
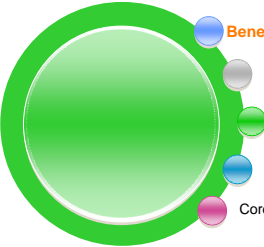


# Core Training Demystified

11<sup>th</sup> Annual YMCA Spring Training April 16, 2011  
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## Today's Objectives



- Benefits of Core Conditioning
- Anatomy of the Core
- Assessment of the Core
- Top 5 Mistakes in Training
- Core Exercises Progression

## Benefits of Core Conditioning

### Definition of Core Training

*"Conditioning and strengthening of the collection of muscles that stabilize the spine, pelvis and shoulder complex"*

- ❖ Primary Roles of the Core Muscles
  1. Protection (stabilizes) joints of the spine from excessive F
  2. Generation and transfer of F in a proximal-distal sequence  
e.g. baseball pitching, avoiding slipping on ice
- ❖ Commonly neglected area in fitness regimes
  - Controversy in research over best way to train
  - Confusion over how to train
  - Training is different than conventional training
    - Ms. Building of more visible mm.

## Benefits of Core Conditioning Cont'd

### Reasons to Train The Core

1. Everyday activities
  - Lifting children, carrying heavy bags, vacuuming, reaching overhead to place suitcase in overhead storage
2. Athletic conditioning/Rec Sports
  - ↑ balance, power output from shoulders, arms and legs
  - Superior movement control
3. Rehabilitation from injury
  - Back pain, shoulder injuries, knee injuries
    - Deficiencies in core conditioning correlated with knee and low back pain


[Leetun DT, Ireland ML, Wilson JD, et al. 2004]

## Benefits of Core Conditioning Cont'd

### Reasons to Train The Core

### Injury prevention

- ❖ Healthy core contracts prior to any arm or leg movement.
  - Delayed contraction/tensing of core before limb movement in people with *mechanical* LBP



[Richardson et al. 2002. (27) 4: 399-405. ]

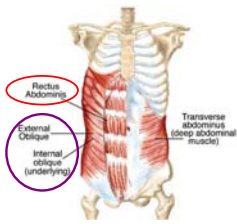
## Benefits of Core Conditioning Cont'd

### Functional Anatomy of the Core

- ❖ 2 Groups of Core Muscles to accomplish the 2 Primary Goals (Protection & Force Transfer)

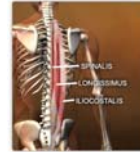
1. LOCAL
  - Active in endurance activities
  - Activates at LOW resistance levels (30-40% voluntary contraction)
  - Low resistance, isometric positions
2. GLOBAL
  - Involved in large movements of spine through full ROM
  - High resistance, low rep

## Functional Anatomy of the Core: The Movers



- ❖ Aka. "Global muscles"
- Rectus Abdominis (6-pack)**
  - Action: spinal flexion/curling spine forward
  - Use: Moving from lying to sitting
- Obliques**
  - Action: side-bending, turning torso to other side, [flexing spine]
  - Use: Raking leaves

## Functional Anatomy of the Core: The Movers



- ❖ Psoas
  - Flexes hip, pulls vertebrae forward
- ❖ Erector Spinae Group
  - Parallel to the spine
  - Action: Extend spine

## Functional Anatomy of the Core: The Stabilizers

- ❖ Aka. "Local Muscle group"
- ❖ All have attachments to the vertebrae, provide stability to spine
- ❖ Don't provide gross mov't of spine
- Transversus Abdominis (TrA)**
  - Deepest of abdominal muscles
  - Action: Stabilizes spine over the pelvis before mov't in arms or legs



### Multifidus

- Action: Keeps spine upright



## Anatomy of the Core: The Stabilizers Cont'd

### Diaphragm

- Involved in breathing
- Action: Maintains abdominal pressure and stabilizes spine



### Pelvic Floor

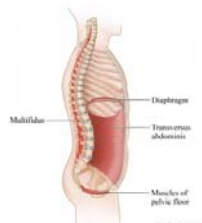
- Hammock of muscles that connect the pelvis at the front to the tailbone and 'sits' bones
- Contracts simultaneously with TrA (bottom of cylinder)



## Functional Anatomy of the Core: Core Complex

The Global and Local Muscles act as a unit to make up the 'Core'

Visualize a Cylinder  
Lid – Diaphragm  
Wall – TrA and MF  
Base – Pelvic Floor mm.



- ❖ Maintaining neutral posture helps decrease abnormal joint loading
- ❖ Spine inherently unstable – neural and muscular input req.

## Core Assessment: Establish A Baseline

- ❖ Use tests that have been scientifically supported to be both **VALID** (measures what's supposed to be measured) and **RELIABLE** (consistently provides same results when repeated) (Jewell 2008)
- ❖ Tests strength in functional movement vs. traditional manual ms. testing

### Core Assessment: Repetitive Squats

#### ❖ "Squat Back" vs. "Squat Down"

- Angulation of hip
- Hip moves POST. Into squat vs. excessive knee flexion, heels off ground



### Core Assessment: Lunge

- Trunk bends to the side
- Adducts and int. rotation of hip
- Knee valgus



### Core Assessment: Star Excursion Balance Test

#### ▪ Dynamic postural control

[Gribble 2003]

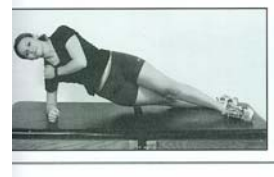
- ❖ Begin standing on 1 leg at center
- ❖ Reach as far as possible in each direction. Foot should gently touch ground. Client then returns back to start while maintaining base of support with stance leg
- ❖ Mark on tape pt. at which client's foot makes contact. Measure distance from center of star. If client places weight on foot, comes rest, loses balance or can't return to start position, trial is discarded and should be repeated.
- ❖ Potential gluteal mm. weakness of stance leg or dysfunctional dynamic balance



### Core Assessment: Endurance Muscle Testing

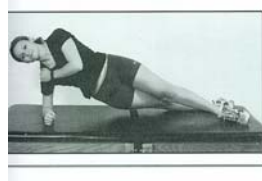
*Balance of endurance among torso flexors, extensors and lateral musculature differentiating those who have experienced or at greater risk of [mechanical] back troubles [McGill, Childs, and Liebenson 1999, Brumitt 2010]*

- ❖ Position: Full side-bridge, with top leg placed in front of lower leg. Uninvolved arm held across chest with hand placed on the opposite shoulder



### Core Assessment: Lateral Musculature Test

- ❖ Position: Full side-bridge, with top leg placed in front of lower leg. Uninvolved arm held across chest with hand placed on the opposite shoulder



### Core Assessment: Flexor Endurance Test

#### FLEXOR ENDURANCE

- ❖ Position: With feet stabilized, sit-up posture at 60°, arms folded across chest
- ❖ Pull back 10cm/4 in.
- ❖ Timing stops when any part of the person's back touches the box



## Core Assessment: Extensor Endurance Test



### EXTENSOR ENDURANCE

- ❖ Pelvis, knees and hips secured at end of bench
- ❖ Arms folded across chest
- ❖ Timing stops when upper body drops from horizontal position



## Core Assessment: Scoring Endurance Tests



Average Endurance times for healthy individuals mean age 21

Mean Endurance Times (seconds) and Ratios

RSB = Right Side Bridge LSB = Left Side Bridge SD = Standard Deviation

Task	Men		Women		All
	Mean	SD	Mean	SD	
Extension	107	61	105	60	107
Flexion	136	66	124	61	134
RSB	86	37	75	37	83
LSB	99	37	79	37	90

Ratios Normalized by the Extensor Endurance Test

Parameter	Men	Women	All
Flexion/Extension Ratio	1.26	1.18	1.22
RSB/LSB Ratio	0.96	0.96	0.96
RSB/Extension Ratio	0.79	0.72	0.76
LSB/Extension Ratio	0.81	0.74	0.78

Table adapted from: Stuart McGill, Low Back Disorders: Evidence Based Prevention and Rehabilitation, Champaign, IL: Human Kinetics, 2002.

Endurance Scores Compared	Ratio suggesting Imbalance
RSB/LSB	> 0.05
Flexion/Extension	> 1.0
RSB or LSB/extension	> 0.75

## To Hollow or Not to Hollow?



- ❖ Controversy exists as to the best technique to train the core
  - "It Depends"
    - Goals – General conditioning? Sport specific?
    - Participant injured or 'healthy'

**Abdominal hollowing** - commonly cued as "drawing-in of the navel toward the spine"

- May ↓ activation of mm. of dynamic mov't
- Suited for static movement

**Abdominal bracing** – "tightening the abdominal muscles as if preparing for a punch in the stomach"

- Suited for dynamic mov't

## Learn Core Skills



Activity #1: Activate your Transversus Abdominis

Activity #2: Activate your Pelvic Floor



## Program Design: Considerations



- ❖ Client's training goals – general conditioning, previous injury, athletic performance
- ❖ Current level of training (baseline)
- ❖ Limiting routine to 3 to 4 core-specific exercises → ↑ compliance, review ~ 4-6 wks.
- ❖ Combine **strength exercises, endurance, and proprioception** exercises to meet functional demands

## Program Design Cont'd



- ❖ Neural system (motor connection) – Trained through varied mov'ts in different planes, balance
- ❖ Recruitment pattern ensures optimal movement control, muscle performance of core, and control of reactive forces produced by the limb movements.

## Program Design: The Basis

- ❖ Co-contraction of deep mm. and pelvic floor – maintain activation through ALL reps

- ❖ The Clam



- ❖ Curl up



## 4 Most Common Training Errors

### 1. Neck deviation from Neutral Posture During Curl-up

- Neutral posture - Most stable, ↓ risk of injury
- When abs fatigue, body cheats by pulling on the head to complete the ROM
- Neck Pain?
  - Wt. of head (N) supported by spine; lying on back no support for the head



4 Most Common Training Errors Cont'd.

## How to Avoid Neck Pain

- ❖ Lead to the ceiling with your chin and don't lift with the head, lift with the chest.
- ❖ Maintain Neck Alignment
  - Push tongue to the roof of mouth
  - Place fist under chin to maintain ideal neck alignment and avoid head mov't
- ❖ Low level of neck fatigue and discomfort normal as core strengthens



## 4 Most Common Training Errors

### 2. Challenging Higher Levels too Soon

- Endurance Exercises: Do not progress to next level of exercise until proper form can be maintained for at least 45 – 90 s.
- Dynamic Exercises: Ensure 2-3 sets of 12-15 reps performed with no compensation from other parts of body

## 4 Most Common Training Errors

### 3. Hip Flexor Over-activity

- Low back leaves mat
- ROM too large
- Facet joint stress



## 4 Most Common Training Errors

### 4. Compromised force distribution

- Hamstring Pain? Contract glutes 1<sup>st</sup> instead of tensing hamstrings



## Supine Bridge Progressions



Level 1: Sustained Bridge at least 45 s

Level 2: Marching, hold 2-3 s, 15 reps, 2 sets



Level 3: Leg straight up, hip dips

## Functional Exercise Defined



Functional exercises are specific to the demands of an individual's sport or activity; often multiplanar

- ❖ Reduce focus on crunches - best exercises for back health work your core while **holding your spine straight**, like planks or leg drops

## Functional Exercises



### Overhead Press Functional Progression



Stance	Lifts
1. 2 feet at hip or shoulder width	1. Both arms at the same time
2. Staggered stance	2. Alternating
3. Single leg	3. Single arm
4. Repeat 1-3 on stability device	4. Repeat 1-3 with rotation

[Faries and Greenwood, 2007]

## Functional Exercises



- ❖ 10 T-pushups, 10 Lateral pushups, 5 Diamond Pushups
- ❖ Lunge w/ overhead raise, rotation to opp. Side
- ❖ Lateral lunge with ipsi-lateral sweep
  - Level 2: Knee-up when returning to start position
- ❖ 1-leg balance, straighten leg
  - Level 2: Add press with leg extension
  - Progress when comfortable performing 15 reps each side

## Contraindications:



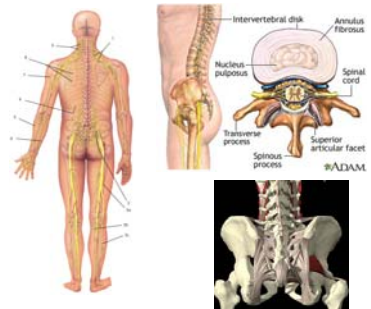
Any client actively experiencing the following should be referred to an appropriate health professional trained in MSK assessment (Chiro, PT)

- Limited joint movement/stiffness
- Symptoms that are 'spreading'
- Worsening pain or pain that does not go away after a few hours
  - "2-Hour Rule": *any joint pain experienced during or after activity lasting more than 2 hours should be subject to further investigation.*
- Pins and needles sensations or numbness
- Burning, stabbing pain
- Pain that wakes you up at night
- Swelling, redness

## Sources of Pain



- Joints
- Tendons
- Ligaments
- Muscles
- Nerves
- Discs and menisci



## Final Key Points



1

Train endurance before strength – Race car analogy

Incorporate endurance, strength and balance exercises into your programs

2

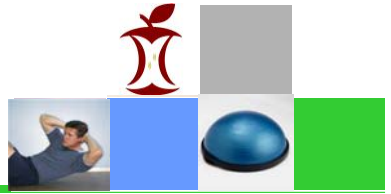
3

Brace vs. hollow for most dynamic movement's, Hollow for sustained holds

Monitor the *QUALITY* of your Reps vs Quantity, Rest if you're losing form or feeling fatigued.

4

THANK YOU!



# Happy Training!

Any Questions?



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