



Core Stability Fact and Fallacy

HKIN 303 High Performance Conditioning for Sport
School of Human Kinetics, U.B.C.

Lecture Overview – Part 1

1. The CORE defined – the Role, the Structure and Function
2. Did you know? Assumptions, Fact, Fallacy and Malpractice
3. Principles you must know and understand

The Core defined

- The term “core” has become increasingly popular in recent years.
- Core strength training, which refers to programming designed to enhance the “muscular control required around the lumbar spine to maintain functional stability,” has been endorsed ***as providing injury prevention and rehabilitation as well as performance enhancement***

AKUTHOTA, V., AND S.F. NADLER. Core strengthening. *Arch Phys Med Rehabil.* 85(3 Suppl 1):S86-92. 2004.

The Core - Structure

- The core may be defined as a “box”, consisting of the diaphragm as the roof, pelvic floor and hip musculature as the base, abdominals as the front, and paraspinals and gluteals as the back.

AKUTHOTA, V., AND S.F. NADLER. Core strengthening. *Arch Phys Med Rehabil.* 85(3 Suppl 1):S86-92. 2004.

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The Core - Structure

- "...is composed of the lumbar spine, the muscles of the abdominal wall, the back extensors and the quadratus lumborum"
- "Also included are the multi-joint muscles: the lats, psoas and gluteals"

Mcgill 2009

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The Core - Function

- The passive human spine is an unstable structure and therefore further stabilisation is provided by co-contraction of trunk muscles.
- Since many different muscles of the trunk contribute to stability, their stabilizing action **may change according to varying tasks**



The Core – Function (McGill 2009)

- “these muscles COCONTRACT to stiffen the torso and function primarily to prevent motion”
- “this is fundamentally different from those muscles of the limbs, which create motion”
- “by stiffening the torso, power generated at the hips is transmitted **MORE EFFECTIVELY** by the core”

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The Core - Function

- What is this TrA's functional role?
 - TrA has several functions in the upright posture. Stability is one, **but this function is in synergy with every other muscle that makes up the abdominals wall and beyond.**
 - It acts in controlling pressure in the abdominal cavity for vocalisation, respiration, defecation, vomiting etc.
 - **You CANNOT isolate the TrA in real-world training/movement scenarios.**

Differing School of Thought (Lee, Diane)

Transversus Abdominis

Step 1: Isolation of Transversus Abdominis – Train before you Strengthen

Lie on your back or side with your spine in a neutral posture, (gentle curve anterior in your lumbar spine).

Gently isolate a contraction of transversus abdominis by:

- Thinking about gently closing the muscles around your rectum and then connect the rectum to the back of the pubic symphysis.
- Thinking about the muscles around your urethra / vagina or the muscles that draw your testicles up and then gently and slowly lift the urethra, vagina or testicles up and forward into your abdomen.
- Imagining a line connecting the inside of your two hip bones in the front of your pelvis. Think about connecting along this line.



Breathe in and on the breath out contract the transversus abdominis with your image. No actual movement of the hip, pelvis or spine should occur. The isolated contraction of transversus abdominis will feel like a light, *deep* tension under your fingertips, not a contraction that pushes the fingers out.

Hold the contraction for 3- 5 seconds and then release without becoming rigid, and continue to breathe. Repeat 10 times 3 – 4 times per day to start.

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Core - Function

- Often, in Core Stability exercise there is an emphasis on strength training for the TrA or low velocity exercise performed lying or kneeling on all fours.
- It is believed that such exercise would help normalize motor control which would include timing dysfunction.
- **This kind of training is unlikely to help reset timing differences.**
- *“It is like aspiring to play the piano faster by exercising with finger weights or doing slow push ups.” (From: The Myth of Core by Lederman)*

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Core – Function

- “The primary function of the abs is not to pull your ribcage and your pelvis together, unless you are a crunch-junkie or chop wood for a living, but to provide a stable base for other muscles to pull from.” (T, Pavel)
- From “functional anatomy” lessons: The RA functions brace, while “stopping/slowing motion” (vs. flex the spine). **The RA is an anti-extensor!**

Current Core Malpractice

- Repeated bending of spinal discs is a recipe for injury (McGill)
 - So why are we doing sit-ups?
- Pulling in the abdominals to ‘activate the core’ (TA)
 - It is not a task specific drill that enables the muscles to co-contract and act to stabilize the spine. (McGill)

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Assumptions about the 'Core'

- That certain muscles are **more important** for stabilization of the spine, in particular transversus abdominis (TrA).
- That weak or unstable abdominal muscles lead to back pain
- That strengthening abdominal or trunk muscles can reduce back pain
- That there is a unique group of "core" muscle working independently of other trunk muscles
- That a strong core will prevent injury.

Did you know? (McGill 2009)

- The QL's are a KEY stabilizers and not often trained?
- Drawing the abdominals inwards **REDUCES** stability
- The TrA misfiring is not often the root cause of back pain, yet many rehab professionals prescribe 'core strengthening' to fix low back disorders...

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Did you know (McGill 2009)

- Remember: The core functions to PREVENT motion versus initiating it.
- When the spine moves aberrantly, this is called an **energy leak**.

There are many energy leaks one can see here:

- <http://www.youtube.com/watch?v=XDZAsD-9bks>

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Did you know? (McGill 2009)

- The task of daily living is not hindered by a lack of strength strength but rather insufficient muscular **endurance**.
- "After an injury it has been demonstrated that the motor system loses its fitness, and abnormal relationships of muscle activity occur."

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Mel Siff on Core Stability

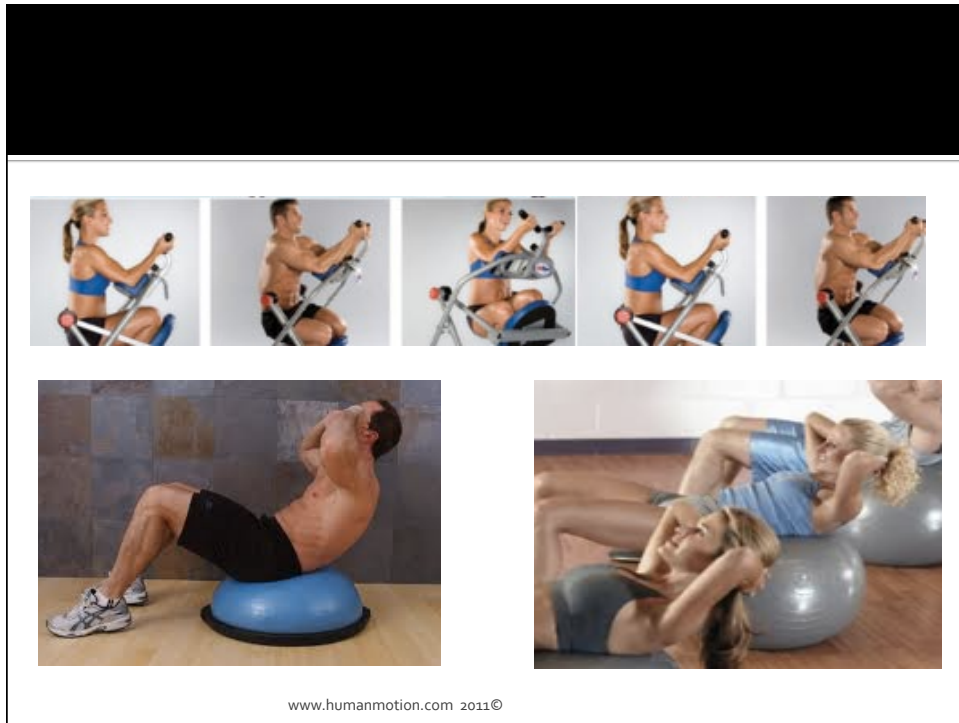
- "At the very outset, we have to dispel the belief that it is possible to focus on 'core stability' on its own."
- "Unless one's entire body is off the ground or is immersed in water, the idea of stabilizing the core separate from other parts of the body is sheer nonsense, since the ability of the core in all sports in which one is in touch with a static or moving surface **depends strongly on peripheral stability (the limbs).**"

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Mel Siff on Core Stability

- "If one is carrying out some movement such as lifting weights, doing aerobics, running, jumping or playing some ground-based sport, the body stabilizes as a whole, with interacting contributions from the periphery and the core....."
- "The world of core stabilization currently **remains far too heavily based in marketing and belief than in valid science.**"

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When Lost – Go Back to . . .

PRINCIPLES!

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Core Principles

1. The brain recognizes movement patterns and not simply muscle groups

- *"The most basic patterns of human movement and how they build upon each other in a neuro-developmental sequence starting in infancy and developing through childhood."*
- *"The most fundamental activities of the human body revolve around simple and basic movements of running and climbing."*

Cook, Gray 2010

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The brain recognizes movement patterns

- Normal movement does not consist of isolated actions that are cortically (consciously) controlled.
- **It is a sequence of synergic movement patterns that are functionally related.**
- Evidence shows that poor movement patterns can lead to low back disorders

'Sensory feedback therapy and theoretical knowledge of motor control and learning'. Am J Phys Med 63:226-244, 1984.

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Mel Siff on Movement

- *"How can one prescribe specific set ways of recruiting muscles in any complex natural movement if research now shows that these highly deterministic patterns of muscle action are not characteristic of human movement?"and...*
- *"Research into motor control has never shown that training of individual muscle actions enhances skilled complex motor activities."*

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Back to: Core Principles

- 2. The core runs on a reflex base.**
 - This means that the core musculature is triggered by reflexes in response to your actions and reactions.
 - *"As many of your movements involving the limbs are structured, controlled, planned out and trained, the movements of your core are reflex driven in an attempt to stabilize the spine so that more efficient movement patterns of the extremities can be produced."*

Gray Cook 2010

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Core Principles

3. **Stability is different than strength.**
 - “Stability is the use of muscular timing, control and sequence to maintain a relatively stationary or stable spine in the presence of extremity movement whereas strength would demonstrate or reflect the need for movement.”

Cook, Gray 2010

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Training the Core

With respect to developing a client physically, we must establish spine stabilization prior to core strengthening or core endurance training and we must do so from a movement standpoint.

Thanks!

- *Thanks to Gray Cook, Stu McGill, Mel Siff and others who base their rationale on a fundamental understanding of the disciplines of motor learning, biomechanics, physiology of the human machine.*
- *Contact me at carmen@carmenbott.com for any clarification or for workshops in strength & conditioning*

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