Core off the Floor: Vertical Core Training

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Objectives —
- Identify the functional anatomy of the core and explain how muscles are designed to function efficiently from the position of gait, the default pattern of human movement.
- Create core exercises that mimic muscle actions during gait and how to train clients (or group exercise class participants) to maximize their movement efficiency.
- Design an exercise program to develop optimal stability, mobility, strength and power in the muscles of the core region.

3 dimensions:
- Nervous system → Muscular system → Skeletal system
- Principles → Strategies → Techniques
  - Understand the principles
  - Applying the principles
  - Specific to the task

Anatomy Review:
The skeletal structure and musculature of the human body is designed to function for optimal efficiency in gait—the default pattern of human movement. The pattern of gait is based on muscles being able to optimally use force and momentum created by gravity and ground reaction. Identify which muscles are responsible for stability and which drive mobility to in order to establish the rationale for program design, specifically exercise selection in order to determine the most effective method of training.

Skeletal structure of the core:
- Thoracic spine → Scapula → Humerus
  - Joints: T-spine, Scapulo-thoracic, gleno-humeral
- Lumbar spine
- Pelvis
- Femurs

Muscles which stabilize the spine and pelvis:
- Segmental stabilizers (rotatores, interspinali, intertransversarii), transverse abdominis, diaphragm, pelvic floor, quadratus lomborum, multifidus, posterior fibers of the internal oblique and the thoracolumbar fascia

Muscles responsible for movement and locomotion:
- Rectus abdominus, latissimus dorsi, iliopsoas, rectus femoris, erector spinae group, external/internal obliques, gluteus maximus, gluteus medius, biceps femoris, semi-membranosus, semi-tendonosus, and adductor magnus.

Movements of the core
- Top-down—movements influenced by gravity
- Bottom-up—movements influenced by ground reaction forces

Assess core stability and mobility
- McGill tests: flexor/extensor endurance, lateral muscle endurance
  - Look for imbalances
- Screens: Identify movement inefficiencies
Integrated core program design—application of the variables

- Exercise selection—ability to control top-down and bottom-up forces
  - Skill-related: agility, balance, coordination, reactivity, power and speed
  - Variables for increasing difficulty of an exercise:
    - Base of support/points of contact
    - Center of gravity/body position
    - Sensory input
    - Unstable surfaces
- Intensity—consider muscle fiber orientation of specific core muscles:
  - Type I fibers: low force/long duration activation
  - Type II fibers: high force/low duration activation
- Repetitions: dictated by intensity; low loads → high reps/high loads → low reps

### Core Conditioning and Stages of Training

**This table serves as a template from which the trainer can operate. Ultimately, the decision to progress is determined by mastery of the exercises and rate of improvement demonstrated by the individual.**

<table>
<thead>
<tr>
<th>Conditioning Stage</th>
<th>Objective</th>
<th>Duration</th>
<th>Exercises</th>
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<tbody>
<tr>
<td><strong>ACE IFT Phase 1:</strong> Stability and Mobility</td>
<td>Reeducate neuromuscular pathways. Spinal stabilization under minimal loading; improve proprioceptive awareness and reflexive response</td>
<td>Daily, 1 – 2x / day for 1 – 2 weeks</td>
<td>Static positions, supported, unloaded or minimally loaded, activation and co-contraction of the local muscle systems (seated, quadruped position), local and global muscle integration.</td>
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<td><strong>Emphasis:</strong> Core Stabilization &amp; Static Balance</td>
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| **ACE IFT Phase 2:** Movement Integrate Stability & Mobility (Dynamic Balance) | Spinal stabilization under increased loading of standing using dynamic, multi-planar movements | 2 – 4x / week for 10 – 15 minutes, 2 – 3 weeks | Foundational movements:  
- Squat  
- Lunge  
- Push  
- Pull  
- Rotation |
| **Objective** | | | |
| **ACE IFT Phase 3:** Load Core Conditioning (Integrated strength) | Develop muscular endurance and strength of both muscle systems to effectively tolerate dynamic forces | 2 – 3x / week, 4 – 6 exercises for 4 – 12 weeks, or indefinitely for maintenance | Traditional set x repetition range for strength (type II units and fibers), multiple exercise modalities, multiple planes of movement |
| | | | |
| **Objective** | | | |
| **ACE IFT Phase 4:** Performance Core Power | Enhance neuromuscular force production and control deceleration to improve biomechanical efficiency and performance | 2x / week, 3 – 4 exercises for 2 – 4 weeks, - include core conditioning maintenance | Traditional set x repetition range for power (rate coding, motor unit, emphasizing explosive movements) |
Recent Research Findings


McGill, Karopowicz and Fenwick. “Ballistic Abdominal Exercises: Muscle Activation Patterns During the Three Activities Along the Stability/Mobility Continuum.”


Contreras and Schoenfeld. “To Crunch or Not to Crunch: An Evidence-based Examination of Spinal Flexion Exercises, Their Potential Risks and Their Applicability to Program Design.”

Thank you for your time

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