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The Core: What it is and what it is not

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The Core: What it is and what it is not.

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BLUF

The concept up front:

- When training the core are you treating the victim?
- All tissues have a yield point?
- What causes overtraining?

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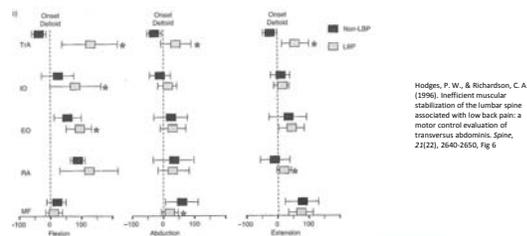
Why train the core?

- To increase spinal stability
 - Have they been diagnosed with an segmental instability?


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Why train the core?

- Previous Hx of Back Pain?
 - Delayed TrA




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Why train the core?

- Previous Hx of Neck Pain?
 - Pts with WADs found to have postural control system impairments (Treleaven, et al. 2003; Heikkila & Astrom, 1996)
 - Includes altered kinaesthetic sense with increased cervical JPE (Treleaven, et al. 2003; Heikkila & Astrom, 1996)



<http://www.defence.gov.au/content/uploads/2009/06/bushmaster.jpg>
http://upload.wikimedia.org/wikipedia/commons/4/4b/ushmaster_interior.jpg
[1 Joint Public Affairs Unit - Achieves](#)

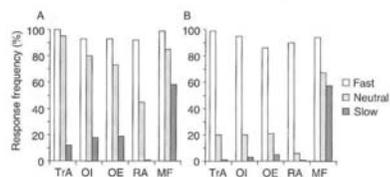

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Why train the core?

- Make the core stronger?
 - TrA thickness does not change above 20-30% MVC (Himes et al., 2012).

Why train the core?

- Make the core stronger?
 - Research suggests that the problem is not one of strength or endurance but of motor control (Jull, et al., 1999)



Jull, G., Hodges, P., Hides, J., & Panjabi, M. M. (1999). *Therapeutic exercise for spinal segmental stabilization in low back pain: scientific basis and clinical approach* (pp. 61-76). Edinburgh: Churchill Livingstone., Fig 5.5

What do you know about the core?

- Common Terms – Is there a difference
 - Rigidity vs Stability vs Stiffness
- 4 Roles of muscles in movement
 - Which roles are they training for?
 - Does this make a difference?

The Control System

- Do you think that they are thinking ‘Gently draw in my abdominals?’



http://thebeach.beaten.com/en/medien_grotho/stephokipokurakiphen_06_30_10x07_240055.jpg



<http://resources1.news.com.au/images/2011/10/21/2110211226172966417-000cy-malboura.jpg>

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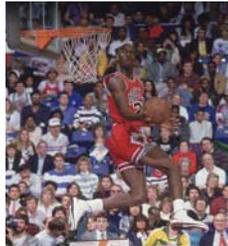
The Control System

- Do you think the core is ‘stiff’?

<http://www4.pictures.zimbio.com/g/Tim-Cahill-A-FC-Asian-Cup-Semi-Final-Uzbekistan-38zBhzjNEI.jpg>



<https://tyrannyoftradition.files.wordpress.com/2011/05/mic-hair-jordan.jpg>



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The Control System

- Do you think the core is ‘stiff’?



<http://www.history.army.mil/brochures/Afghanistan/images/40.jpg>

https://timemilitary.files.wordpress.com/2012/10/hires_120929-a-d064-701c.jpeg?w=480

http://i.telegraph.co.uk/multimedia/archive/01376/police-batons_1376843.jpg

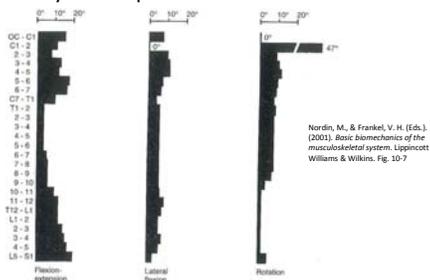
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The Passive System

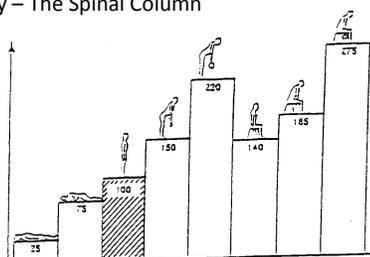
- Basic Anatomy – The Spinal Column



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The Passive System

- Basic Anatomy – The Spinal Column

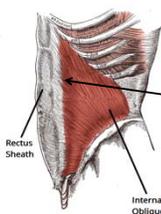


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The Active System

- Basic Anatomy – Rectus Abdominus (RA)

Upper 1/4 enclosed by a sheath formed from the aponeurosis of the Obliques and TA



- IO divides into 2
- Anterior sheath blends with EO to pass in front
- Posterior sheath with TA to pass behind
- All join again at the Linea Alba

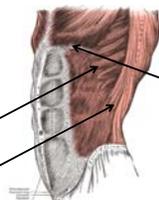
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The Active System

• Basic Anatomy – External Oblique (EO)

8 fleshy digitations from the lower 8 ribs–

- 5 superior are received between corresponding Serratus Anterior and
- 3 lower from the lats dorsi



Mid and Upper fibre's spread into an aponeuroses which connects left and right but also to the lower Pec Major

Internal surface connects with the IO



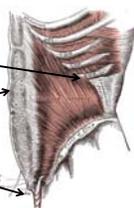
The Active System

• Basic Anatomy – Internal Oblique (IO)

Attachments into the LDF and iliac crest

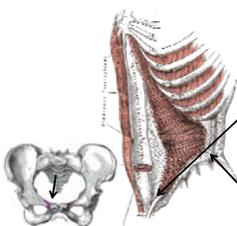
Attachments into the Linea Alba

Inserts conjointly with TrA into pubis and pectineal line



The Active System

• Basic Anatomy – Transverse Abdominals (TA)



- O – Crest of the ilium, lower six costals – Interdigitates with the diaphragm & through a broad aponeurosis to the Lx processes
- Fibres insert together in a conjoint tendon with the IO into the crest of the pubis and pectineal line (purple)

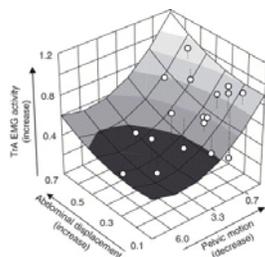
Vertebral aponeuroses of the TrA divides into three layers

- Between anterior and middle layer = QL
- Between Mid and Post – ES
- Posterior lamella of this aponeurosis also receives the IO attachment and Lat Dorsi forming the Lx Fascia



The Active System

Association between EMG activity, abdominal displacement and lumbopelvic motion. A three-dimensional graph depicting the relationship between EMG activity of all regions of TrA (as a proportion of the total abdominal muscle activity) (y axis), maximal abdominal displacement (x axis), and pelvic motion (z axis). EMG activity of TrA, relative to the other abdominal muscles, was greater when abdominal movement was performed without pelvic motion.

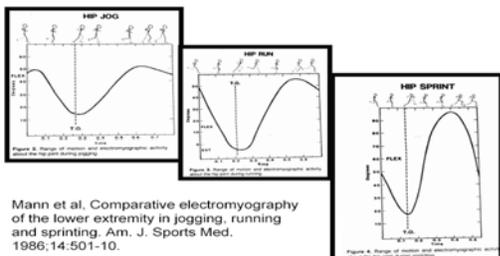


Urohart, D. M., Hodges, P. W., Allen, T. J., & Story, I. H. (2005). Abdominal muscle recruitment during a range of voluntary exercises. *Manual therapy, 30*(2), 144-153. Fig 5

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The Active System

- Does the pelvis move during gait?



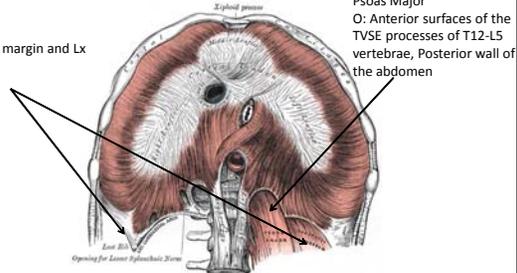
Mann et al. Comparative electromyography of the lower extremity in jogging, running and sprinting. *Am. J. Sports Med.* 1986;14:501-10.

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The Active System

- Basic Anatomy – Diaphragm

O: Costal margin and Lx Vert 1-3



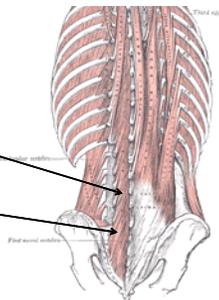
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The Active System

- Basic Anatomy – The Multifidus

Transverse Process to Spinous process 1-4 higher

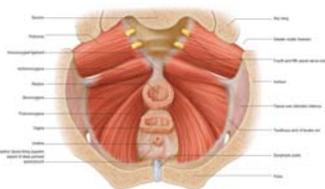
Sacrum and Aponeurosis of the ES



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The Active System

- Basic Anatomy – The Pelvic Floor
 - Voluntary activity in the abdominal muscles lead to increased activity in the PFM (Sapford & Hodges, 2001).



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What do you know about the core?

- From what we have discussed would this:
 - Activate TrA/IO effectively?
 - What about the other 'core' muscles?



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What do you know about trg the core?

Urquhart, et al., 2006

- **Pelvic tilting** is likely to produce greater activity of Middle IO relative to TrA and RA
- **Abdominal bracing** recruits EO with less activity of upper TrA, lower IO and RA (Urquhart, et al. 2006)
- **For TrA alone – Discourage** any movement of the upper abdominals, bracing of the abdominal walls or posterior tilting of the pelvis (Urquhart, et al. 2006)



What do you know about trg the core?

Tehyen, et al. 2008

- Changes in TrA and IO muscle thickness differed during 6 trunk strengthening exercises as assessed with USI.
 - Abdo crunch; ADIM, Abdo Sit back, Side Plank, Supine lower extremity extender; Bird dog
- Specifically, the greatest changes in muscle thickness of both muscles were found with the horizontal side-support and the abdominal crunch.



What do you know about trg the core?

Himes, et al., 2012

- Further examined the Side Plank with Healthy and Non symptomatic sufferers from LBP (5 levels of difficulty)
- No differences between groups at any level
- Only difference within groups was the healthy DECREASED activation of the TrA at higher levels
- The recurrence of LBP may not be because of the ability of the TrA to contract but rather the timing of when the TrA becomes activated during exercise



What do you know about trg the core?

Koumantakis, et al., 2005

- General Exercise program or General Exercise Program with Isolation core exercises
- Outcome measures for both groups improved with generally no differences between the 2 exercise approaches.
- Self-reported disability improved more in the general exercise-only group immediately after intervention but not at the 3-month follow-up.



What do you know about trg the core?

Koumantakis, et al., 2005

- A general exercise program reduced disability in the short term to a greater extent than a stabilization-enhanced exercise approach in patients with recurrent nonspecific low back pain.
- Stabilization exercises do not appear to provide additional benefit to patients with subacute or chronic low back pain **who have no clinical signs suggesting the presence of spinal instability.**



What do you know about trg the core?

Monfort-Panego, et al., 2009

- When Sitting Up
 - Initial phase of the exercise during dorsolumbar spine flexion the RA is activated then decreases when Lx is around 30*-45* HF activation increases
 - Having the feet fixed during a sit up increases HF activity – having the arms fixed increases abdominal activity



1 Joint Public Affairs Unit - Actives



What do you know about trg the core?

Nesser, et al 2008

- Correlations between strength, power and core strength
 - Core strength measured using the protocol established by McGill (7) – Results correlated to power (e.g. Dash, power clean and CMJ) and strength (1RM Bench and Squat)
 - Results suggest weak to moderate correlations
 - Authors suggest that increases in core strength are not going to contribute significantly to strength and power and should not be the focus of strength and conditioning.



What do you know about trg the core?

Scibek, 1999 : Stanton, et al, 2004

- Scibek, 1999
 - Swissball training 2 x 6/52
 - Sig improvement in core stability
 - No sig improvement in myoelectric activity of the abdominal and back muscles, treadmill VO2max, running economy, or running posture in either group
- Stanton, et al, 2004
 - Similar findings with Swissball



What do you know about trg the core?

Saeterbakken et al, 2011

- Looked at core training to increase throwing velocity
 - Intervention group performed a progressive core stability-training program consisting of 6 unstable closed kinetic chain exercises in slings
 - Sig increase in throwing velocity
 - Authors state that their results suggest that core stability training using unstable, CKC movements can sig improve maximal throwing velocity.
 - A stronger and more stable lumbopelvic-hip complex may contribute to higher rotational velocity in multisegmental movements



What do you know about trg the core?

Leetun, et al. 2004

- Core stability as an injury risk predictor
 - 80 ♀ 60 ♂ Intercollegiate basketball and track and field athletes
 - Hip Abduction and ER sig predictors
 - Side plank and back extension were not predictors (Large SD)
 - Claim that core stability has an important role to play in injury prevention



What do you know about trg the core?

Rehab Considerations

- Contemporary approach for LBP involves recruitment of TrA with minimal activity of the superficial abdominal muscles in the EARLY stages of Rehab (Urquhart, et al. 2005).
- Abdominal hollowing isolates the co-activation of TrA and OI for patients with spinal instability – retrain perturbed motor patterns (Monfort-Panego et al, 2009).



What do you know about trg the core?

Rehab Considerations

- ALL trunk muscles play a role in spinal stability – 1-2 muscles should NOT be the specific targets when training the abdominal (Monfort-Panego et al, 2009)
- Retraining of 6-8 treatments with low level US guided abdominal drawing in OR sling exercises OR GENERAL Exercises for CLBP attained only marginal changes in contraction thickness and slide in deep abdominal muscles – only provide a limited account for pain reduction (Vasseljen & Fladmark, 2010).



So where does this leave the core?

- Would the 'core' protect them?



http://377.media.tumblr.com/tumblr_mfy0kdw1581rnkfpbo1_500.jpg

<http://coachrobroggers.com/wp-content/uploads/2011/01/bad-deadlift.jpg>

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So where does this leave the core?

- Would the 'core' protect them?



<http://ww2.hdnux.com/photos/16/50/14/3834677/628471.jpg>



1 JPAU Archives

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So where does this leave the core?



<http://i.vimg.com/v1/76ulgg0U9E/mxaredesult.jpg>



<http://captainquinsbootcamp.com/wp-content/uploads/2014/01/park-slope-personal-training.jpg>

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So where does this leave the core?

- Rehab in isolation (as qualified) and then integrate early back into global movements (in the same posture)

So where does this leave the core?

- Get back to Task Specific Training or global tasks that generally mimic tactical tasks
 - If the 'core' is a concern then it is either
 - Mismatched with global force production
 - Mismatched with muscular endurance
 - = Progressed too fast – regress and retrain.



So where does this leave the core?

- It is not the magical answer – it is just another message lost in a marketing scheme
- If there is a dysfunction seek retraining (isolate then integrate)
- Train movement and you will train the 'core'.



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