** Linea alba, pubic crest, ASIS, & iliac crest

**Action:** Lateral flexion, rotates trunk contralaterally, & compression of abdomen
Core Muscles

Rectus Abdominus

**Origin:** Pubis & pubic symphysis

**Insertion:** Xiphoid process & costal cartilages of 5th and 7th ribs

**Action:** Compression of abdomen & flexion of trunk
Core Muscles

Internal Oblique

**Origin:** Ant. 2/3 of iliac crest, lateral 2/3 of inguinal ligament, & iliopsoas fascia

**Insertion:** Lower margins of 9th and 12th ribs, pubic crest, Ant. & Post. Layers of linea alba

**Action:** Flexion & lateral flexion of trunk, & rotates trunk contralaterally
**Core Muscles**

**Transverse Abdominus**

**Origin:** Inner surface of 7th to 12th ribs, Ant. 2/3 of iliac crest, & lateral 1/3 of inguinal ligament.

**Insertion:** Linea alba, pubic crest, pecten pubis

**Action:** Rotation, Flexion, and lateral flexion of trunk.
**Core Muscles**

**Origin:** Transverse process of C2–L5 & sacrum

**Insertion:** Spinous process superior to origin

**Action:** Extension of spine, ipsilateral lateral flexion, & contralateral rotation
Importance of Core Stabilization and Strength

• Proximal stability is fundamental for distal mobility.

• “The core is a “muscular corset that works as a unit to stabilize the body and spine, with and without limb movement”. (Richardson et al. 1999)

• Core control is required for ADL’s, balance, stability, and coordination during occupational task and complex high-level sports.

• The core serves as a link that transfers energy between the UE and LE’s.

• Provides protection to the lumbar spine and transmits forces that are places on the spine and core by the extremities.

• When the core presents as weak or imbalanced, injury or tissue damage may result.
Identifying Weaknesses

• Local muscles function primarily as stabilizers
• Global muscles function primarily as producers of moment

• While the global muscles do play a role in the stabilization of the core, an improper balance between strong global muscles and weak local muscles will produce local instability.

Clinical Tools

• Manual muscle testing
• Biofeedback
Abdominal Drawing In Test
(Richardson et al. 1999)

The patient is in a hook lying supine position with a Stabilizer Biofeedback unit placed under the small of the back. The Stabilizer is inflated to 40mm HG. The patient is instructed to perform a posterior pelvic tilt, maintain 50–55 mm Hg with normal breathing for 10 seconds.

An insufficiency is noted as 49 mm Hg or less.
Therapeutic Exercise for Core Stabilization and Strengthening

Key to abdominal training Start with **local muscles** and progress to **global muscles** to ensure that global muscles are not compensating for local muscles. **Stabilization before strength.**

**Progression of Core Strengthening:**
1) Formal motor skill training
2) Gradual incorporation into light functional task
3) Heavy load functional task
Table 8.10 Progression of Core Stabilization Exercises

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<td>Isometric holding exercises:</td>
<td>Functional positions:</td>
<td>Progress to advanced positions:</td>
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<td>1. The abdominal hollowing exercise</td>
<td>1. Setting to/from standing (Fig. 8-30)</td>
<td>1. Tall kneeling with core ball (Fig. 8-31)</td>
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<td>2. Polvic floor contractions, best started in supine, hook lying</td>
<td>2. Polvic floor contractions with leg on ball (Fig. 8-37)</td>
<td>2. Half kneeling chop with Theraband (Fig. 8-38)</td>
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<td>3. Lumbar multifidus contractions (Fig. 8-28)</td>
<td>3. Quadruped multifidus exercise (Fig. 8-29)</td>
<td>3. Standing with UE perturbations (Fig. 8-34)</td>
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<td>4. Diaphragmatic breathing</td>
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<td>“Consider the body blade”</td>
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Abdominal hollowing in alternate static positions:
- Prone, knees straight with Stabilizer (Fig. 8-28)
- Supine, knees bent (Fig. 8-26)
- Quadruped with therapist (Fig. 8-27)

Abdominal hollowing with challenges:
- Supine bridging
- Movement of legs with Stabilizer, aka “dead bug”
- Movement of legs into long-loading tasks with Stabilizer (Fig. 8-26)
- Four point with UE or LE movements

Table 8.10: Progression of Core Stabilization Exercises

<table>
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<th>Planks:</th>
<th>Other training postures:</th>
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<td>Half side planks (knees flexed)</td>
<td>Standing on unstable surfaces with trunk or UE movements with or without resistance (Figs. 8-26, 8-42, 8-44, and 8-47)</td>
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<td>Side plank (knees flexed)</td>
<td>Squat with overhead lift (Fig. 8-39), lunges to assess with core ball (Fig. 8-38)</td>
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<td>Half front planks (knees flexed, modified push-up position)</td>
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<td>Full front planks (Fig. 8-28)</td>
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Abdominal hollowing during side planks:
- UE movements
- Side plank on BOSU (Fig. 8-25)
- UE/LE movements
- Use of tubing, weights, ab roller with various plank positions

Dynamic sport/work positions:
- Overhead medicine ball toss (Fig. 8-43)
- Half kneeling medicine ball rotation toss (Fig. 8-45)
- Core ball punch on unstable surface (Fig. 8-46)
- Single-limb dead lift (Fig. 8-47)

Notes: It is important to provide the patient with clear explanations and use a variety of teaching “tools” such as verbal analogies/descriptions, visual aids, clinician demonstrations, and tactile cues. The patient must be educated to the type of skill and motor retraining that needs to occur. This includes a discussion about precision and intensity of contractions (from mild to moderate contractions of the involved musculature, rather than maximal contractions), is indicated. The patient must not progress the exercises beyond the subject’s ability of the contractions practiced and then apply to all activities. Be certain to monitor for signs of unwanted global muscle activity during activities. These signs include pelvic or spine movement, rib cage depression, or change in diameter of the abdominal wall (should shrug in laterally and anteriorly, aberrant breathing patterns, inability to perform normal breathing during tasks), and coactivation of thoracic portions of the erector spinae. Methods of observation include visual observation, palpation, and electromyographic assessment. Be creative in designing and progressing activities of core stabilization; your only limitation is in your own imagination.
Another important feature of teaching the skill of abdominal bracing is that the patient understands the corset-like circular function of the TA so he or she can envision it working to draw in the waist or hollow the abdomen. The four-point or quadruped position can be used initially to teach this task and then other positional instruction can be added (e.g., supine, prone, sitting, standing, and half kneeling) (Fig. 8-27).
Variety of core exercises
General Functional Exercises

*Once patient/athlete has demonstrated proper recruitment patterns and control with exercises described, it is imperative to progress program to a more functional routine

**Transversus Abdominis with UE Perturbations**

Exercises: Drawing in technique with bilateral tubing pulls standing on A kes ped (Fig. 8-34).

**FIGURE 8-34** Transversus abdominis stabilization in standing with upper extremity.

Description: The patient is instructed to perform a proper drawing in technique in a partial squat position while performing repeated bilateral UE pull-downs with tubing or band with the goal of maintaining an isometric hold of the trunk.
Single-Limb Stance on BOSU™ Ball with Repeated Rowing

Description: With the tubing anchored at chest height, the patient assumes a single-limb stance in a partial-squat position on the BOSU™ and performs repeated rowing motions with the tubing (Fig. 8-42). The emphasis is on having the patient maintain neutral lumbo-pelvic alignment, especially in the frontal and sagittal planes.

**Figure 8-42**: Single-limb stance on BOSU™ with repeated rowing.

The movement patterns encountered during sport and work often generate a great deal of rotational joint and tissue stresses at the spine. It is important to challenge the core stabilizers in a rotational manner with the primary goal of maintaining the ideal transverse plane spine position specific to the individual sport or industrial demand.

Squat with Overhead Sustained Lift

Description: With feet shoulder-width apart, knees slightly bent, spine in neutral, the athlete starts by lifting a piece of dowel overhead and maintaining while performing a form squat (Fig. 8-39). The emphasis is on having the patient maintain a neutral spine position throughout the entire squatting motion. This exercise is progressed by adding weights (e.g., dumbbells, barbell, or barbell with weights) in the overhead position.
Goal: maintain good trunk alignment, avoiding flexion/extension of the lumbar spine while maintaining a neutral lumbopelvic alignment. This is especially true for the frontal and sagittal plane. It is important to provide patient with tactile cueing to their core if necessary.
Quadruped progression
Conclusion

- Core stability training is increasing in popularity as clinicians have become aware of the relationship that a poorly functioning core has to performance and injury.
- Experts agree that retraining of the deep local muscles of the core must be incorporated into rehabilitation of patients with injury to the low back to effectively accomplish functional rehabilitation (Richardson et al. 1999).
- Core training routines can be creatively designed and progressed by the rehabilitation professional to facilitate complete return to occupation or sport.
- Local muscular exercises must be carefully assessed, taught, and mastered using available clinical tools and techniques before training the global muscles of the core. Incorporation of core stabilization techniques into rehabilitative, fitness, preventive, and wellness programs will continue to be important in the ever-evolving practice of spinal rehabilitation.
References


Anatomy pictures; Musclesystempro3
Ultimate core strength