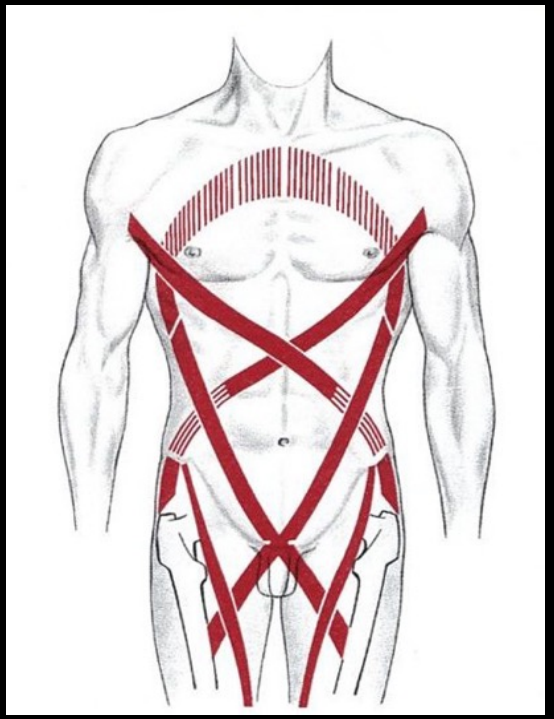
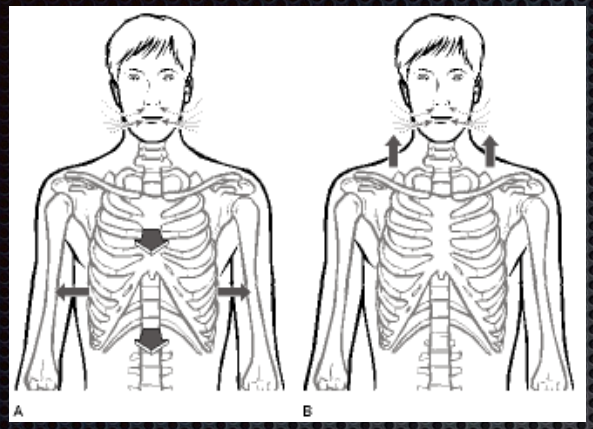
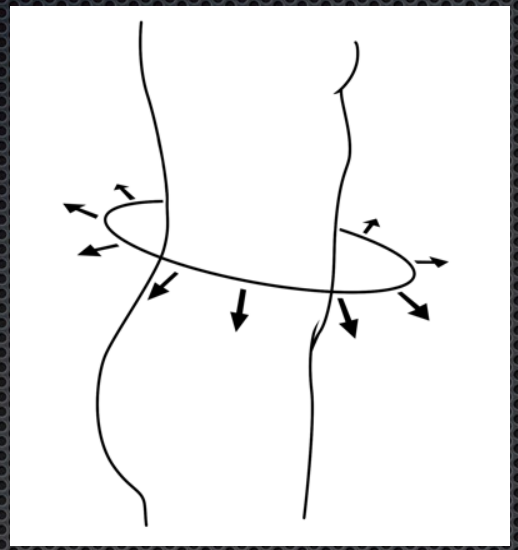
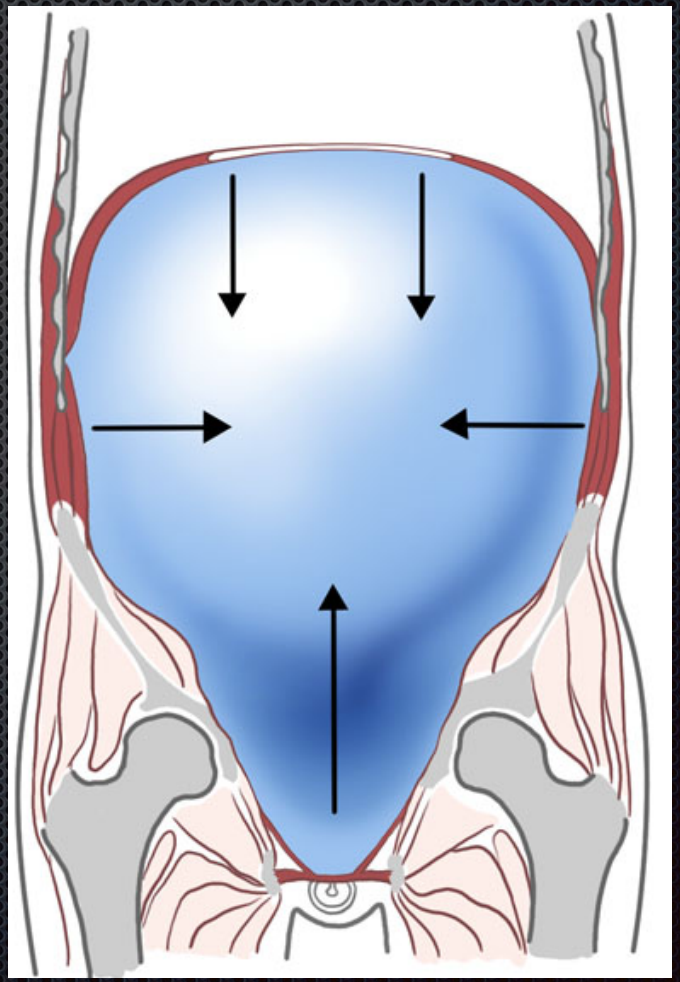
II) SPINE STABILIZATION TRAINING

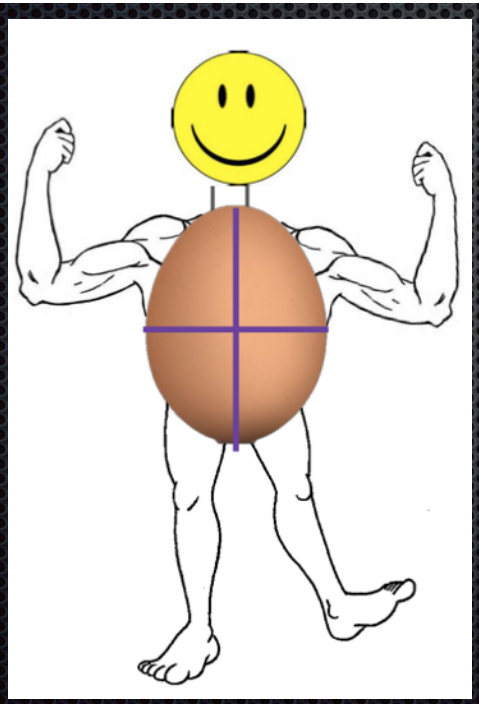


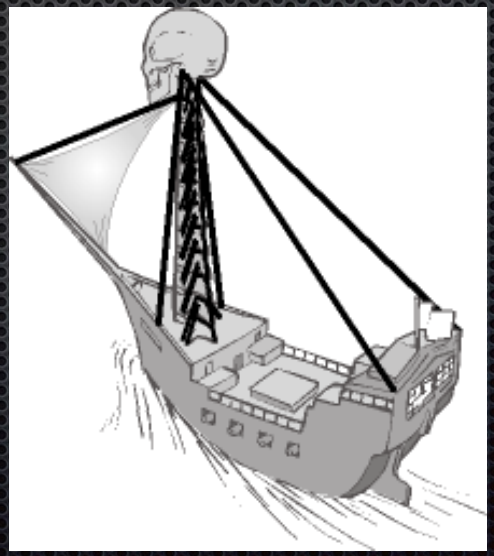
The Diaphragm & the Core

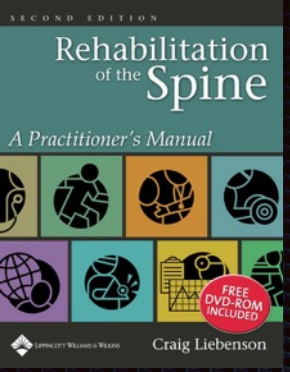




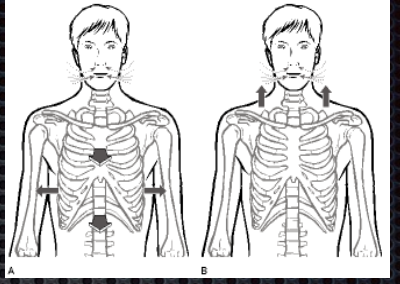




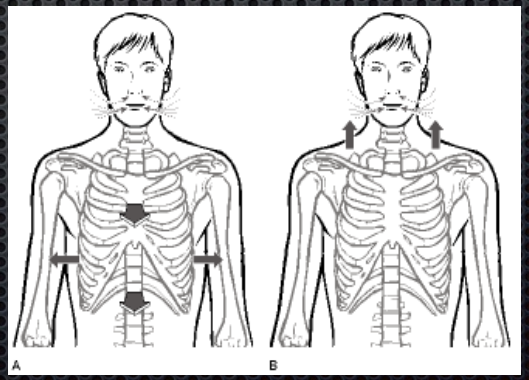


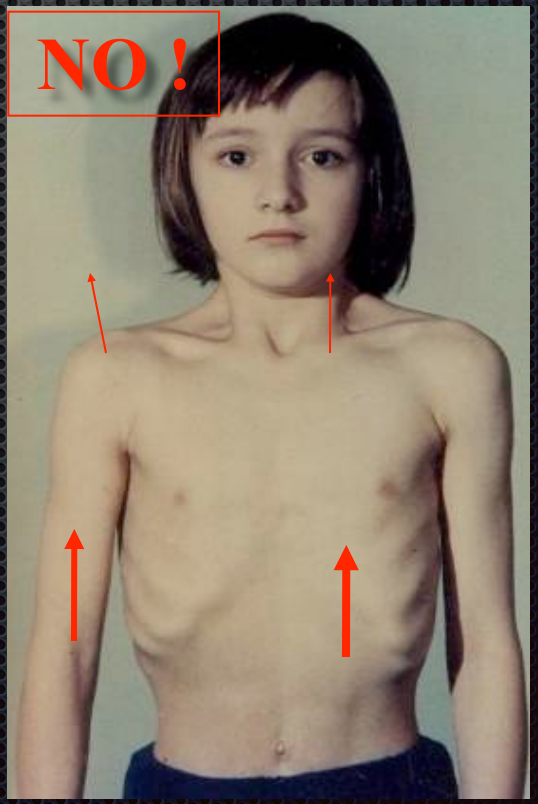


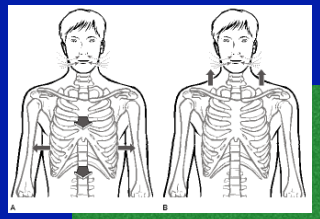
Diaphragm Test - p553-555 (ROS)



- Most common faulty movement pattern
- Vertical chest breathing predominates over horizontal
- Scalene overactivity



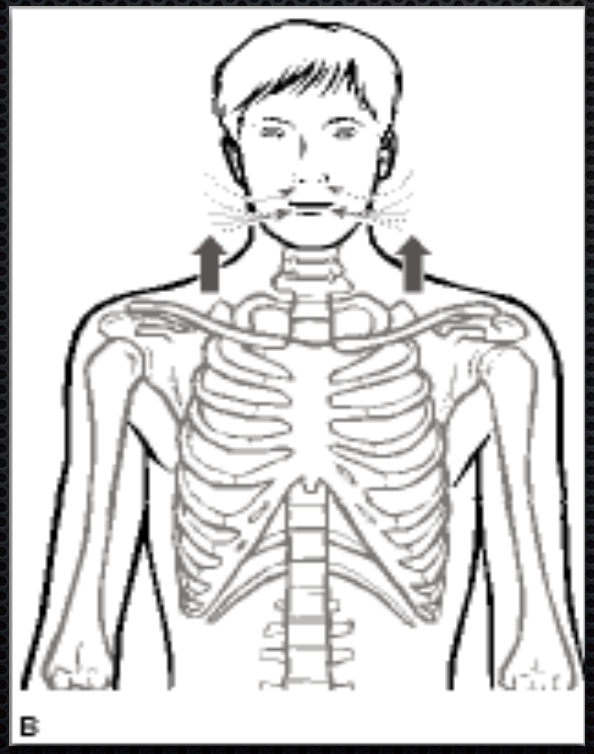


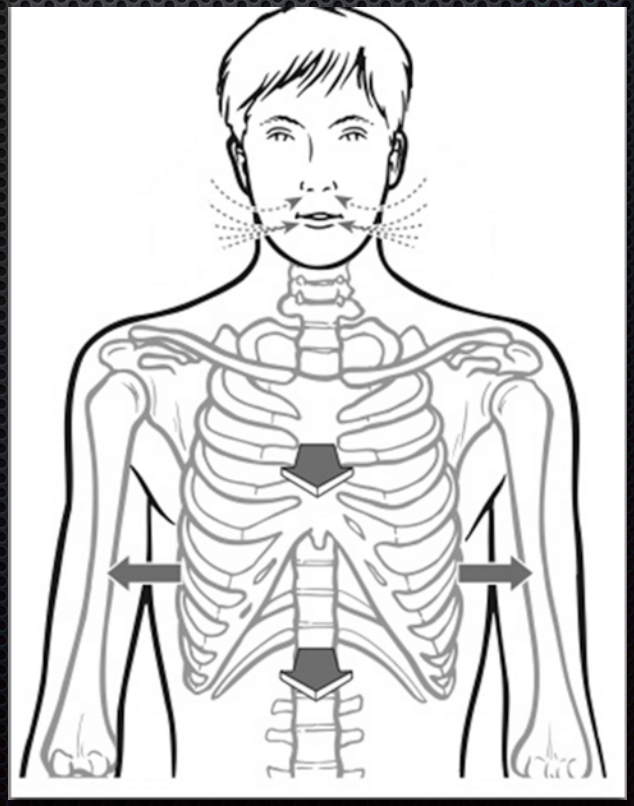


Assessment:
Breathing/Core

- Most common faulty movement pattern
- Dysfunctional breathing usually occurs with **vertical** chest breathing predominating over lower abdominal and lower rib cage **horizontal** breathing
- Scalene & upper traps overactivity & poor abdominal function result from faulty breathing

- “Before any real benefit can be derived from physical exercise, one must first learn how to breathe properly…Our very life depends on it” Joseph Pilates

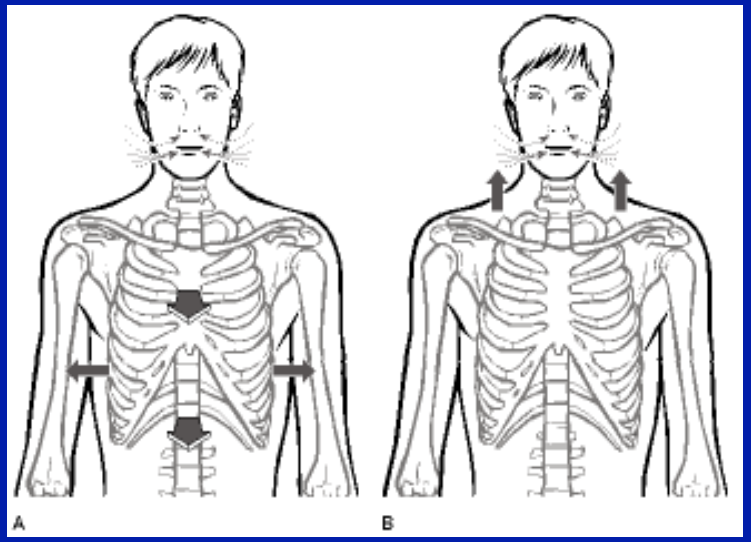




Breathing Test - Upright

Standing or Sitting Inhalation Test

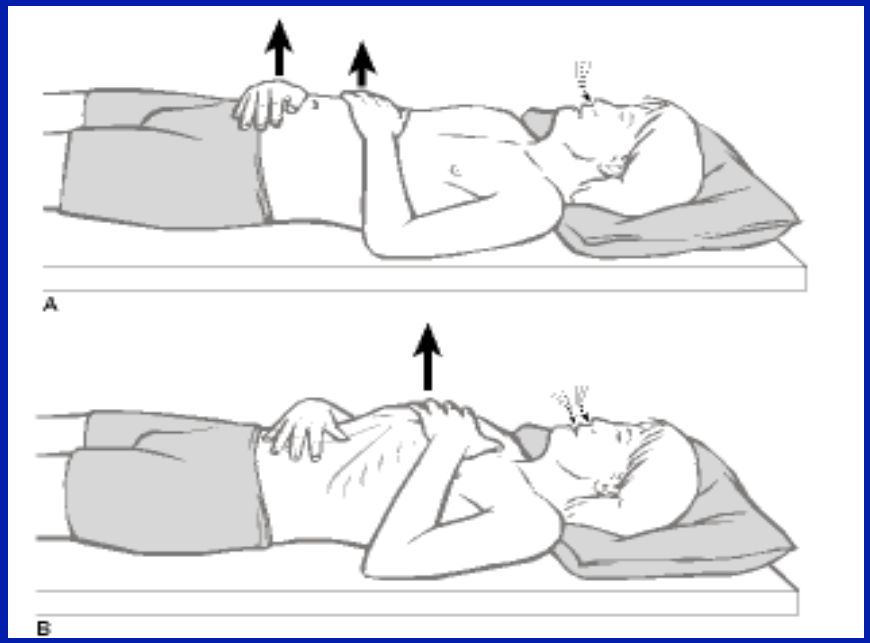
- During a breath in do the shoulders rise up?
- Ideally breathing occurs horizontally not vertically



Breathing Observation - Supine

DURING INHALATION:

- Observe if chest breathing predominates over abdominal breathing (**minor dysfunction**)
- Observe during inhalation if the abdomen moves in, rather than out (*paradoxical respiration* – **major dysfunction)**



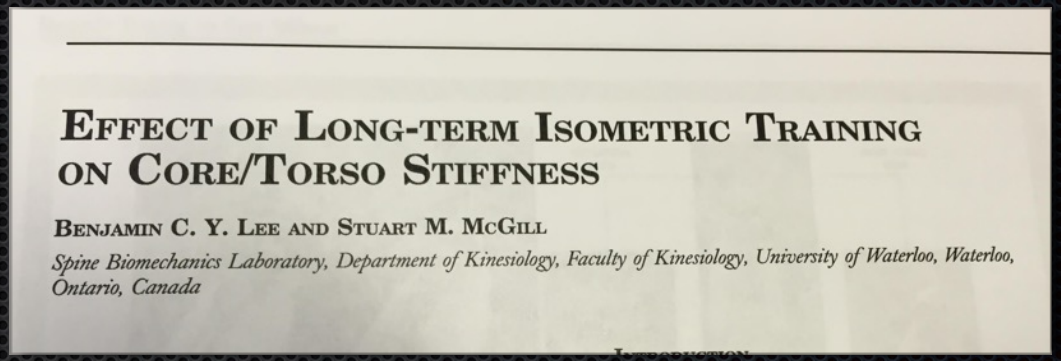
YOGA

Scoring

- 0 - Pain
- 1 - Can’t perform movement
  - Paradoxical respiration
    - Supine inhalation belly goes in/exhalation out
  - Ribs cephalad in upright/vert test
  - Supine - chest breathing predominates over belly breathing
- 2 - Performs movement w/ compensation
  - Lower rib cage does not widen laterally
- 3 - Movement performed w/out compensation

A) Periodized Isometric Core Stabilization Program

Lee & McGill



EFFECT OF LONG-TERM ISOMETRIC TRAINING ON CORE/TORSO STIFFNESS

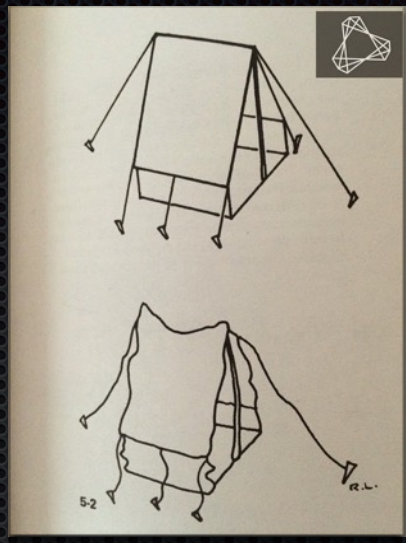
BENJAMIN C. Y. LEE AND STUART M. MCGILL

Spine Biomechanics Laboratory, Department of Kinesiology, Faculty of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada

29(6)/1515-1526
Journal of Strength and Conditioning Research

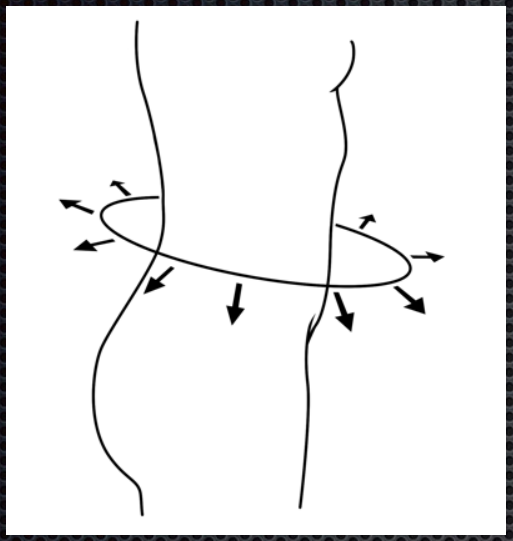
Pr Stuart McGill

WHY?



"Enhanced core stiffness allows the spine to bear greater loads and express greater distal limb athleticism."

Agonist-Antagonist Dysfunction

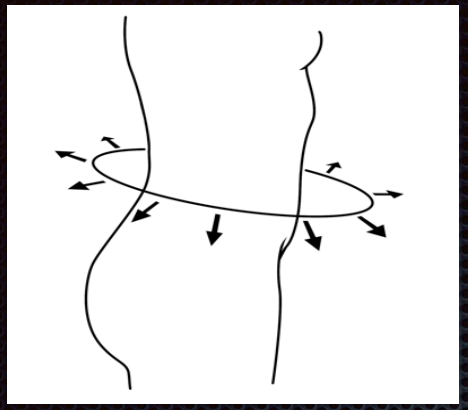


- Muscle response pattern to sudden trunk loading in LBP individuals
- Delayed activation
- Over-activation
- Delayed relaxation

Radebold A, Cholewick J, Panjabi M, Patel T. Spine 2000;25:947-954.

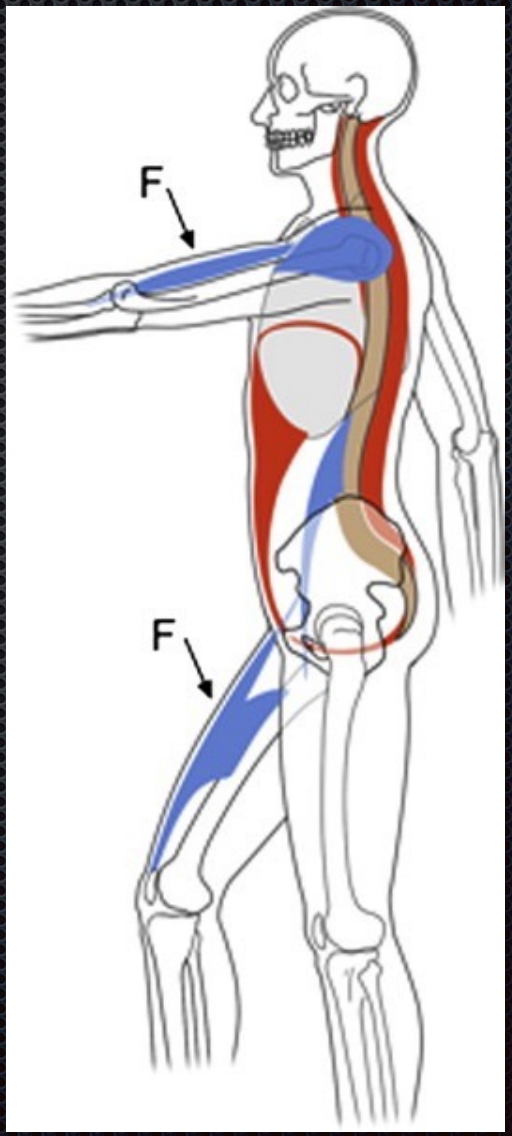
OLYMPIC LIFTERS RELAX THEIR MUSCLES ABOUT 5X FASTER THAN PEOPLE ON THE STREET. THE "GIFT OF THE OLYMPIC LIFT" REQUIRES **RELAXATION.**

DR. STUART MCGILL



Core Stiffness

- enhances load bearing ability,
- arrests painful vertebral micromovements,
- and enhances ballistic distal limb movement



- "**Athletic performance** depends on being able to **generate power through your arms and legs**. That power is only possible if your **torso and hips provide a solid, stable platform**." - Stuart McGill

Foundation/Stability

Pr Stuart McGill

A great coach assesses their athletes for injury history, body type, current athleticisms, and training goals, then creates a program while training best technique. A poor coach beats a client up and makes them sore.


A Note from Dr. Mel Siff, 2008
"To me, the sign of a really excellent routine is one which places great demands on the athlete, yet produces progressive long-term improvement without soreness, injury or the athlete ever feeling thoroughly depleted. "Any fool can create a program that is so demanding that it would virtually kill the toughest marine or hardiest of elite athletes, but not any fool can create a tough program that produces progress without unnecessary pain."
Langara

Minimize Downside Risk

A trainer should be paranoid about injury

"the purpose of the program is to reduce injuries and improve performance. We are not trying to create power lifters, O lifters, bodybuilders or strongmen. We are trying to create athletes. Strength training is simply a means to an end."

Boyle

“Durability is more important than ability”

- Arizona Diamondbacks MLB Training Staff

WHY

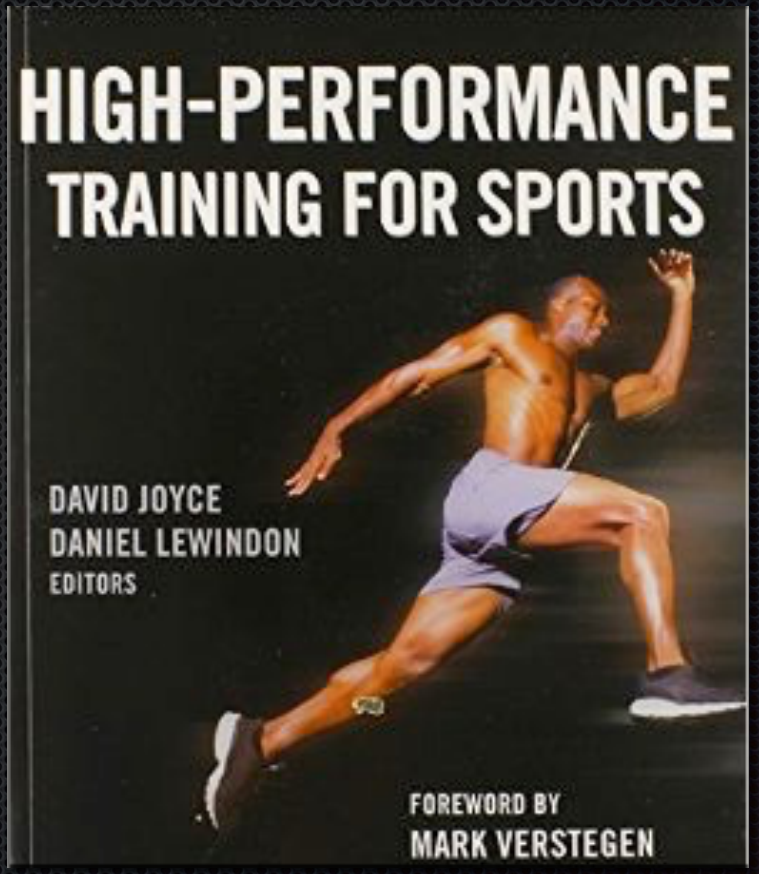
"Exceeding tissue tolerance by loading the athlete too frequently or too greatly increases the odds of tissue injury.
This is where the beauty of the isometric core exercises come into play."

The Injury Prevention Pyramid

The Sports Physio @adammeakins

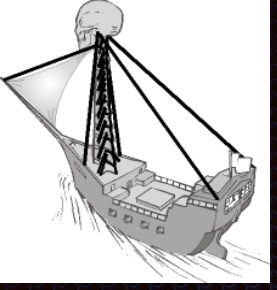
Joyce D

- "In many instances we find the program is king….the athlete is …expected to be shoehorned into the program, there is little **individualization**."



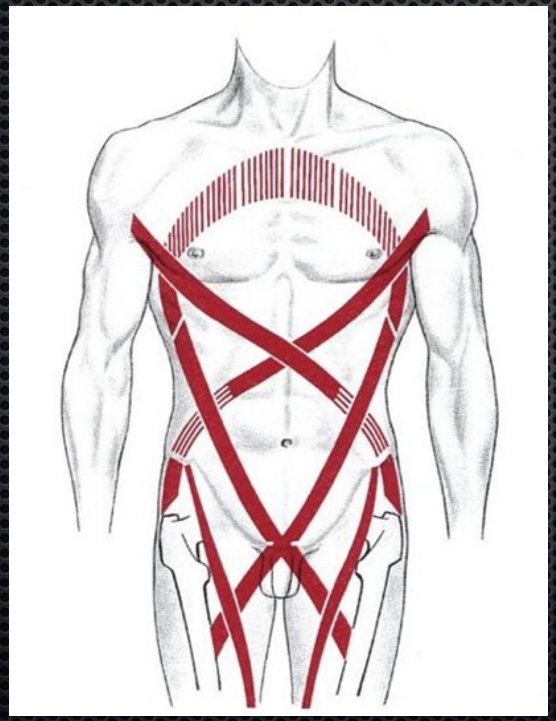
WHAT

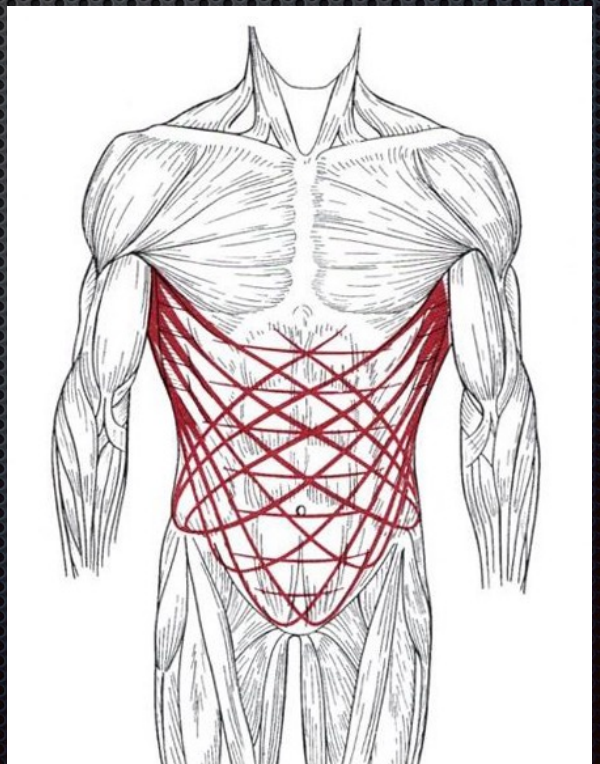
- Designed to train the core about all 3 planes of motion - sagittal, frontal and transverse;
- Each exercise selected was based on criteria to challenge a specific plane



PNF

Core (proximal) Stability for Distal Mobility






Movement Screening,
Testing, and Assessment


Questions?

PERIODIZED REHAB

The progressions are organized in a progressive block manner:

Weeks 1-2 - Static w/ bodyweight

Weeks 3-4 - Quasi-static w/ eternal load

Weeks 5-6 - Proximal stiffness-distal mobility relationship

Isometric Core Stability

- **Level 1 - Static w/ bodyweight**
- Isometric Holds - **Front Plank (2), Side Bridge, Bird Dog**
- **Progressing to - Torsional Buttress, Side Plank, Front Plank (1)**

- **Level 2 - Quasi-static w/ external load**
- **- Pallof Press, Pulley 30 degree abduction, Kettlebell Suitcase hold**

- **Level 3 - Proximal Stiffness with Distal motion/ athleticism**
- **Stir the Pot, Inverted Row (TRX), KettleBell Carry, 1/2 Kneeling Chop**
- **Also - Dead Bug, Plank Saws (2/1), Plank Roll, 1 Arm Bench/ Row, Glute Bridge (2/1), Staggered Arm Push-Up**

Isometric Core Exercise Progressions

STATIC W/ BODYWEIGHT

- BIRD DOG
  - on forearms
- FRONT PLANK (2 to 1)
- SIDE BRIDGE
- TORSIONAL BUTTRESS

STATIC W/ EXT LOAD

- KETTLE BELL STATIC HOLD
- 30 DEGREE STATIC HOLD WITH PULLEY
- PALLOF PRESS (anti-rotation)
  - Lateral Step (Band walk - Frontal)
  - Overhead (Anterior)

PROXIMAL STABILITY WITH DISTAL MOBILITY

- STIR THE POT
- 1/2 KNEELING CHOP
- TRX ROW
- KB CARRY
- WALL BUG
- PLANK ROLL
- Plank Saw (2/1)
- 1 ARM BENCH/ROW
- GLUTE BRIDGE (2 to 1)

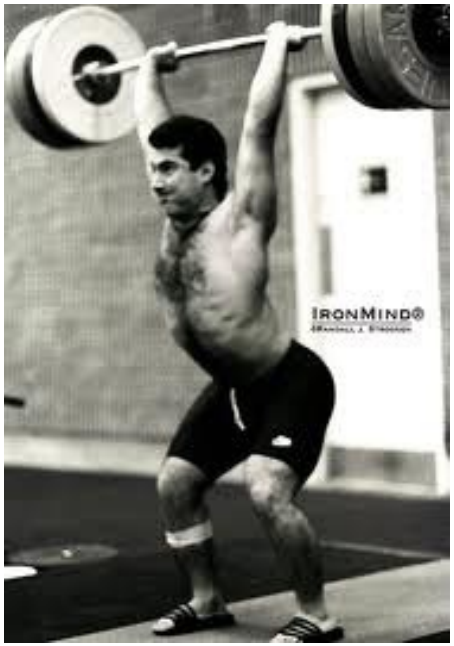
The Functional Training Range

- Hardest thing you do well
  - at the edge of your capability
- Nested to your "weak link"
- *"Painless range that is appropriate for the task at hand"* Dennis Morgan, PT, DC

Janda's Approach

Pr. Janda taught me **"every exercise is a test"**

Every Exercise is a Test



Block 1: Bodyweight Completely Static

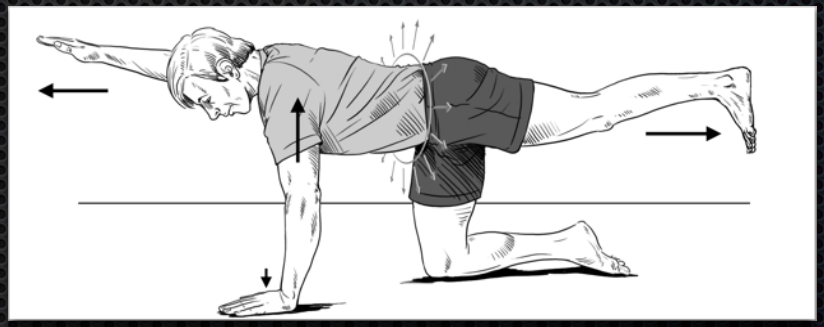
Weeks 1-2
No external load, just using bodyweight to train stability in each plane

Block 1:
Week 1

Bird Dog

Side Bridge

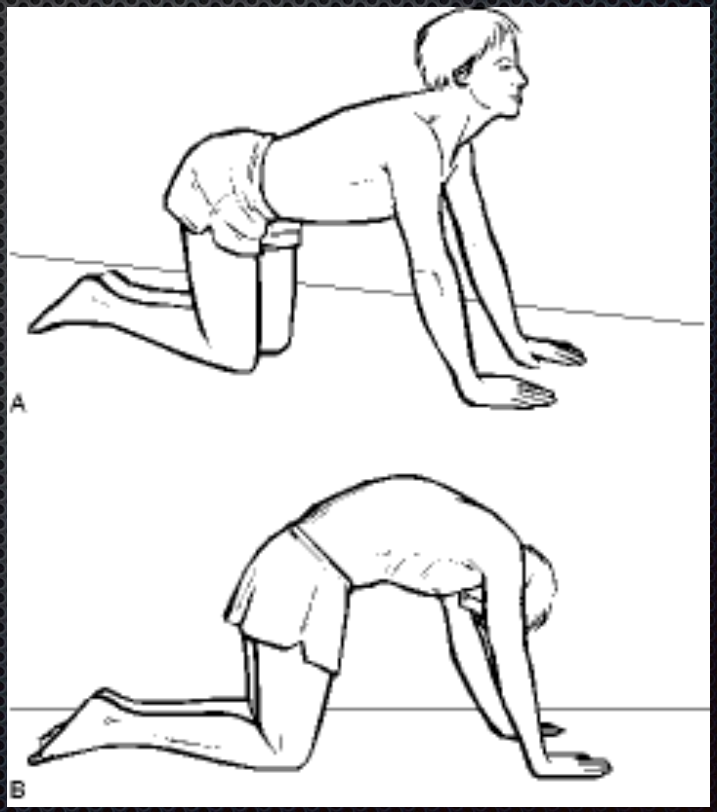
Front Plank - 2 Legs



WARM-UP

Cat - Camel - p621

- Perform in painless or pain centralizing ROM
- Gentle, limbering movement, NOT a stretch
- 8-10 reps
- 2-4X/day



Sagittal

Anti-Flexion

FRONT PLANK

Frontal Side Bridge Technique -p 624

- Shrugged Shoulder
- Lumbar Convexity

- Packed Shoulder
- Lumbar Centrated

Ready-Aim-Fire

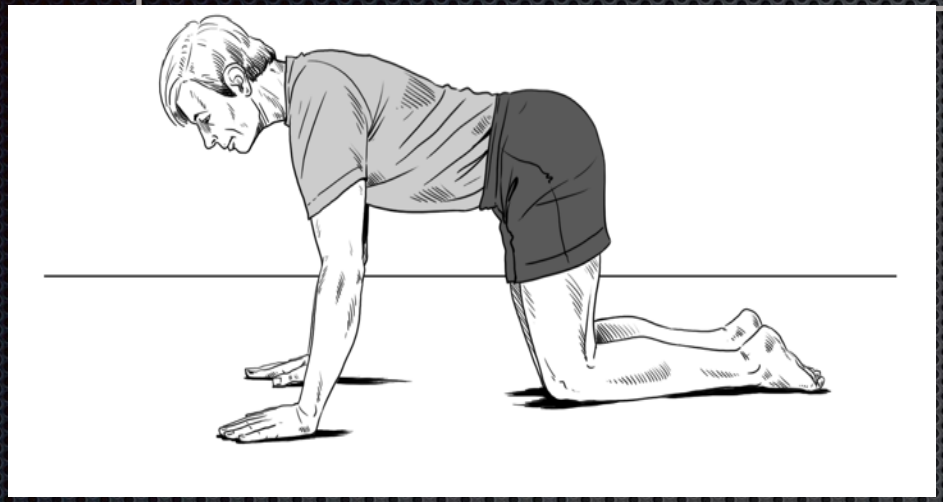
- Hips Centrated

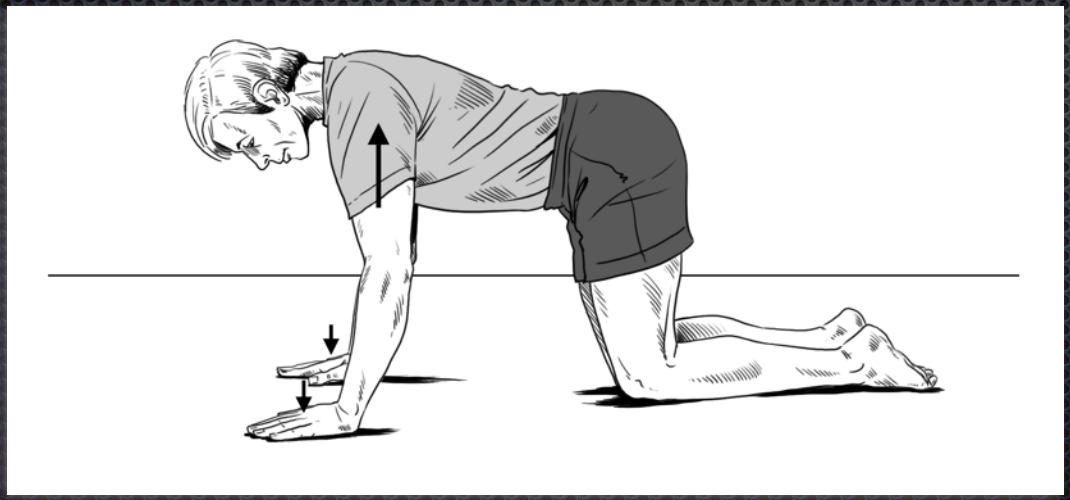
Anti-Lateral Flexion

Anti-Rotation

Transverse

Bird-Dog - p623

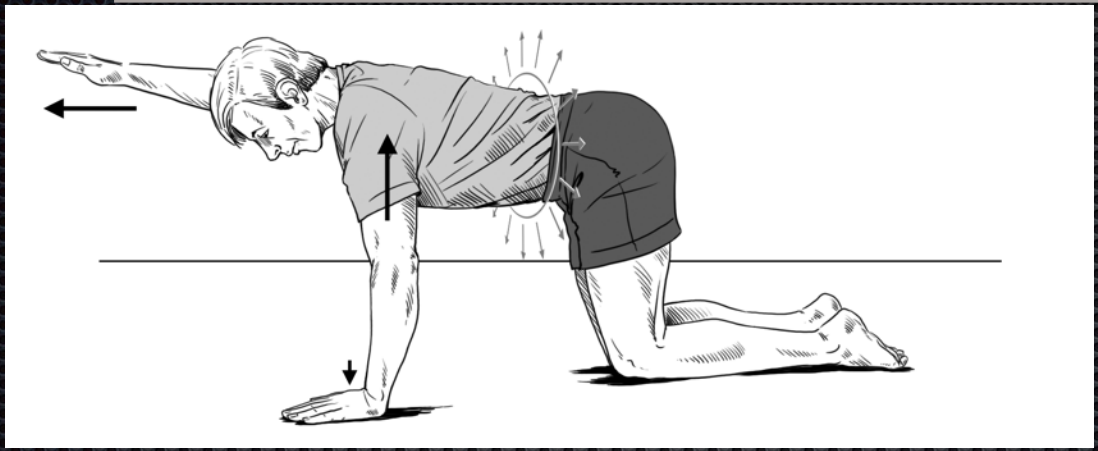


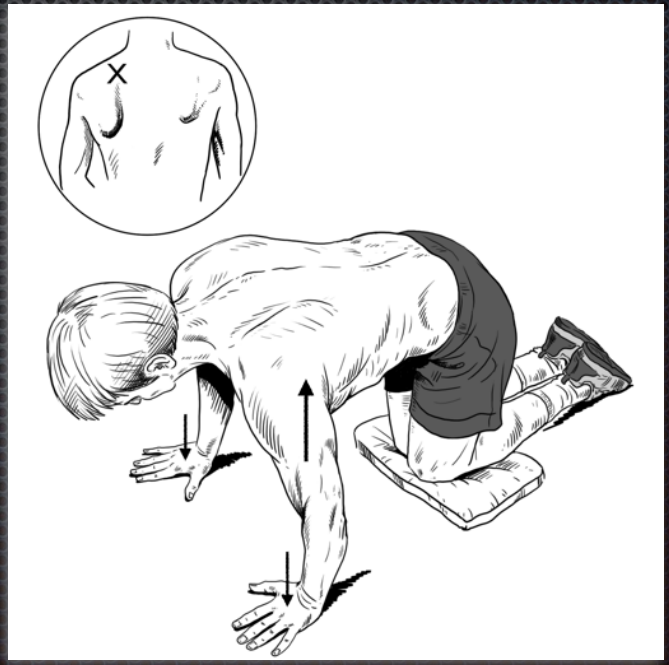


- Start on All 4's
- hands under shoulders
- knees under hips
- push off floor until head glides up

Transverse

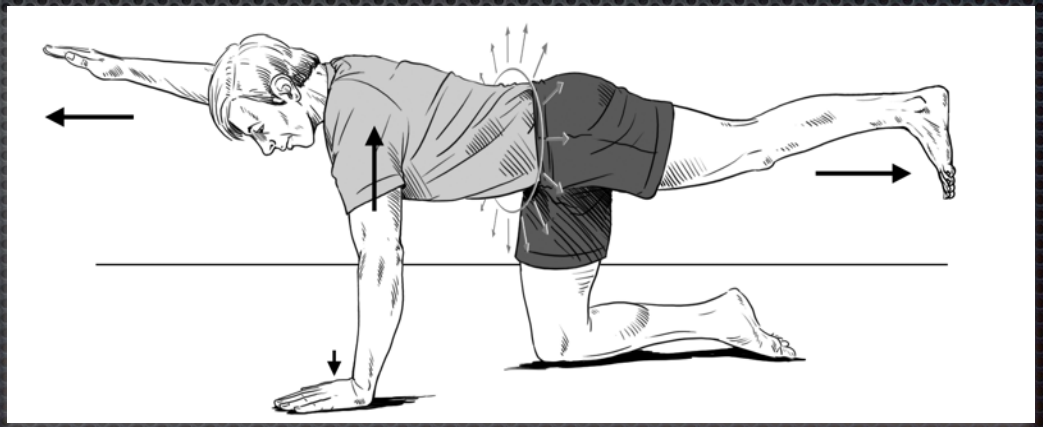
Quad Arm Reach
- brace your spine
- & reach forward w/ your hand
 - Be sure that your shoulder blade(s) don't stick out





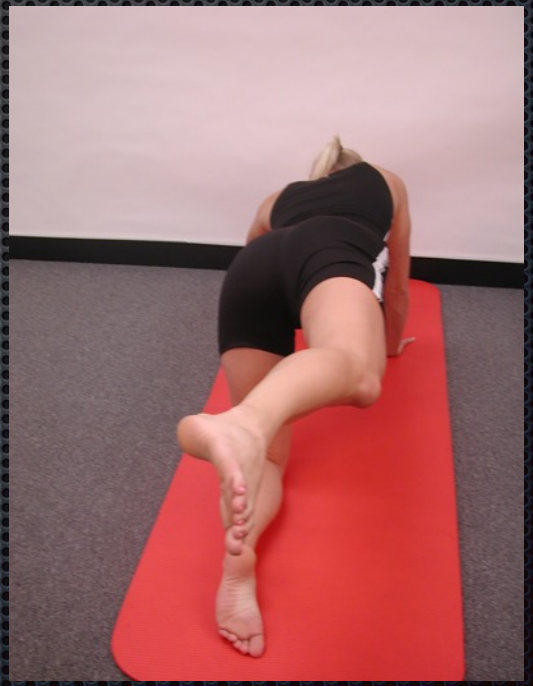
Transverse

- reach behind you w/ your foot
- then progress to opposite arm/leg

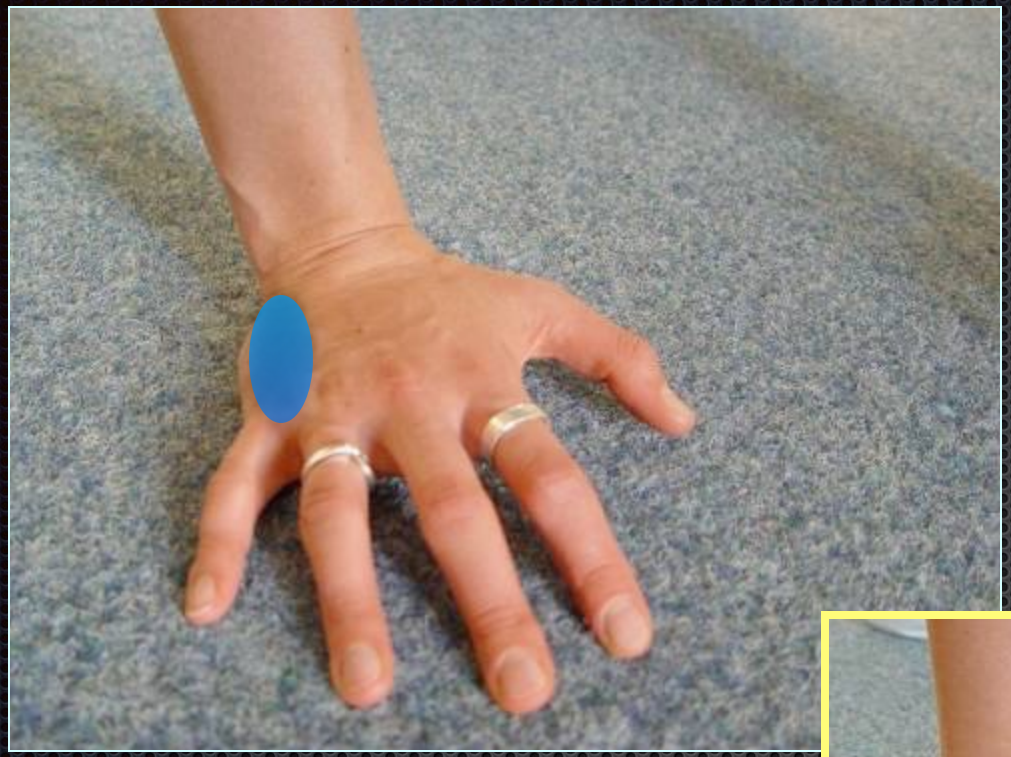


Common Errors

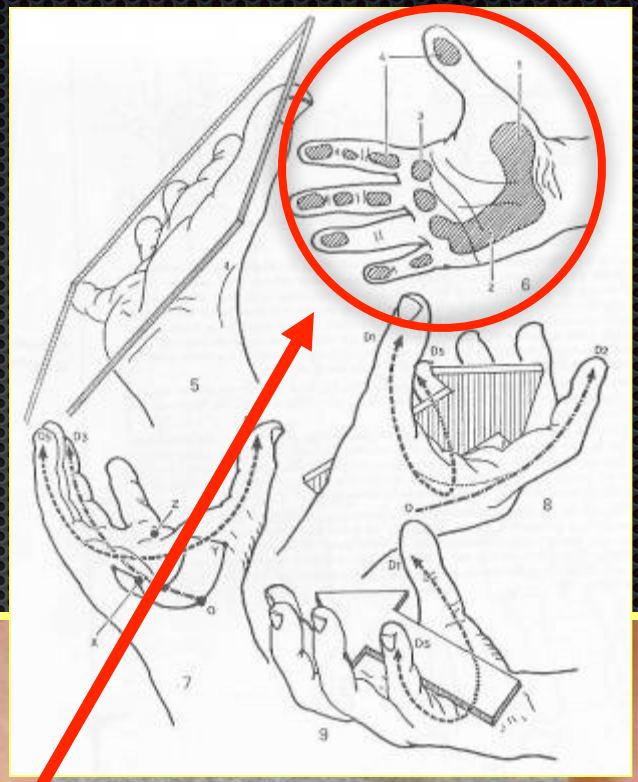
Sagittal

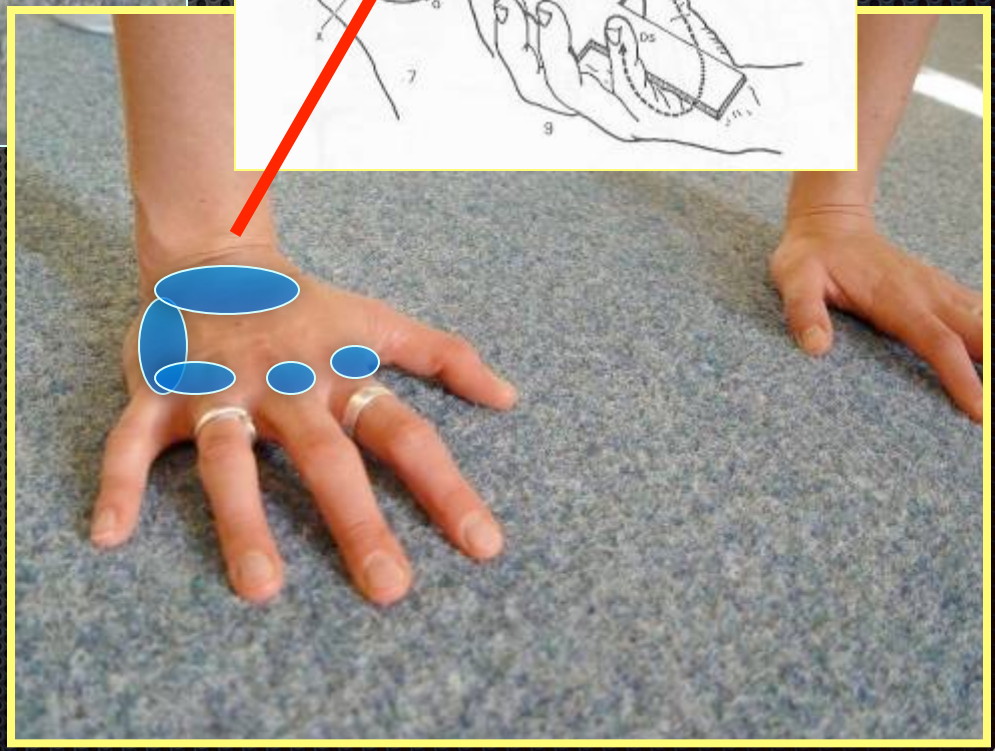


Transverse



NO ☹





YES ☺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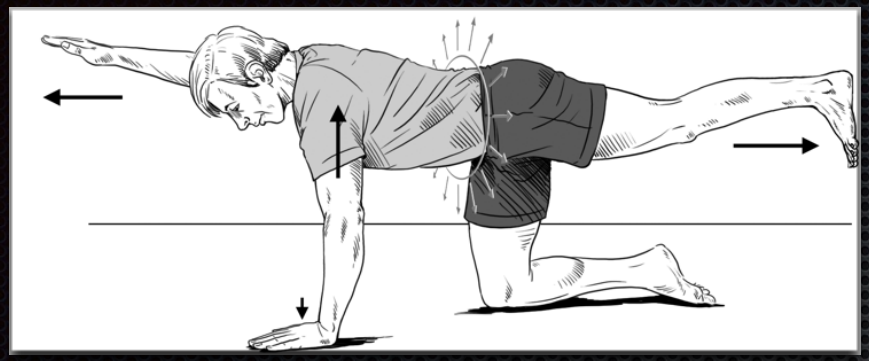
Boyle's Regression



Block 1:

Week 2

Bird Dog

Side Plank

Front Plank - Single Leg

Torsional Buttress

Sagittal

Anti-Flexion

Sagittal Plane Capacity:

FRONT PLANK

1

Anti-Lateral Flexion

Frontal

Side Plank

Progression - Week 2

- Indications
  - Subacute MSP
  - In particular
    - LBP

Transverse

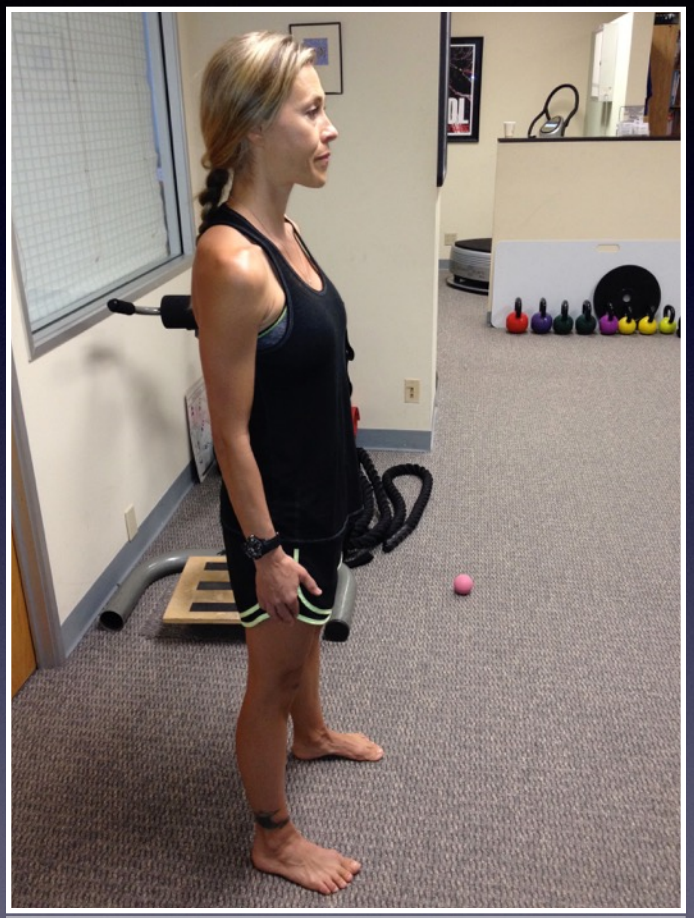
Anti-Rotation

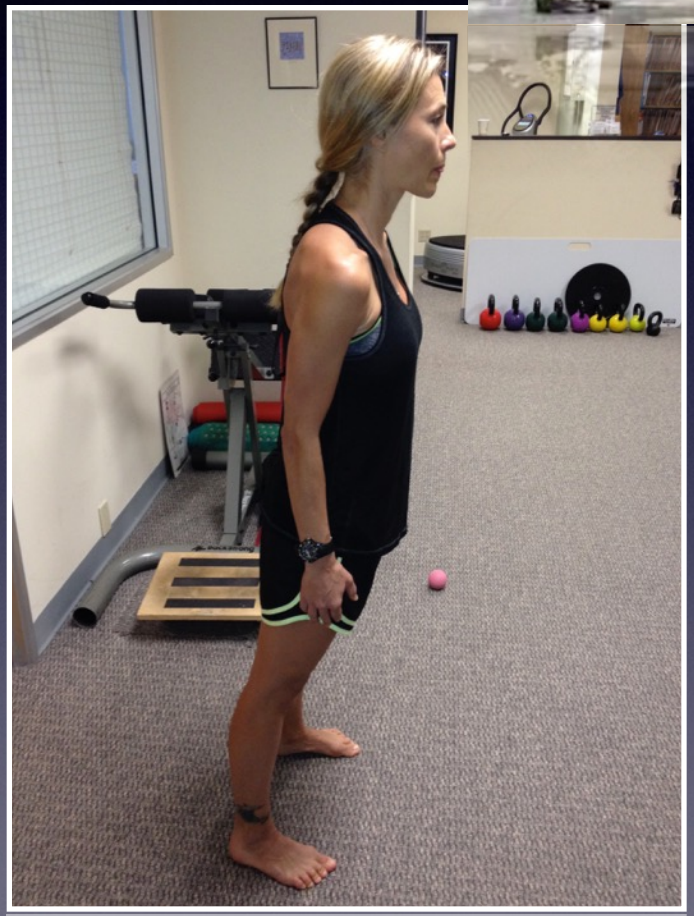
Torsional Buttress

Standing Anti-Rotation Lean

"Fall Forward"


lean-fall run with a partner





1 THE FOLD

Prop the pizza on the upturned fingertips of both hands, at chin height, perpendicular to the body. Gently squeeze the outer edges of the crust until they meet in the middle. Crease the slice longways and direct the sharp end toward the mouth.

2 THE BEND

As the pizza approaches, lean forward at an angle of approximately 35 degrees, enabling the mozzarella grease to drip harmlessly onto the ground, thereby avoiding irremovable stains on the shirt or pants. Insert slice into mouth.

3 THE NIP

Still leaning, bite down and pull away, creating a string of cheese between mouth and pizza. Do NOT attempt to stretch the string to its breaking point. Instead, nibble to the edge of the slice and nip with the incisors. Swallow and repeat.

Anti-Rotation Lean - Arms

STATIC W/ BODYWEIGHT Progressions

- BIRD DOG
  - on forearms (regression)
- FRONT PLANK 2 feet
  - 1 leg progression
- SIDE BRIDGE
  - SIDE PLANK (progression)
- TORSIONAL BUTTRESS
- STANDING ANTI-ROTATION

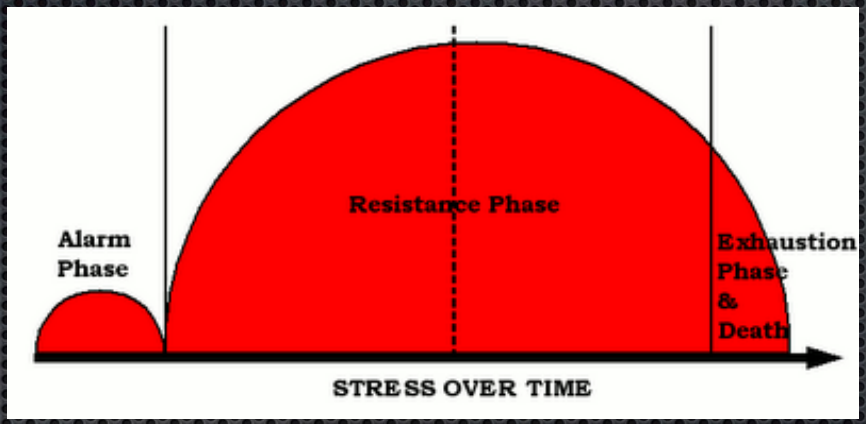
Block 2: External Load Quasi-Static

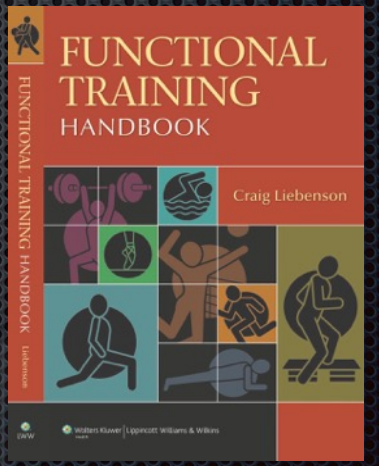
Weeks 3-4

Use of external load and manipulating moment arms to train stability in each plane

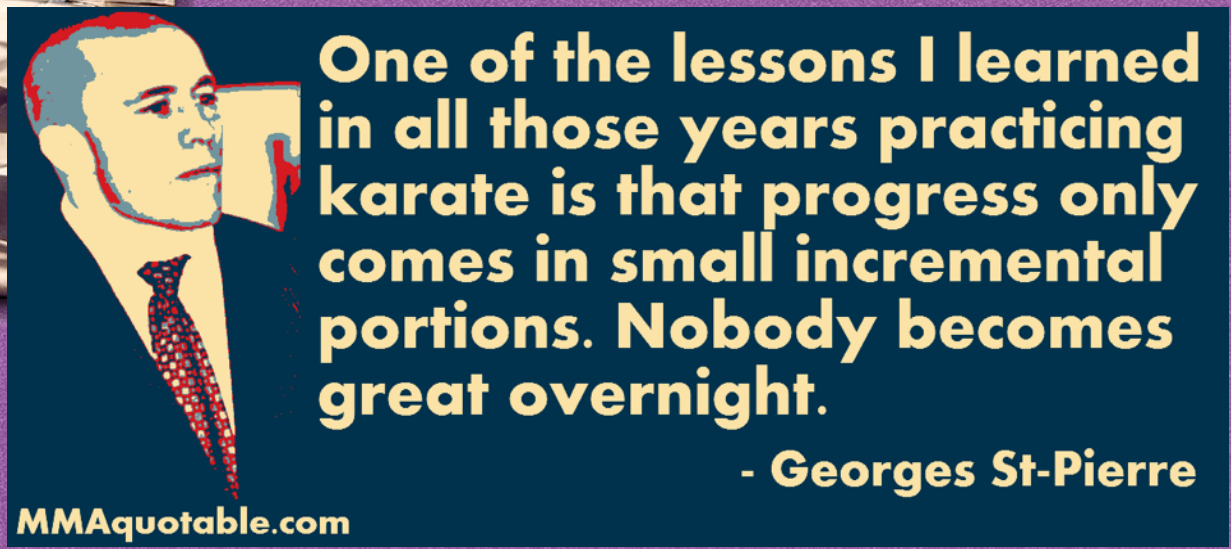
- use bracing abilities learned in Block 1 & apply it to a slightly more challenging drill

How to Progress





Convert 1's into 2's



"The **laws of human motion** with **injury resiliency** begin first with proximal stiffness which enhances distal athleticism, and secondly, generate power at hips, not the spine. "

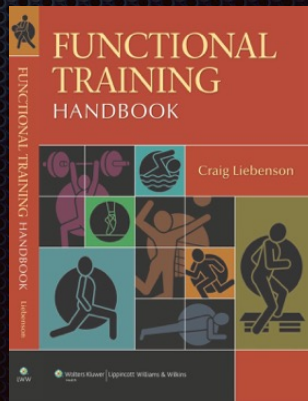
Stuart McGill, PhD

Karel Lewit

- "Don't try to teach perfect movement patterns, rather correct the key fault that is causing the trouble."

Not 2's into 3's

Where Does Go Hard or Go Home Apply?



Needs Analysis

Do you have Enough Capacity?

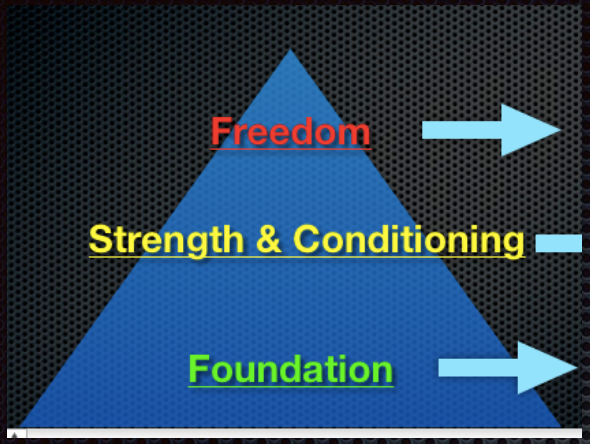
You must have more capacity than the task demands...otherwise injury will occur.

Needs Analysis

Do you have
Enough
Capacity?

Demand>Cap=Injury

Cap>Demand= Durability



Strength

"Go Hard or Go Home"

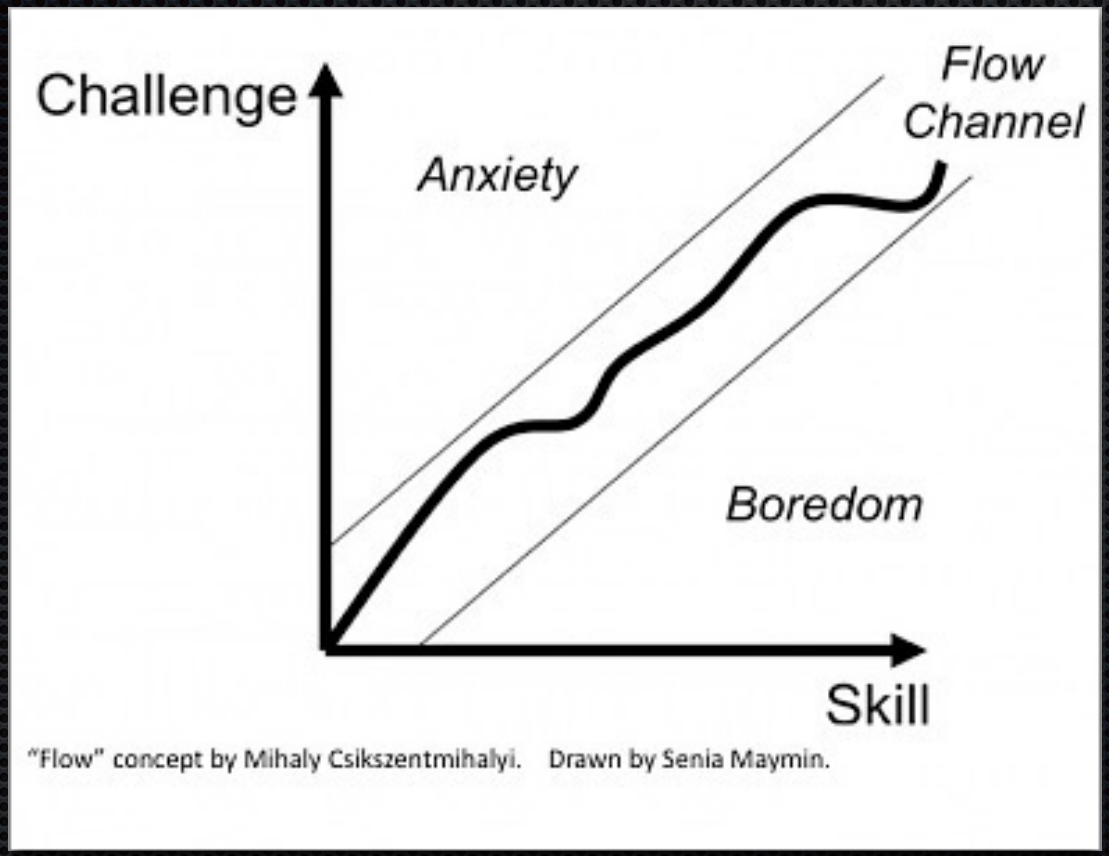
- The hardest thing you can do well
- The limit of your capability

Your comfort zone is a cage

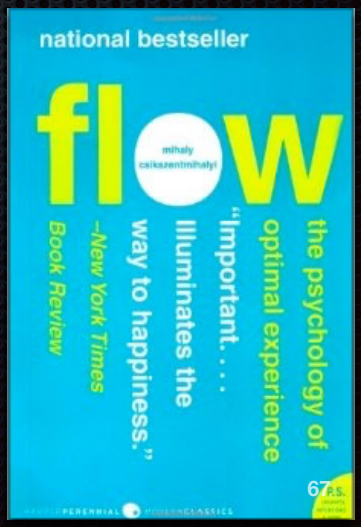
IF IT DOESN'T CHALLENGE YOU,
IT DOESN'T CHANGE YOU

Overload or Novelty → Adaptation

Stress leads to Adaptation & Skill Transfer

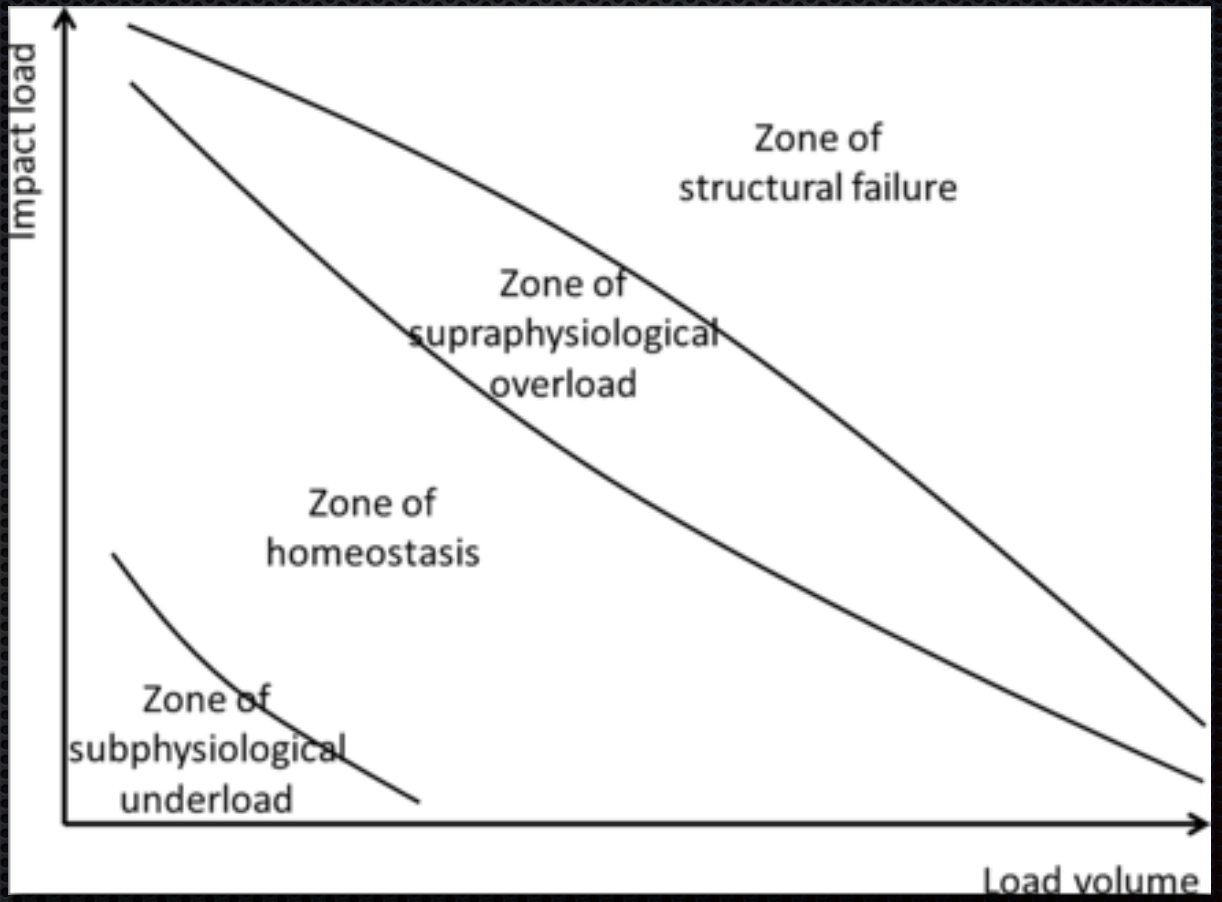


FIND YOUR EDGE!



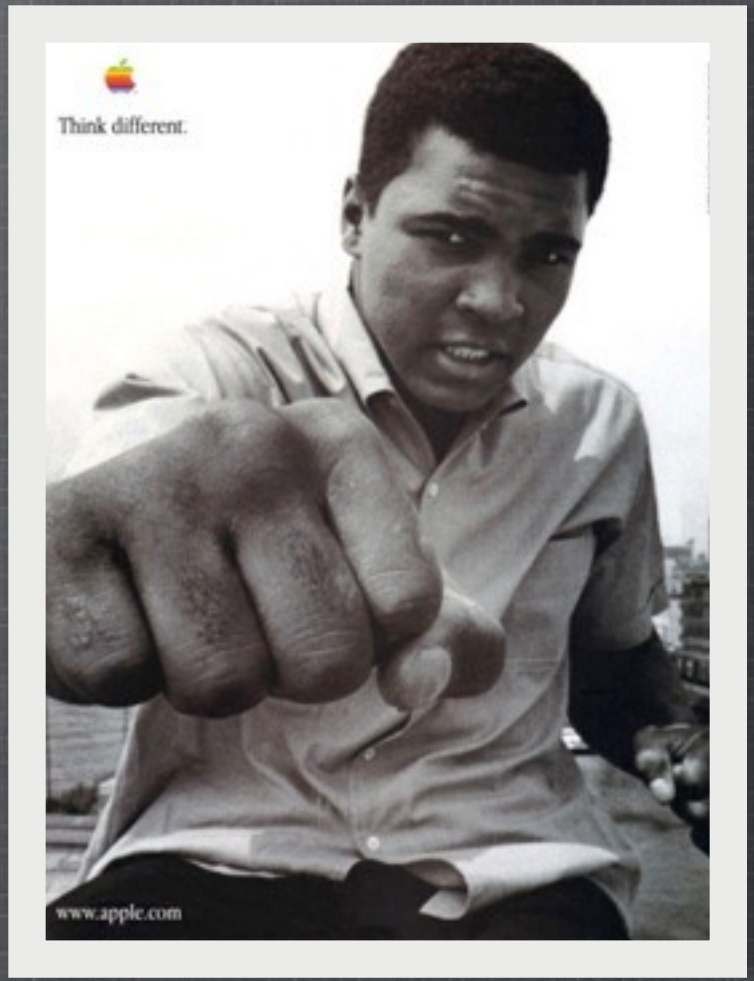
Relationship between structural adaptation and load (Dye 2005)

IMPACT LOAD: throwing speed, jump height or other measures of joint load



LOAD VOLUME: training volume (frequency, duration, intensity), match frequency, etc.

STABILITY FOR POWER



“You can be strong without being powerful (because you can’t get that strength into motion quickly), but you can’t be powerful without having underlying strength of muscles and muscle groups.”
Verstegen and Williams

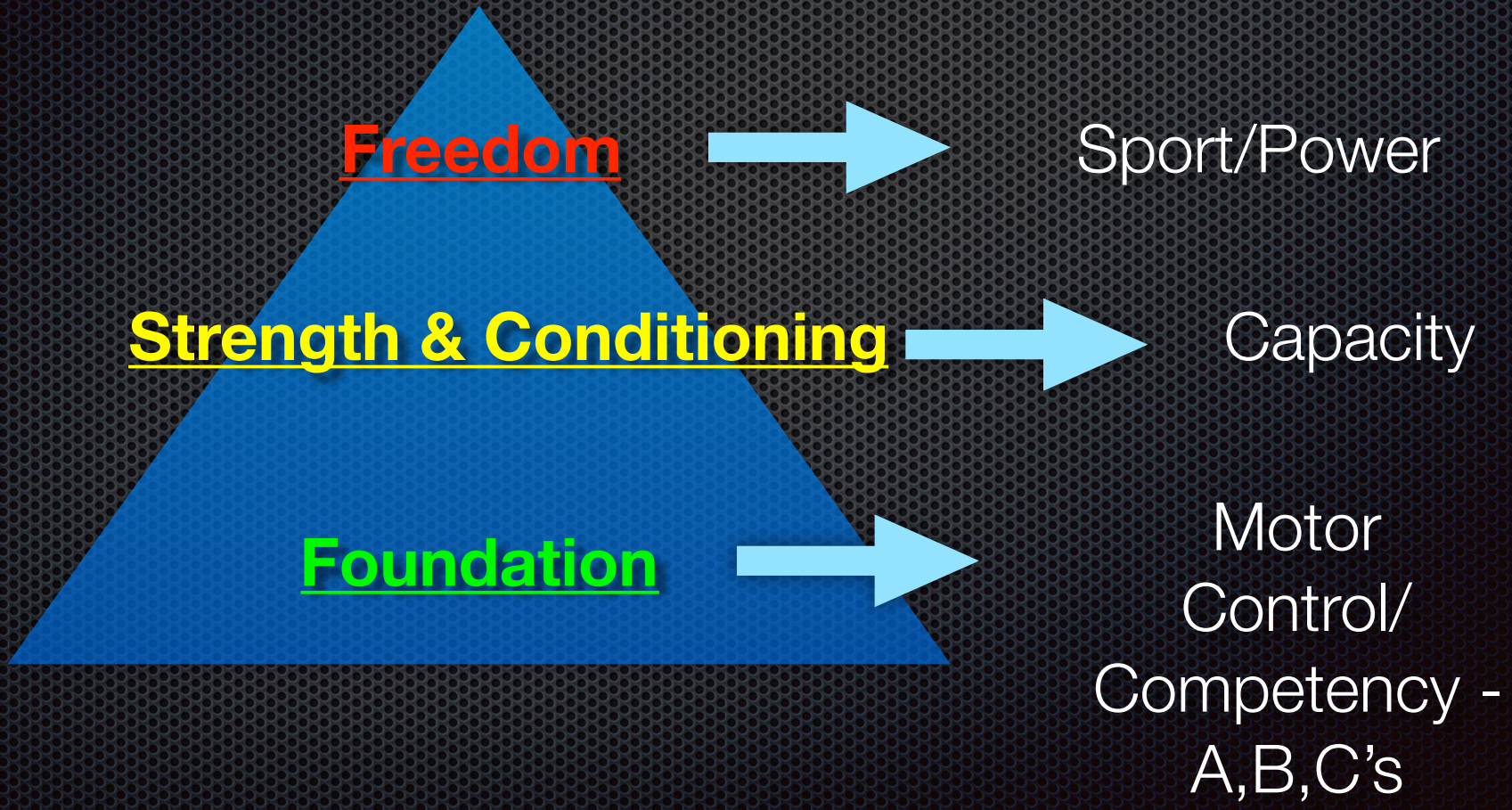
Squat for Speed

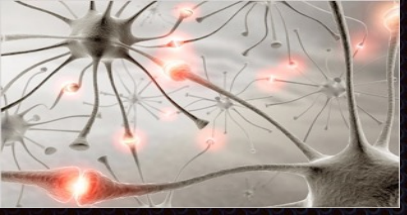
Sports Medicine 2014 Dec; 44 (12) : 1693-702.

Increases in lower-body strength transfer positively to sprint performance: a systematic review with meta-analysis.

Seitz LB, et al.

Training Pyramid





Triple Flexion for Triple Extension

Competency before Capacity

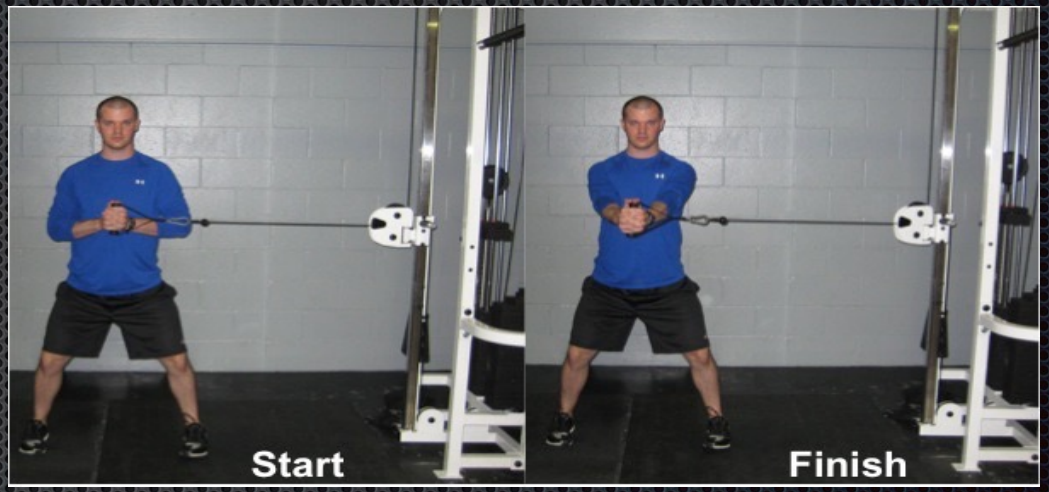
Block 2:
Weeks 3/4

- Pallof Press
- Suitcase Hold
- Pulley 30 deg. Hold

Anti-Rotation - Pallof Press

Transverse

- Standing
- Tall Kneeling
- 1/2 Kneeling
- Supine 3.5 month
- Can reach overhead to increase challenge
- Can add band to knees to increase hip stability



Anti-Rotation

Transverse

Tall Kneeling Pallof Press

Transverse

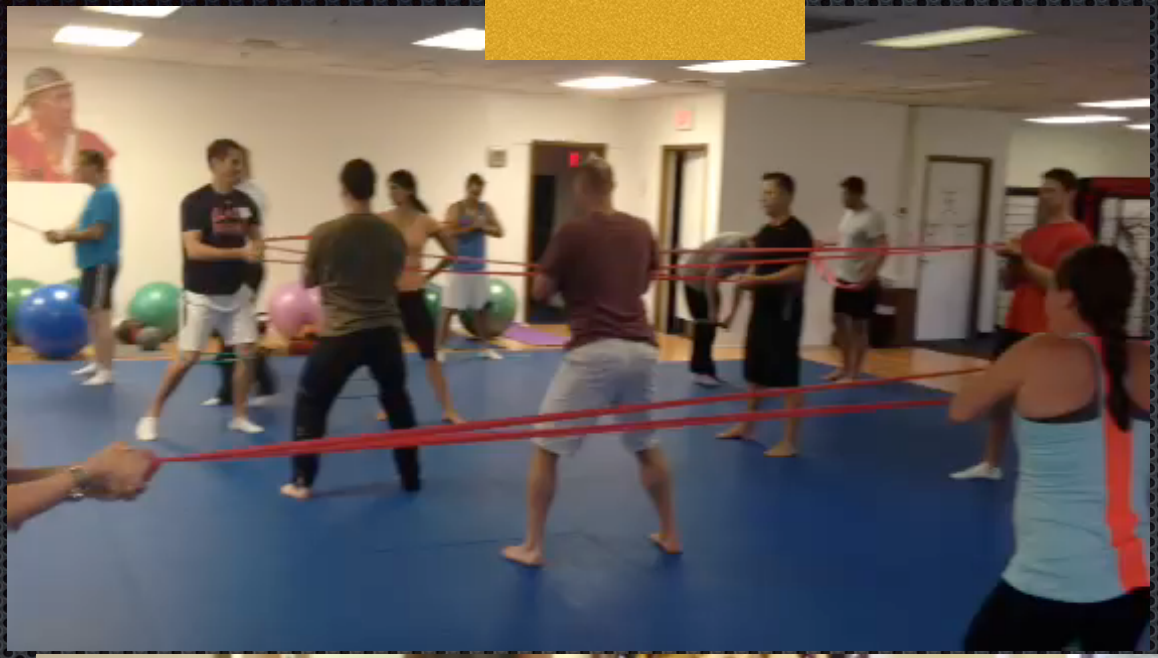
Sagittal

Transverse

Frontal

Multi-Planar Pallof Press

Transverse

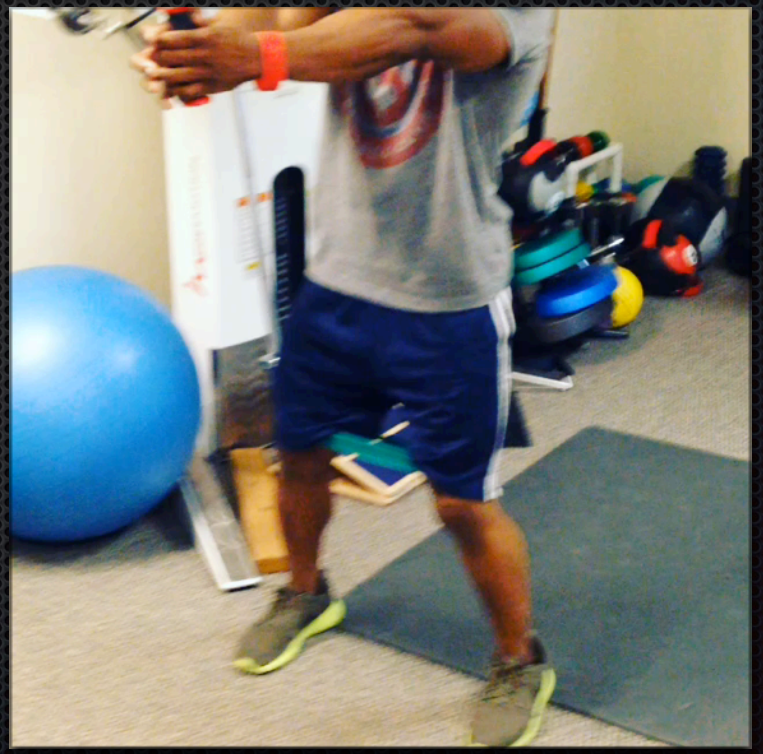


Sagittal

Transverse

Frontal

Multi-Planar Pallof Press



Transverse






Anti-Lateral Flexion

Frontal

Pulley 30 Degree Hold

Frontal

Static KB Hold

Note: This needs to be done with a weight heavy enough to feel the contralateral core

Anti-Lateral Flexion

Static with External Load

- KETTLE BELL STATIC HOLD (contralateral) (frontal plane)
- 30 DEGREE STATIC HOLD WITH PULLEY (ipsilateral) (frontal plane)
- PALLOF PRESS (anti-rotation)
  - Lateral Step (Band walk - Frontal)
  - Overhead (Sagital)
  - 1/2 Kneeling (Frontal)
  - 90/90 (Sagital)

Block 3:
Weeks 5/6

Stir the Pot
Inverted Row
KB Suitcase Carry
1/2 Kneeling Chop

Anti-Rotation

Transverse

Stir the Pot

- If you can perfrom forward plank with stability, progress to this exercise
- Tighten your core to stiffen your trunk
- Move the ball side to side & in circles by small movements from your shoulders

Stir the Pot

1. Rest on ball
2. Set feet & lock knees
3. Press up
4. Roll ball out & back
5. Stir the Pot

Transverse

Stir the Pot

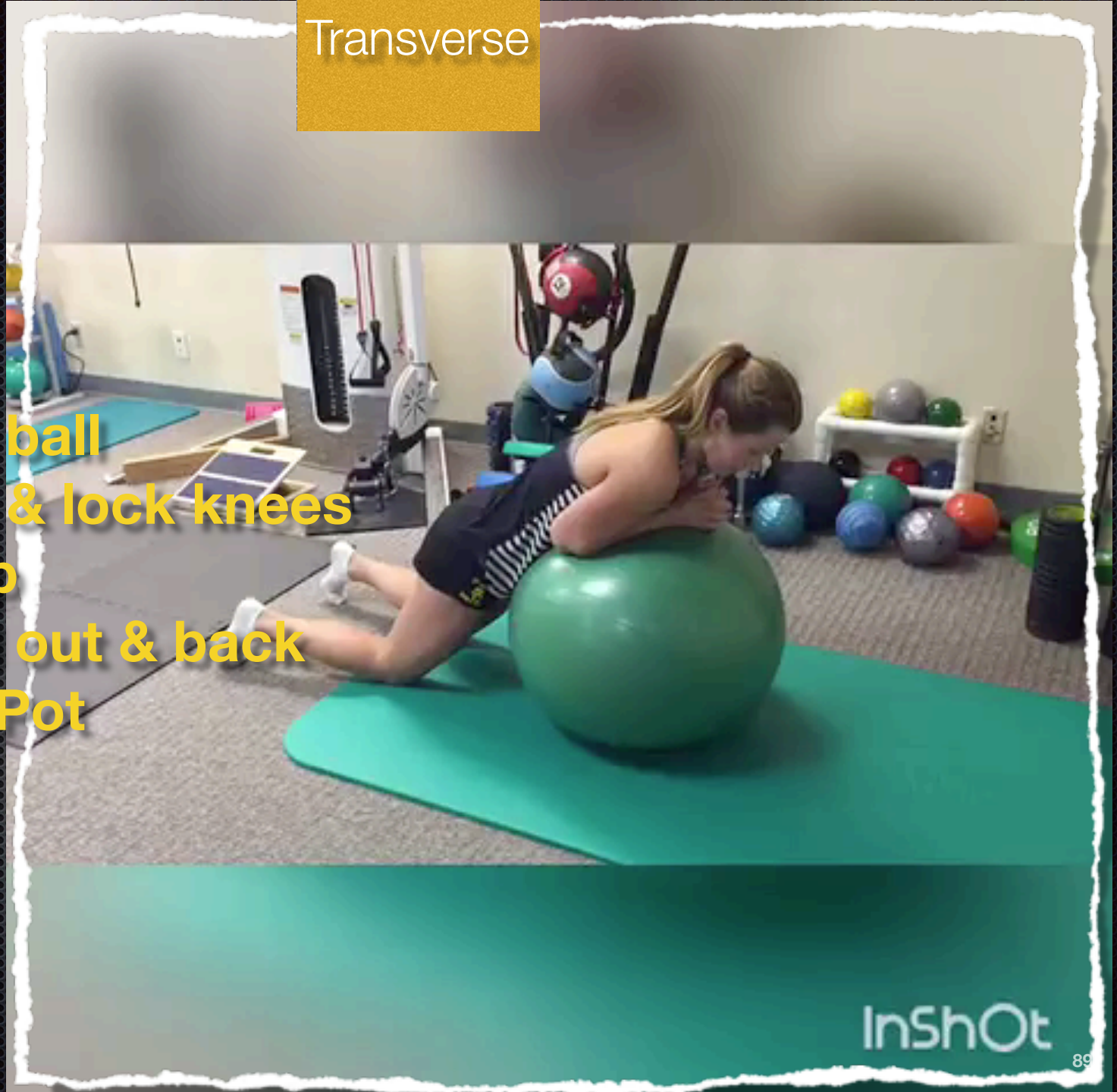
1. Rest on ball

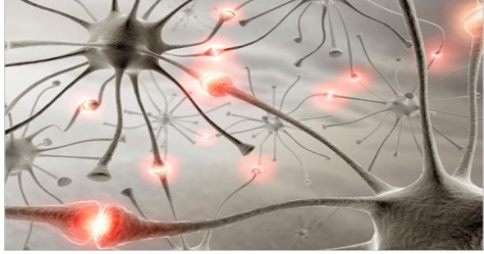
2. Set feet & lock knees

3. Press up

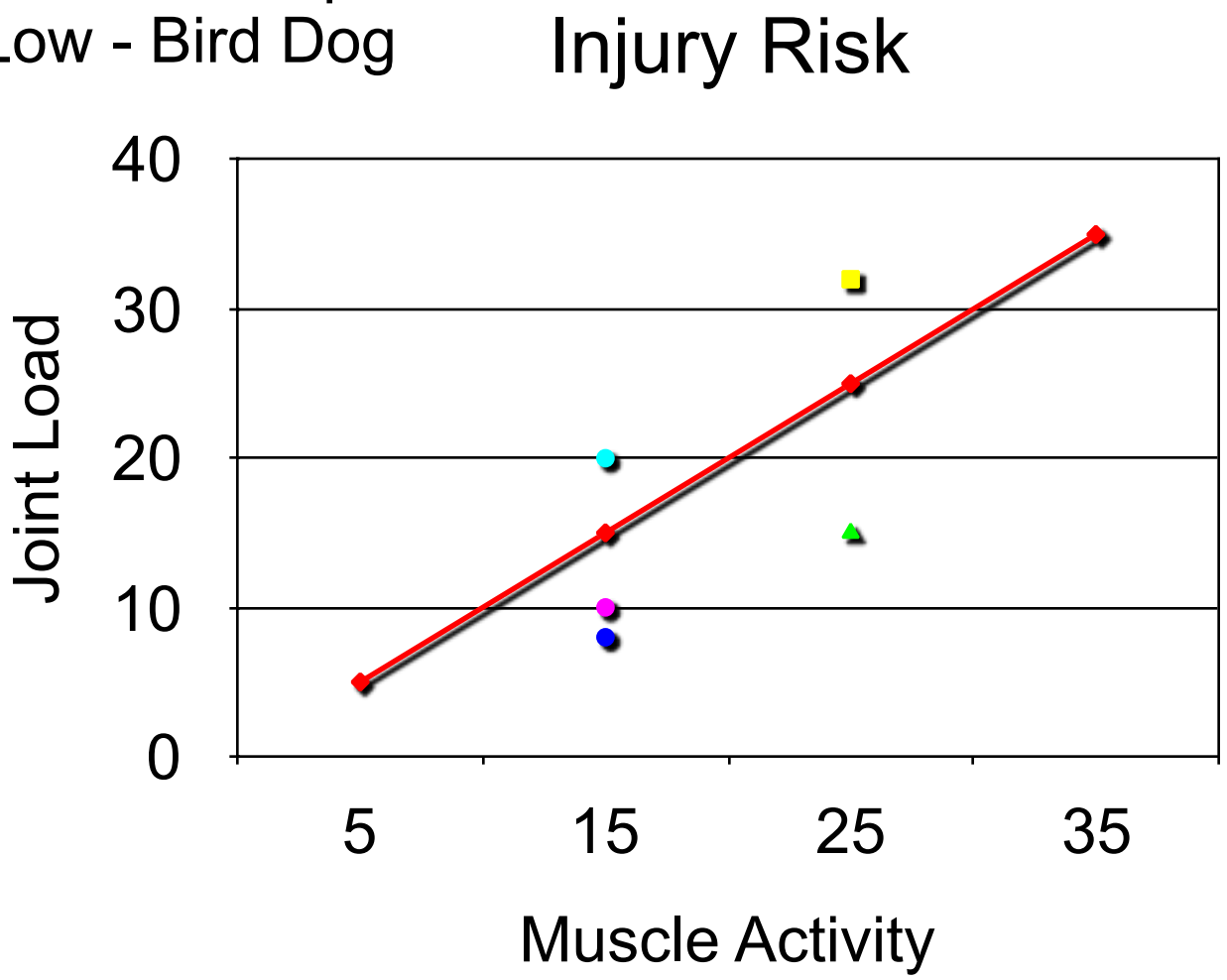
4. Roll ball out & back
5. Stir the Pot

Transverse


1. Rest on ball
2. Set feet & lock knees
3. Press up
4. Roll ball out & back
5. Stir the Pot
InShOt



- Injury Risk
- High - Sit-up on Ball
- Low - Stir the Pot
- High - Sit-up
- Low - Curl-up
- Low - Bird Dog



Sagittal

Anti-Flexion

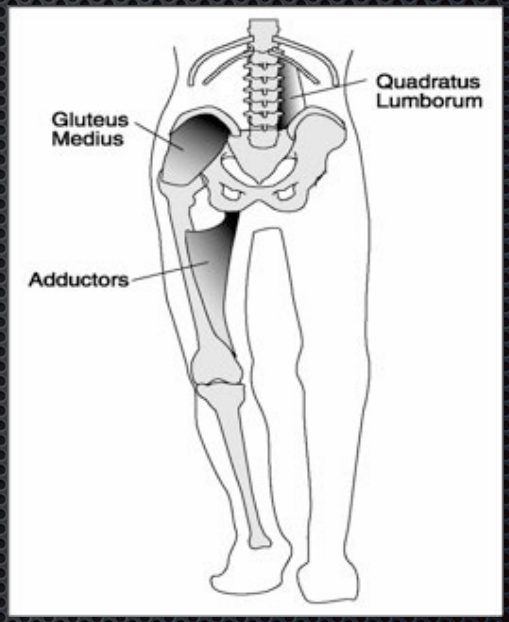
TRX Inverted Row

Anti-Lateral Flexion

Frontal

Kettle Bell Carry

- **Goal:** Activate the core, specifically the obliques & flank muscles (quadratus lumborum)



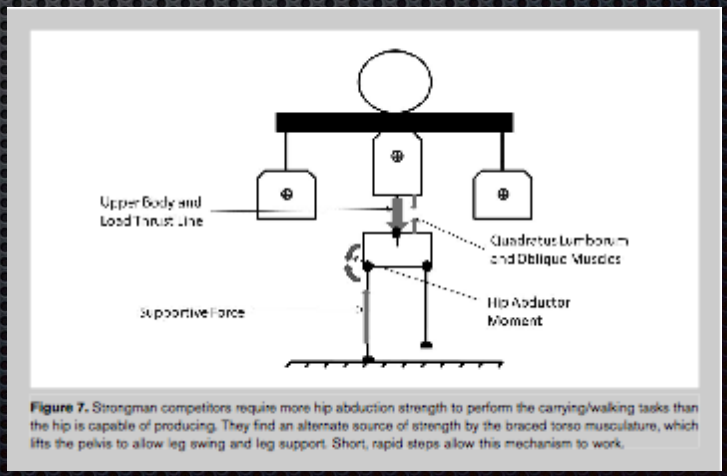


Figure 7. Strongman competitors require more hip abduction strength to perform the carrying/walking tasks than the hip is capable of producing. They find an alternate source of strength by the braced torso musculature, which lifts the pelvis to allow leg swing and leg support. Short, rapid steps allow this mechanism to work.

Anti-Lateral Flexion

Frontal

Anti-Lateral Flexion

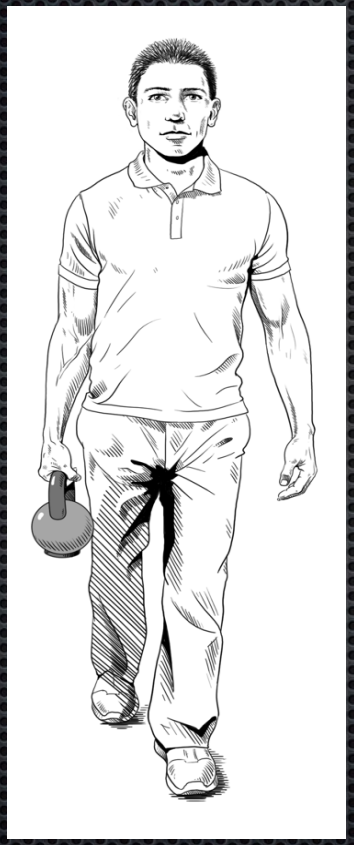
Frontal

Default KB Carry (rack bottoms up)

Anti-Lateral Flexion

Frontal

Regression

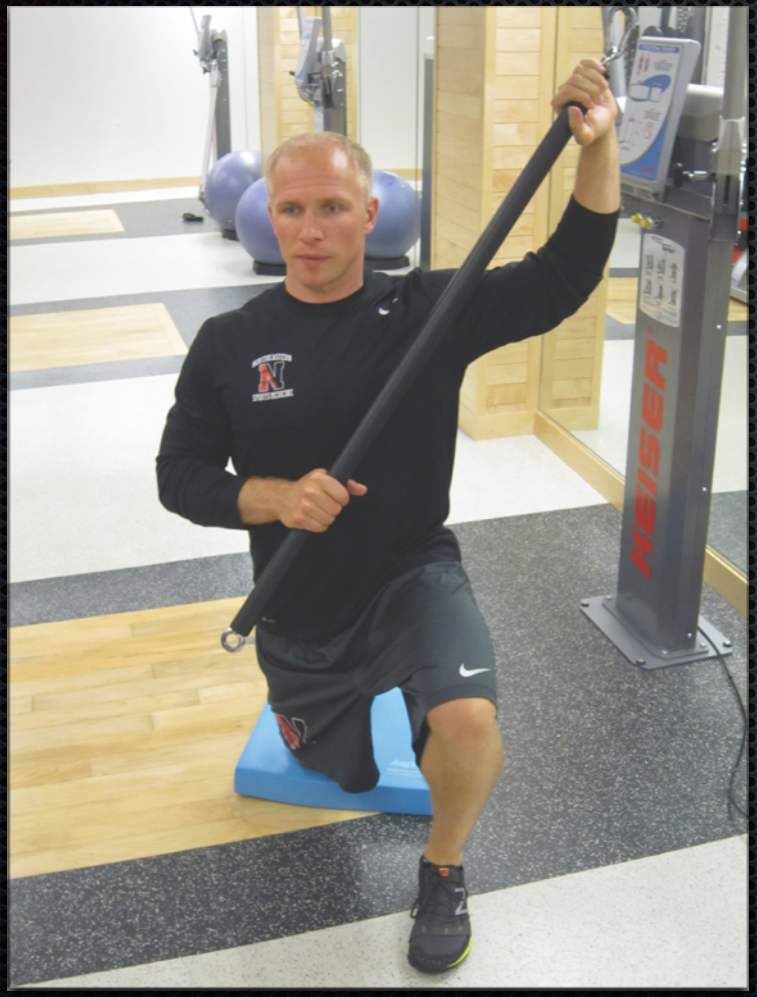


Progression

Anti-Rotation

Transverse

Cable Chop



Anti-Rotation

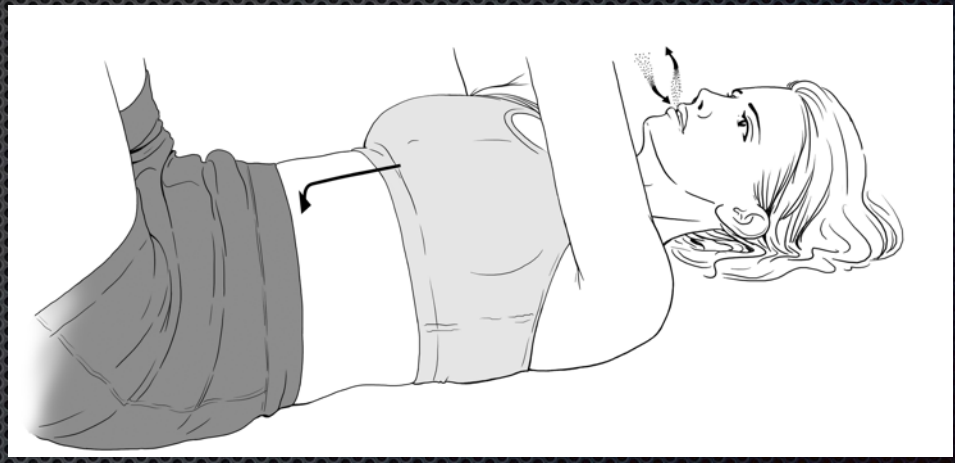
Transverse

Cable Chop

Sagittal

Anti-Flexion

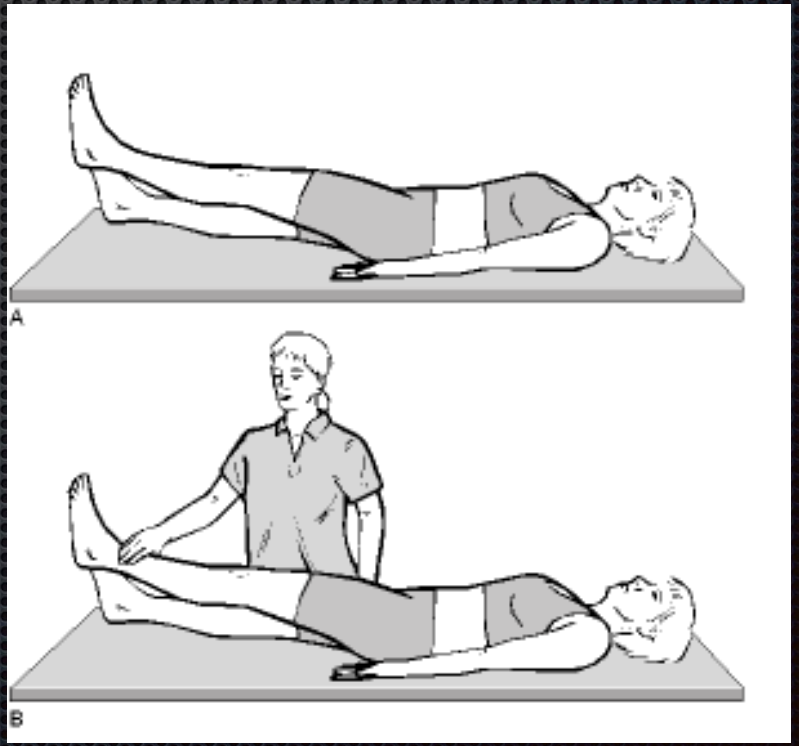
Dying Bugs – p627



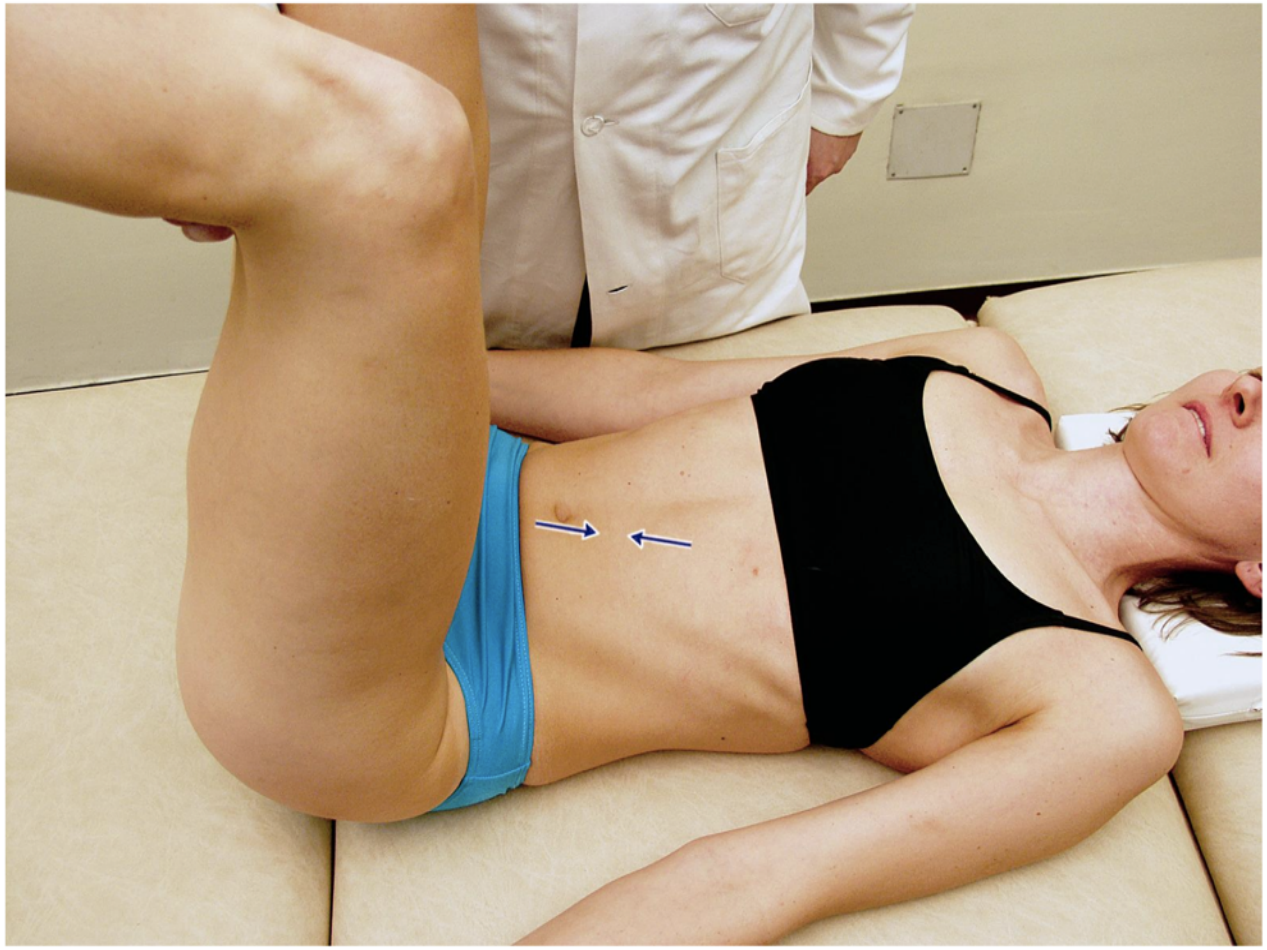
Vleeming's Active SLR "The Core Screen"

Test

- Supine have patient perform SLR 20 cm up & note if there is:
  - Pain
  - Significant trunk rotation
- If the test is negative add resistance/ √ strength _/5



Kolar's Intra-abdominal Pressure Test (p555)



Sagittal

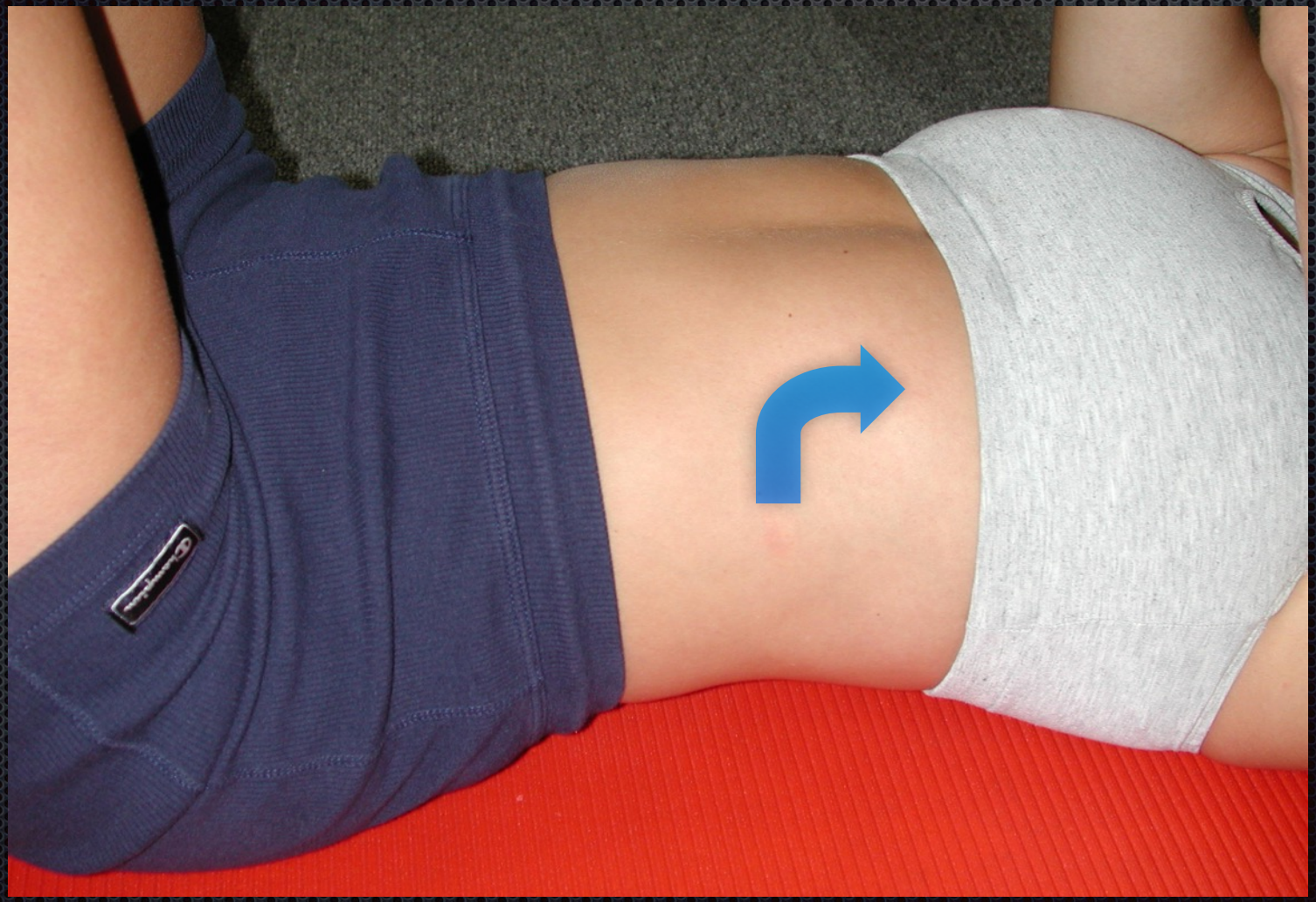
Anti-Flexion

Dying-Bug Technique – p627

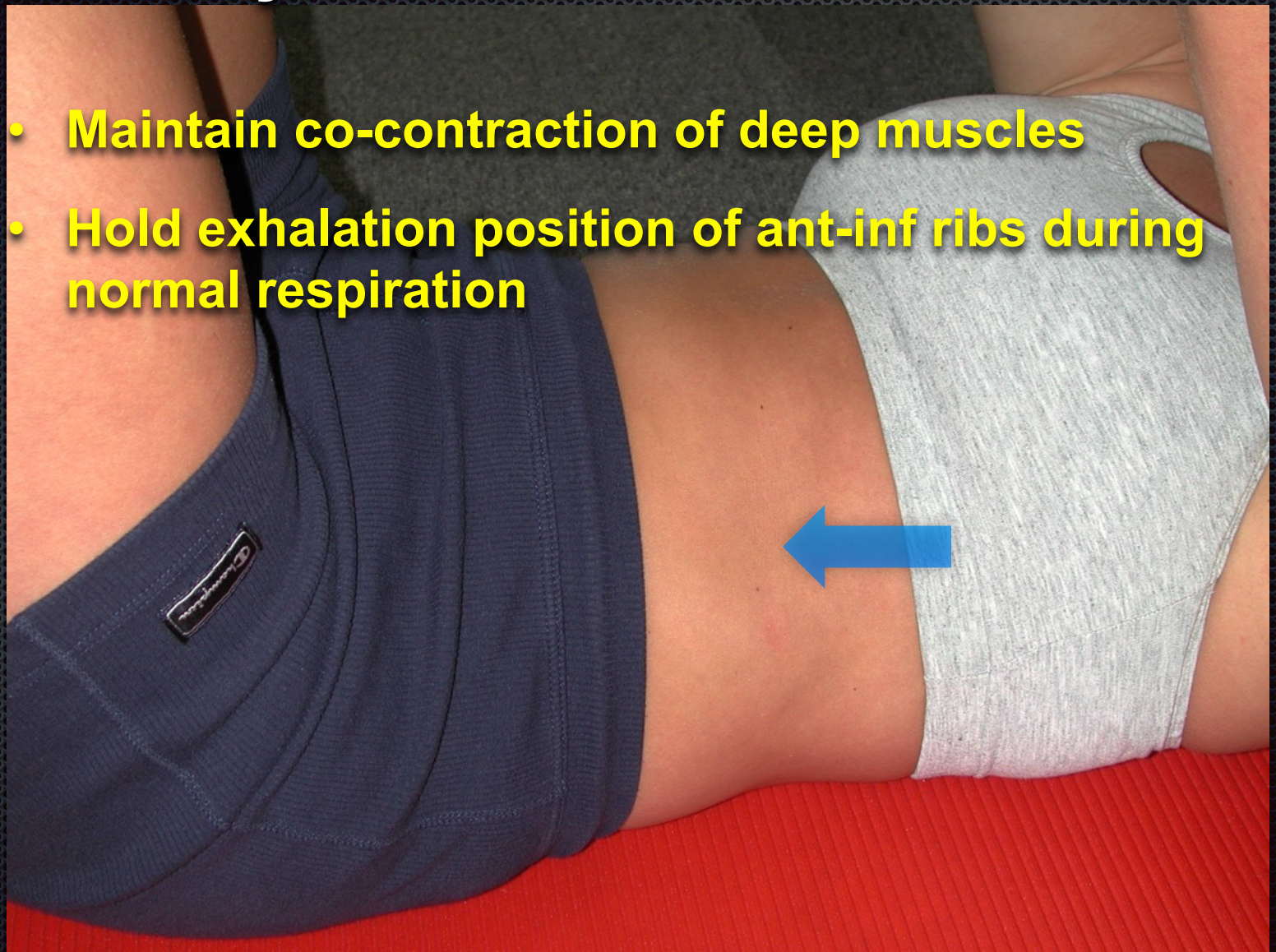
- Brace the core
- Keep ribs stabilized inferiorly in an exhalation position
- Raise legs up to 90/90 position
- Raise arms up to serratus punch (protracted) position
- Move at opposite hip & shoulder joints only while keeping core stable & breathing normally

Training L/S hyperextension w/ poor anterior rib stability

Lower crossed syndrome)



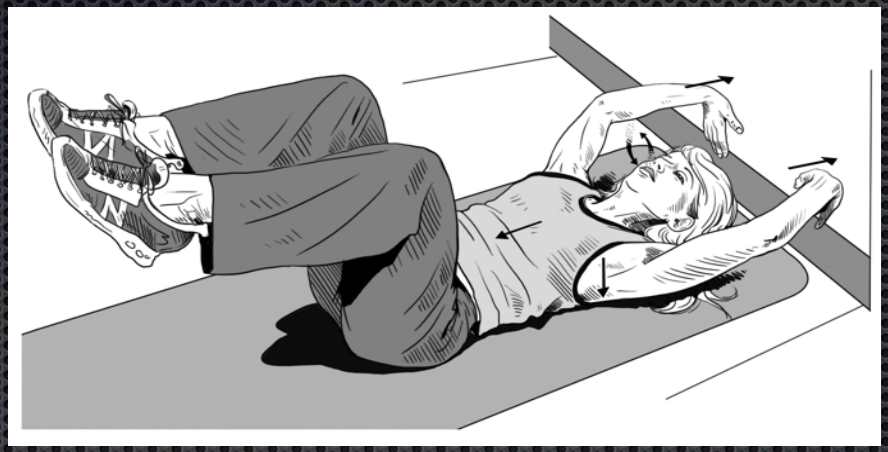
L/S stability w/ good lower rib stability

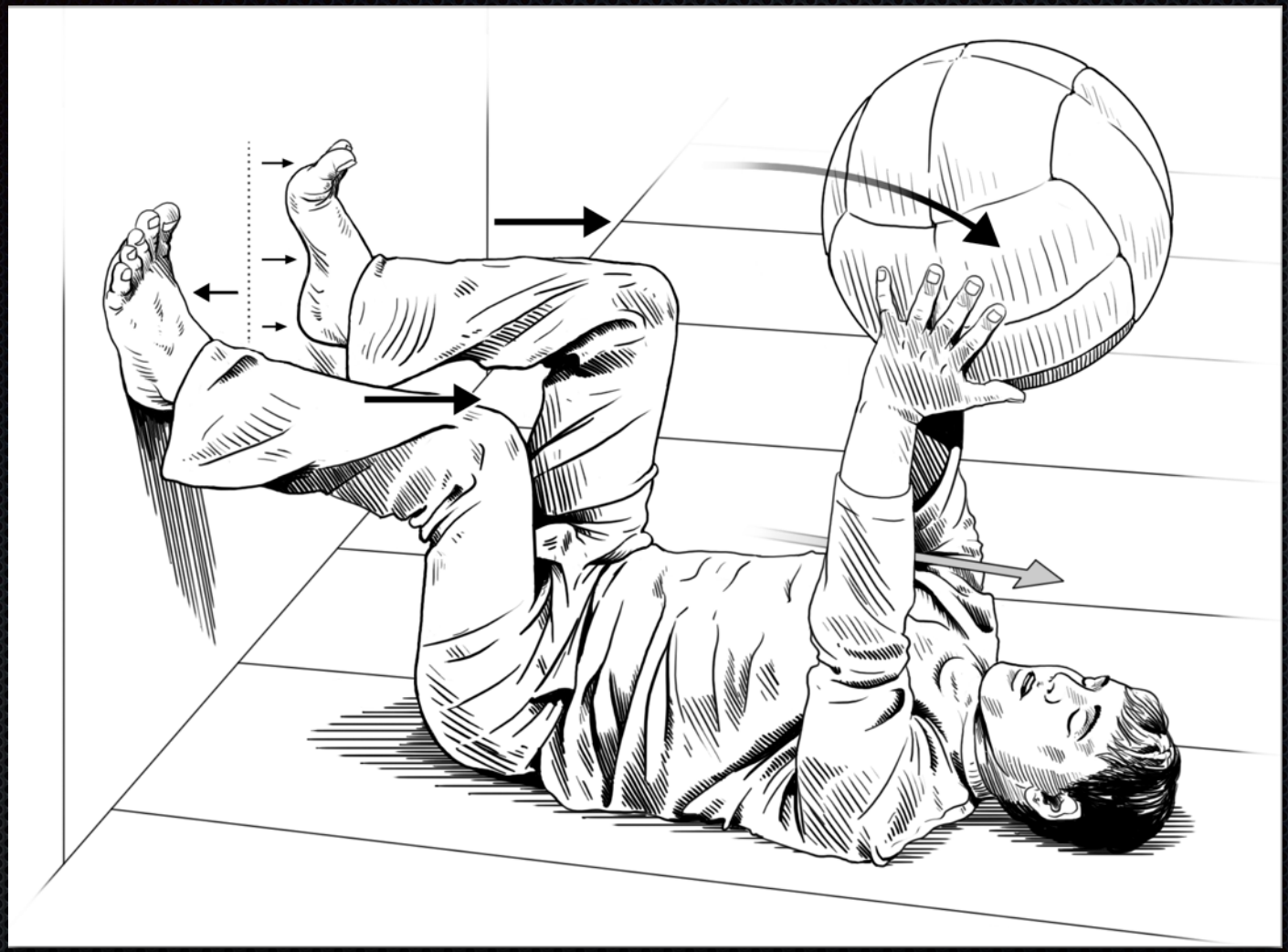


Sagittal

Anti-Flexion

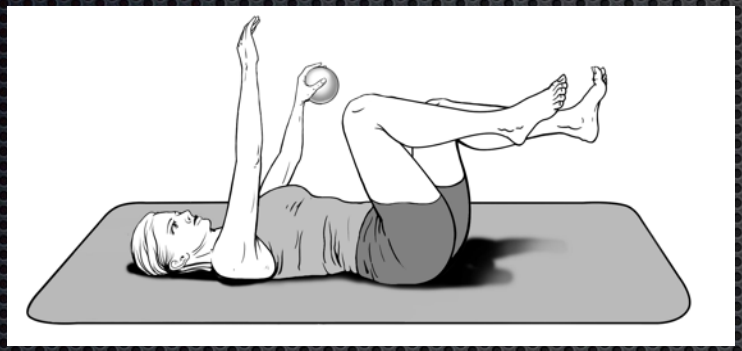
Wall Bug (Kolar)

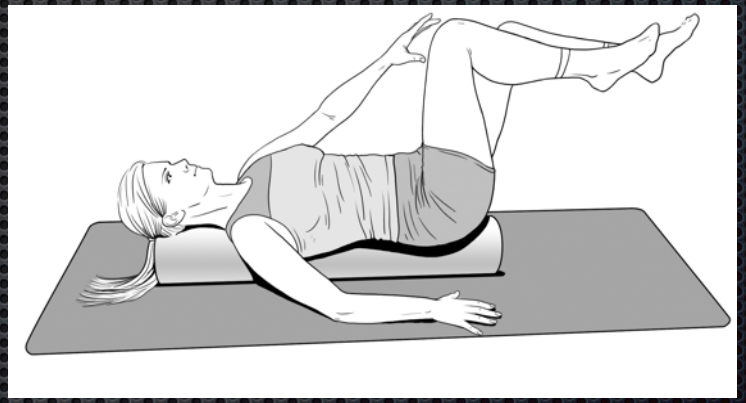




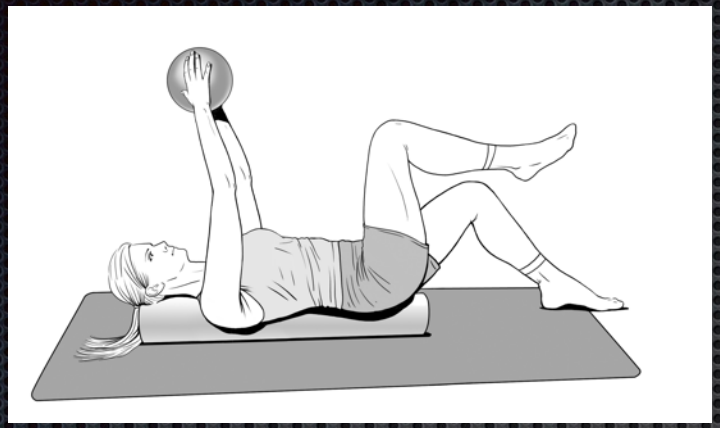
Lift 1 foot at a time while tilting
Med Ball

Variations w/ hand wts or foam roll

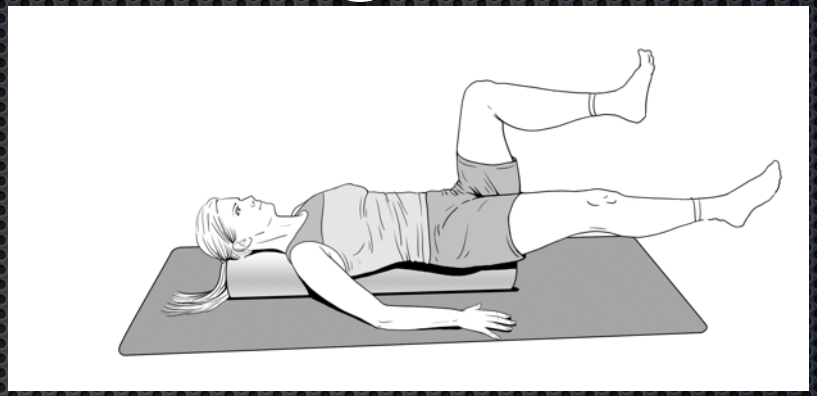




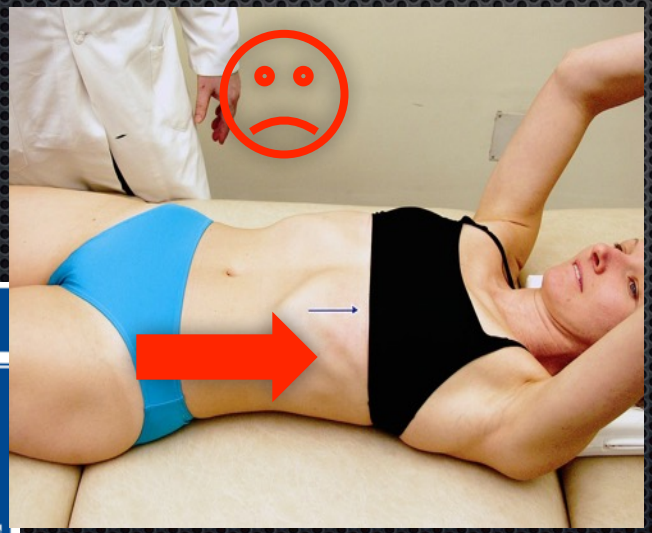
Foam Challenges

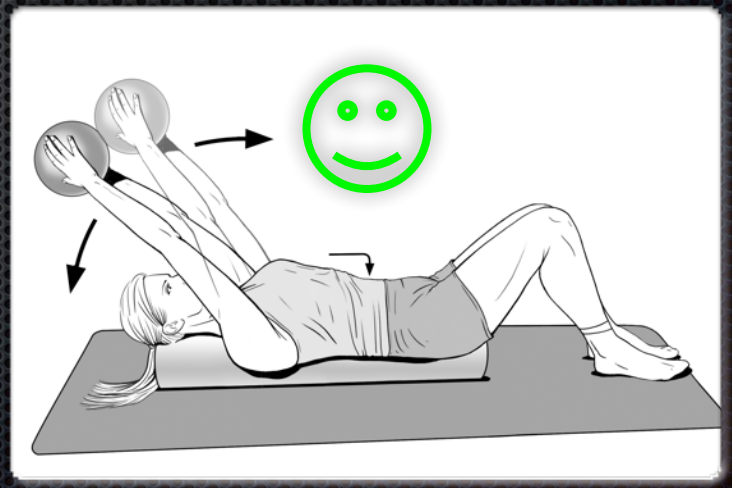


Marching



Bicycle Kicks





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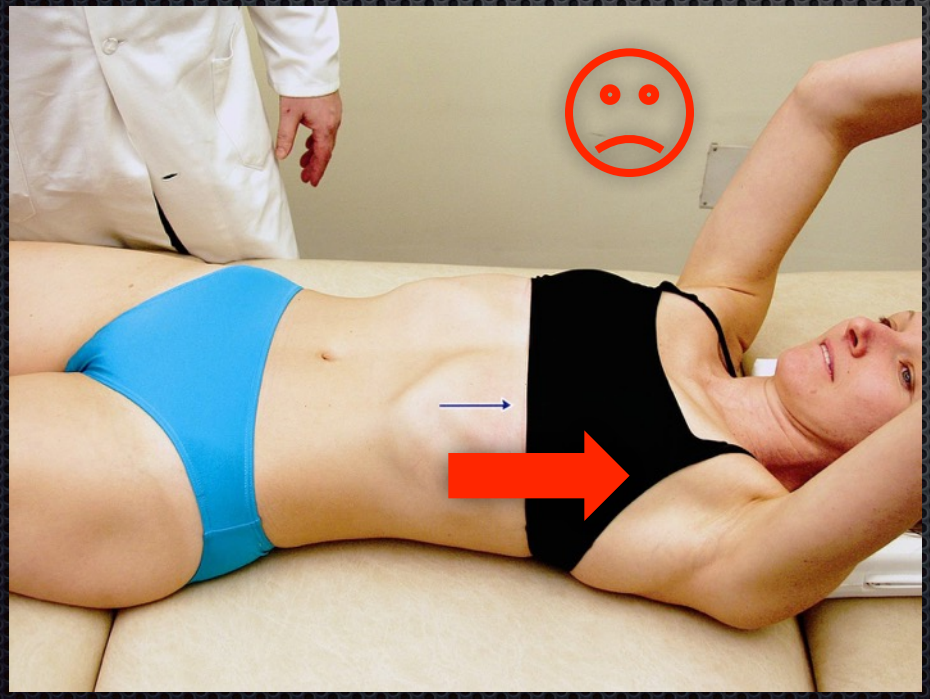
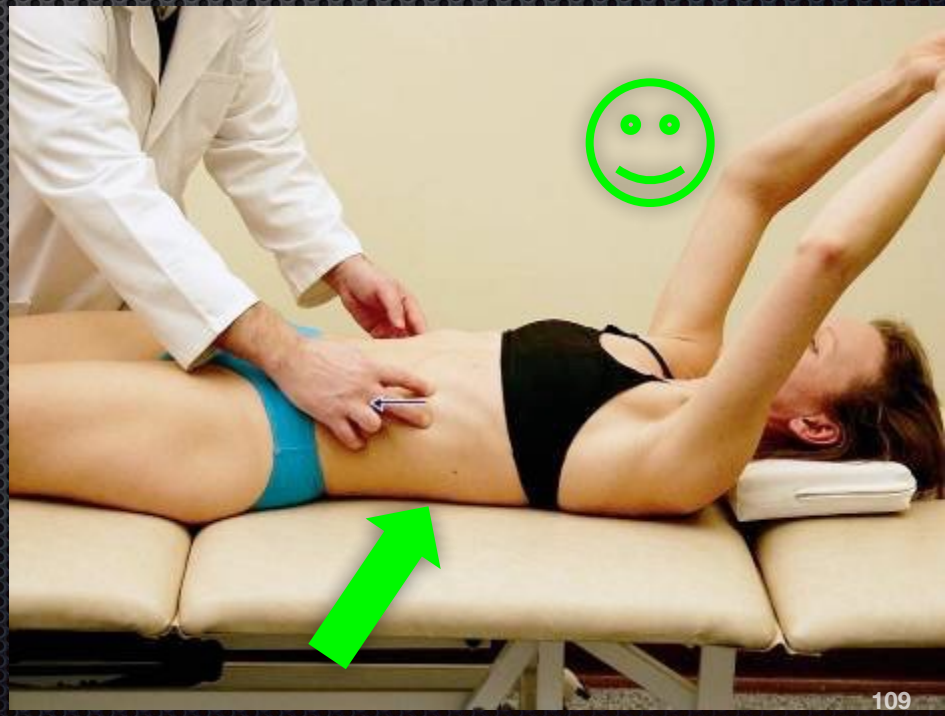
Kolar Arm Lifting Test - p557,558

Initial position

- Patient supine, or standing errects
- He/she lifts both arms slowly



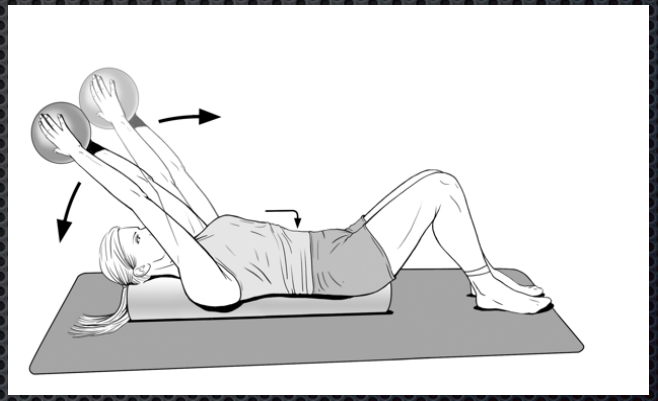


Sagittal

Anti-Flexion

Overhead Arm Reach

- Overhead Reach



Could you use the Wall Bug?

What breathing pattern would you expect w/ dysfunction here?

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Sagittal Plane Capacity:
FRONT PLANKS WITH SAW (2/1)

Anti-Rotation

Transverse

Plank Rolls

Start in Front Plank

a) Release arm

b) Roll Torso

Transverse

Transverse

Anti-Rotation

1 ARM BENCH PRESS

Transverse

Anti-Rotation

1 ARM ROW

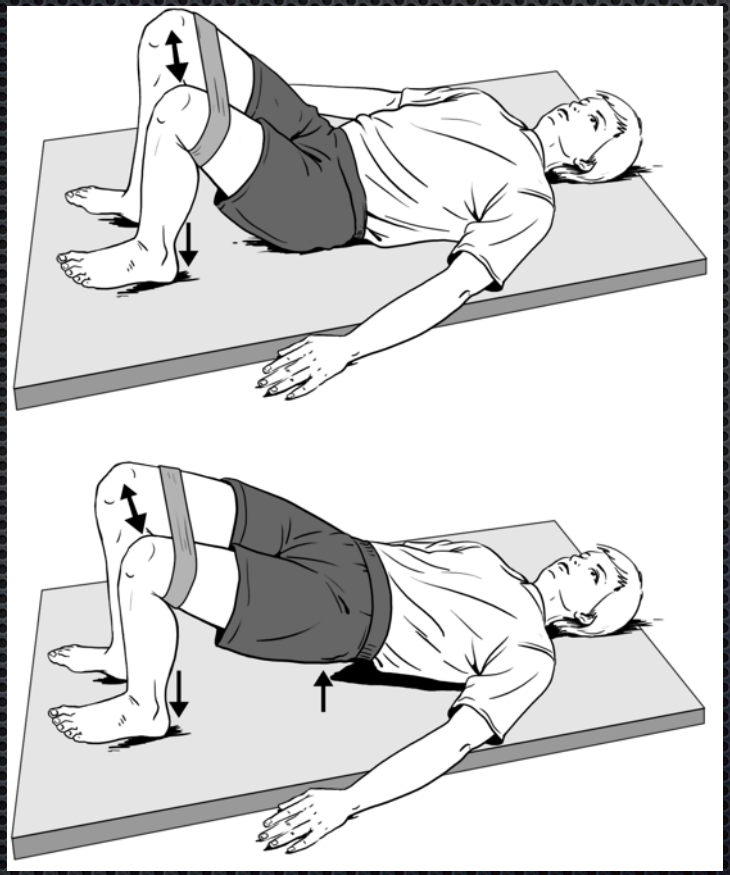
- Knee and hand supporting on bench
- Big chest and arched low back
- Bring weight up to the side keeping the elbow close to body
- Avoid shrugging shoulder
- Keep chin tucked in

Anti-Rotation

Transverse

Bridges

What does the band do?

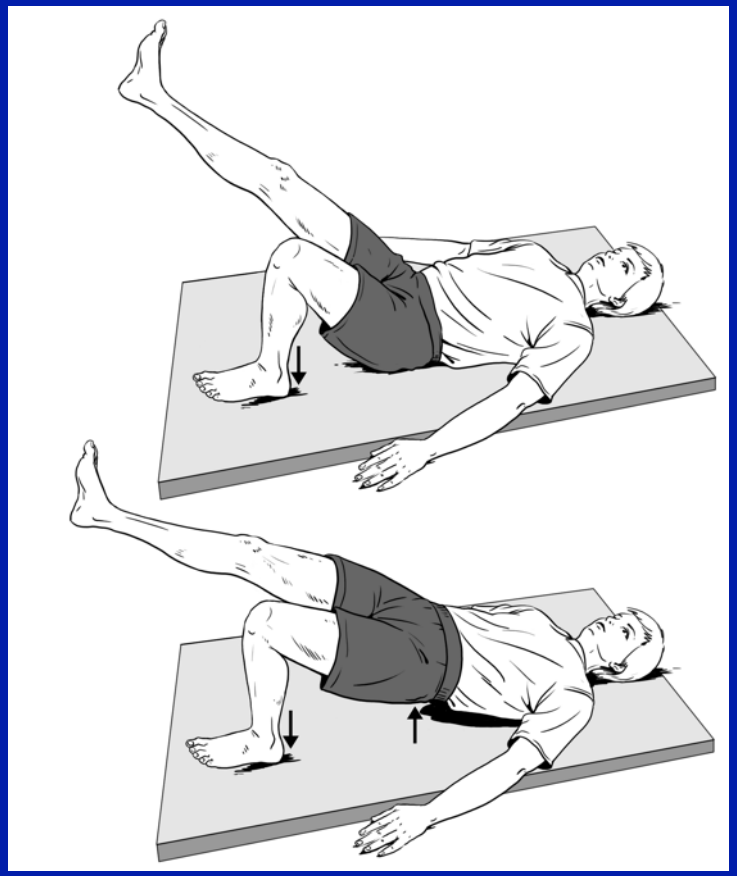


Anti-Rotation

1 Leg Bridge – p631

Transverse

- Bridge Up
- Alternate Kicks & Hold
- Then, perform 1 leg bridge up/down



Mag 7

Scoring

- 0 - Pain
- 1 - Can't perform movement
  - Any pelvic twist or drop
- 2 - Performs movement w/ compensation
  - can't raise hips to neutral position
  - thighs don't stay parallel
- 3 - Movement performed w/out compensation

Mag 7

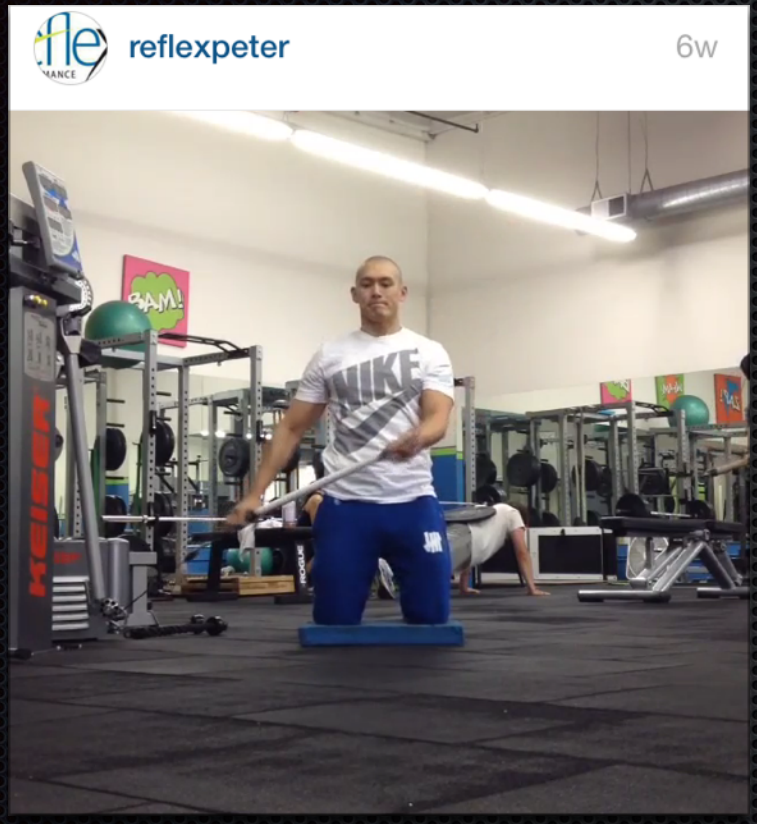
Bird Dog & Anti-Rotation Dysfunction

FMS ALSR Corrective

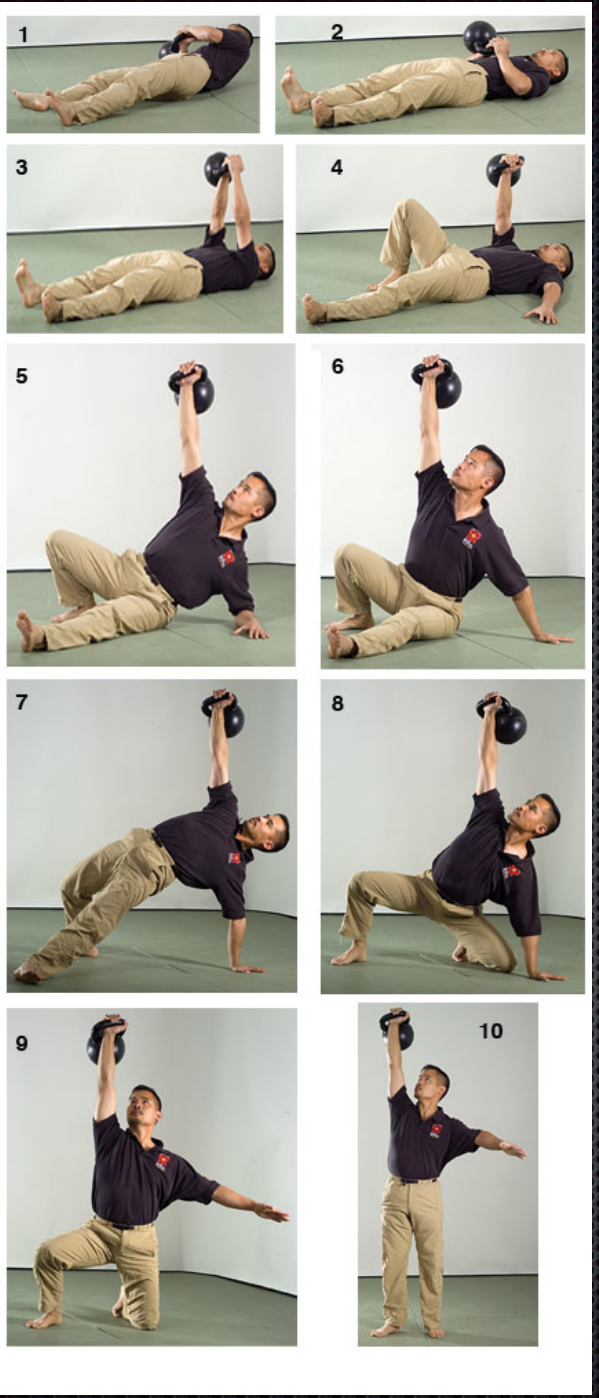
Anti-Rotation

Transverse

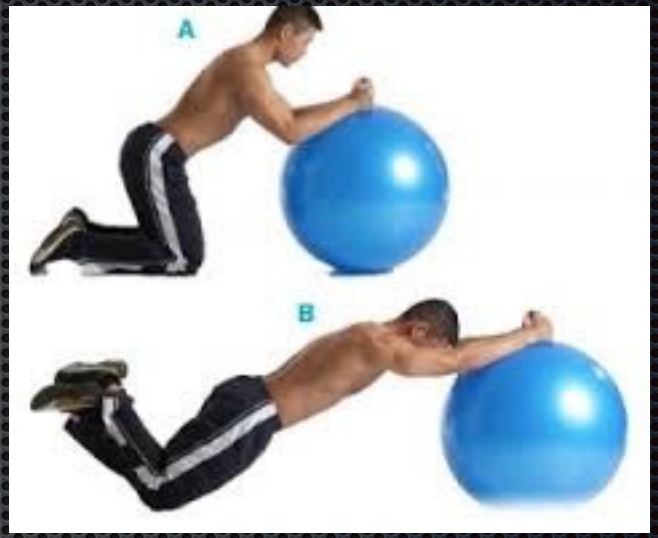
Cable Lift - Tall & 1/2 kneeling



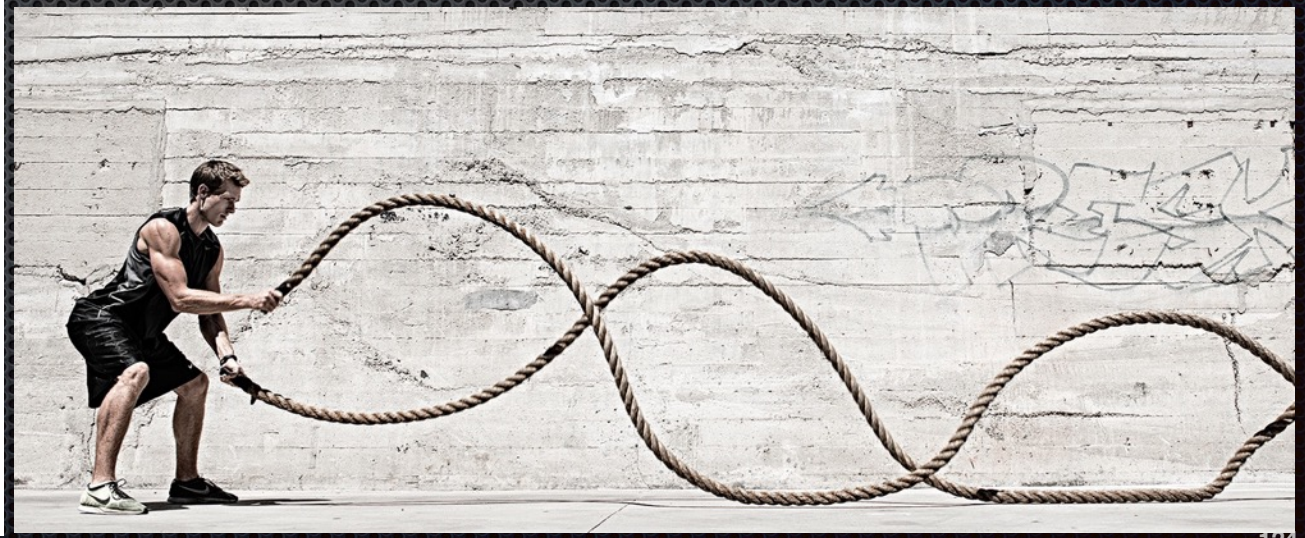
Turkish Get-Up



Stability Ball Roll Out



Battling Ropes



Land Mine
OH Press
&
Reverse Lunges


ROGUE
10


ROGUE
10

PROXIMAL STABILITY WITH DISTAL MOBILITY

TRANSVERSE

- STIR THE POT
- PLANK ROLL
- 1 ARM BENCH/ROW
- GLUTE BRIDGE (2 (sagittal) to 1)

FRONTAL

- 1/2 KNEELING CHOP
- KB CARRY

SAGITTAL

- TRX ROW
- WALL BUG
- Plank Saw (2/1)

PERIODIZED CORE APPENDIX

1. Isotonic Abdominal Training

2. Anti-Flexion Core Stabilization Program

1. Isotonic Abdominal Training

Sagittal

Curl-ups – p630

Sagittal

Curl-up Technique

- Brace the core
- Raise trunk up from middle back without flexing lumbar spine
- Raise & lower trunk as a plank
- Maintain normal respiration

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2. Anti-Flexion Core Stabilization Program

Strength Circuit as an Evaluation Tool

Exercise / Position	Dysfunction	Solution
Hang/Good Morning & Bent Over Row	Lose Thoracic spine (T) posture or Kyphotic posture = restricted T spine motion	Strengthen T Spine prone & disassociation

Start with Abds & Glute Contracted

Abds & Glute stay Contracted to Maintain Posterior Pelvic Tilt

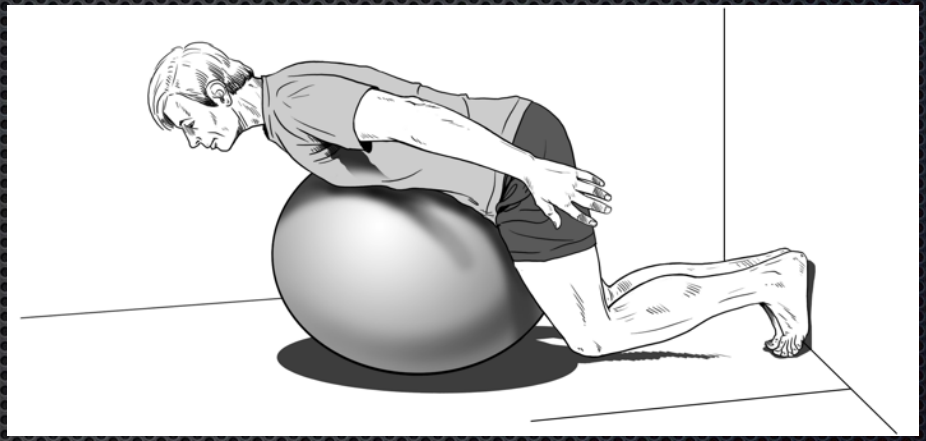
Sagittal

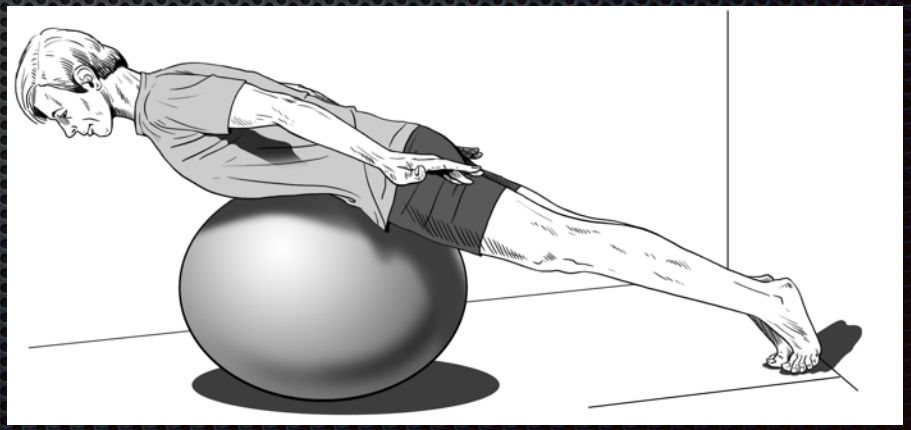
Jerzy & Anelia Gregorek Variations on Prone

Sagittal

Superman - p635

- Push off the wall
- Balance on the ball & your toes
- Palms down
- Chin in





Sagittal

Anti-Flexion Dead Lift

Sagittal

Anti-Flexion

Bent Over Row

Good Morning

Sagittal

Anti-Flexion (McGill/Vermeil)

Good Morning (Eccentric control of flexion)

Sagittal

Press in Snatch

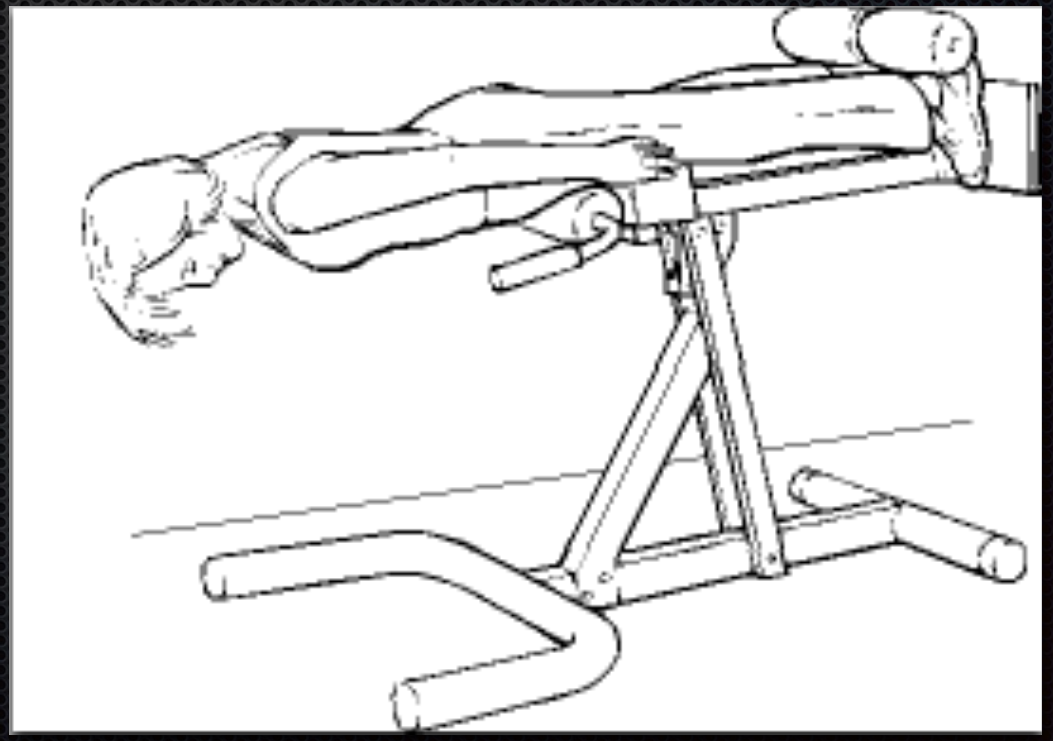
Sagittal

Press in Snatch

Sagittal

Back Extensor Training – p635

- Trunk extensors are normally in a 1.3:1 ratio with Trunk flexors
  - In LBP subjects the ratio is 1:1



Isometric Core Exercise Progressions

SAGITTAL

- BIRD DOG on forearms
- FRONT PLANK (2 to 1)
- PALLOF PRESS - Overhead (Anterior)
- TRX ROW
- WALL BUG (LEWIT)
- Plank Saw (2/1)
- QUAD RNT
- PELVIC FLOOR

FRONTAL

- SIDE BRIDGE
- SIDE PLANK
- KETTLE BELL STATIC HOLD
- 30 DEGREE STATIC HOLD WITH PULLEY
- PALLOF PRESS - INLINE 1/2 KNEELING
- Lateral Step (Band walk - Frontal)
- KB CARRY

TRANSVERSE

- BIRD DOG
- STABILITY BUTTRESS
- FORWARD LEAN
- PALLOF PRESS
- STIR THE POT
- 1/2 KNEELING CHOP
- PLANK ROLL
- BARREL ROLL
- 1 ARM BENCH/ROW
- GLUTE BRIDGE (1)

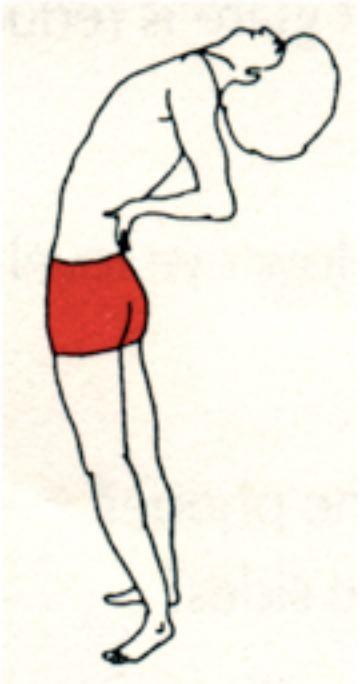
B) Treatment Based Classification - P799

- Directional Preference - McKenzie (Flexion-Intolerant Back Problem)
- Manipulation
- Stabilization

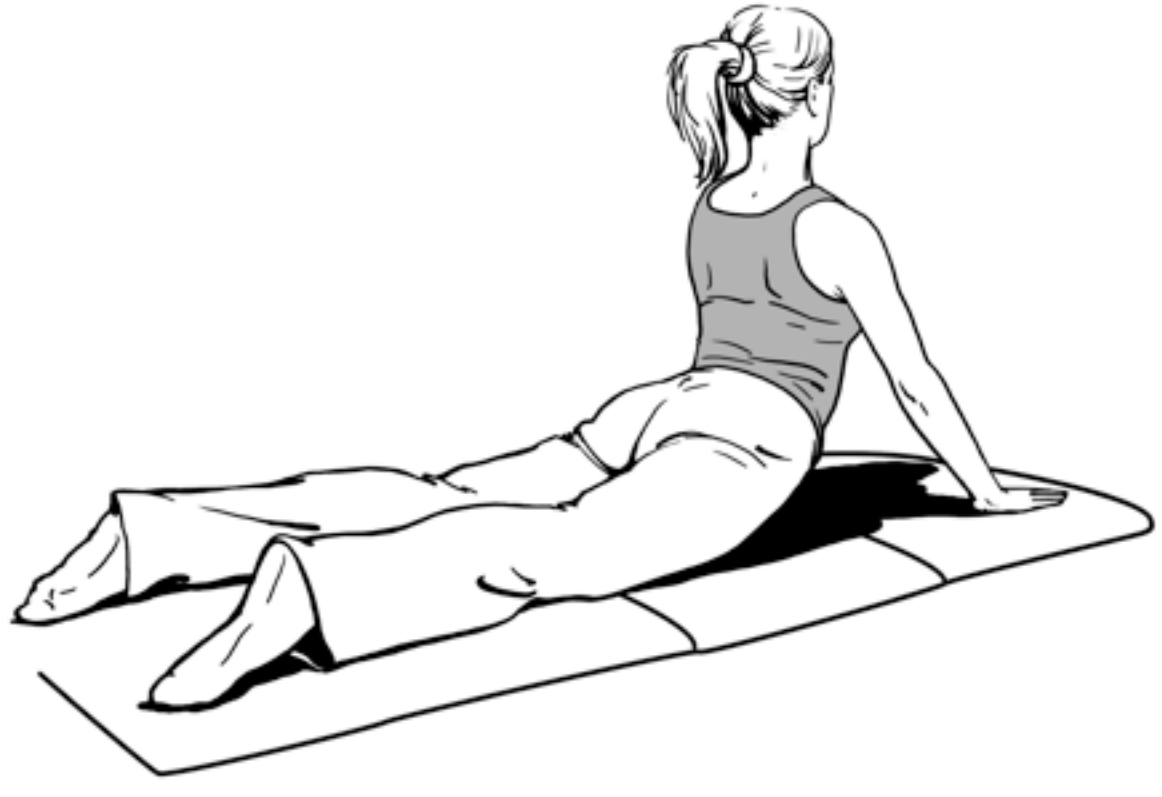
- **Disc Problem**
- **Acute, Non-Radicular**
- **Recurrent/ Chronic**

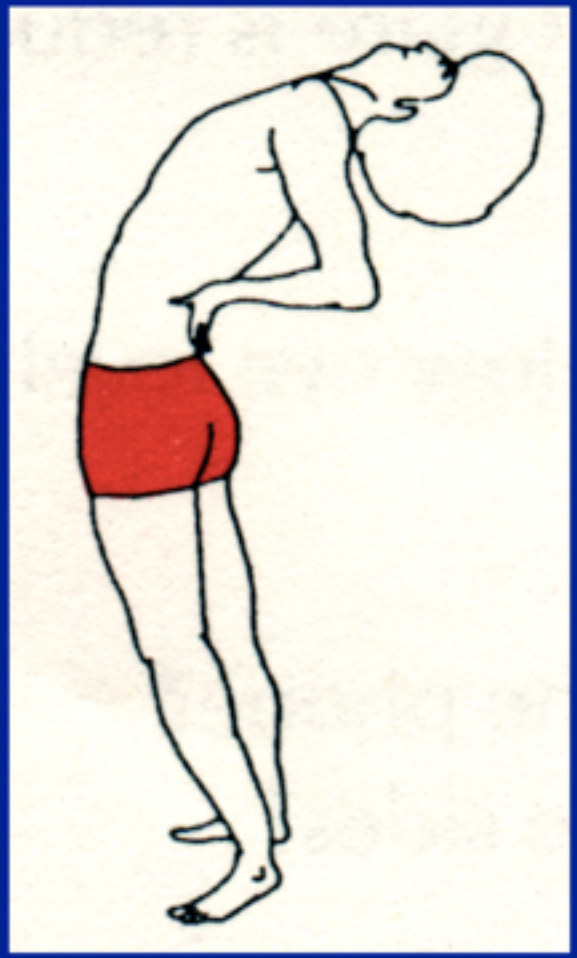
1. Directional Preference Classification

- Centralization w/ motion testing (i.e.flexion or extension)
- Peripheralization in opposite direction as centralization
- Strong preference for sitting or walking
- *Fritz, Brennan*



McKenzie Extension - Ch 15






TOOL

1. Range of Motion - ROM

- Hyper or hypomobile
- Find movements or positions which reproduce, increase, or peripheralize pt's characteristic symptoms
- Example L-spine

ISCRS
INTERNATIONAL SOCIETY OF CLINICAL REHABILITATION SPECIALISTS

Scoring

- 0 - pain
- 1 - can’t perform movement - >50% loss of ROM
- 2 - performs movement w/ compensation
  - <50% loss of ROM
  - Hypermobile
  - Segmental dysfunction (ie. Side-bending w/out convexity)
- 3 - movement performed w/out compensation

Functional Problem Solving

- DISC PATIENTS, CHRONIC BACK PAIN, ETC
- Patient Classification
  - Directional Preference
  - Stabilization
  - Mobilization

2. Manipulation Classification

- **Recent onset** of pain <16 days
- No pain distal to the knee
- Low fear avoidance beliefs score
- Segmental **hypomobility**

- Proper classification improves the probability of improvement from 45% to 95%.

Flynn T, Fritz, J, et al. A Spine 2002.

84% chance of improving by the 4th manipulation session if -

- Decreased pain immediately after visit one
- Decreased pain reported at visit two
- Decreased disability reported at visit two
- Common reaction (local pain or fatigue lasting 24 hours) or no reaction to first treatment

- All of the criteria had to be present.

Axen

NOTE:
Disabiity/Trigger Reduction must be the goal
Clinical Audit post-tx must show painful movements reduced immediately

Only a 30% chance of being recovered by the 4th visit if -

- No immediate improvement immediately after visit one
- No decreased pain at visit two
- No decreased disability reported at visit two
- An uncommon reaction (local pain or fatigue lasting more than 24 hours; new radiating pain, other reactions) to the first treatment
- All of the criteria had to be present.

Axen

NOTE:
CMT is always a trial, not a prescription of long-term care

3. Stabilization Classification

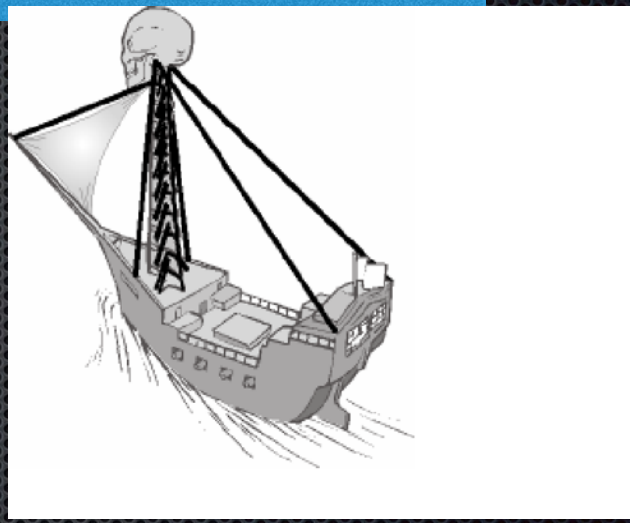
- Avg. SLR > 91°
- Positive prone instability test
- Aberrant motions present (e.g. instability catch, reversal of L/P rhythm)
- **≥ 3 past episodes** [redacted] ratio) 4.0
  - The LR represents the change in odds favoring success given a positive diagnostic test result.

Hicks GE, Fritz JM, Delitto A, McGill SM. Arch Phys Med Rehabil. 2005.

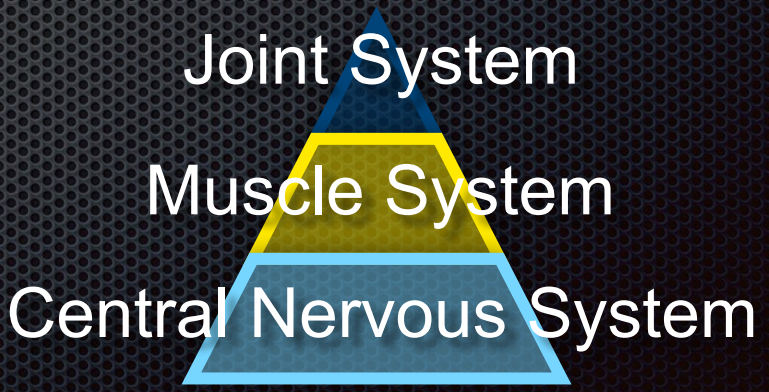
Brennan. Spine, 2006

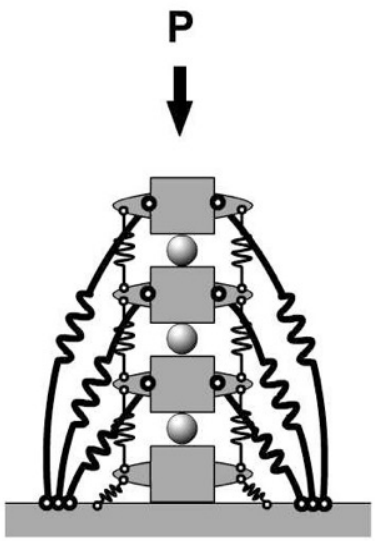
C) Stabilization Principles

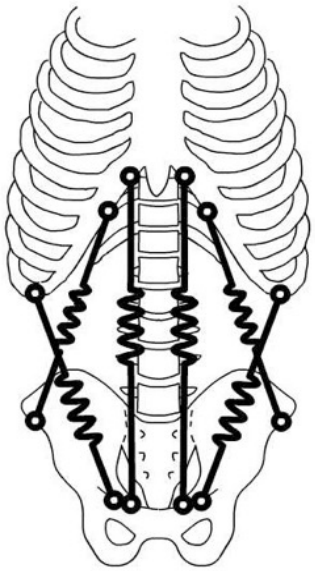
"evidence from tissue-specific injury generally supports the notion of a neutral spine (neutral lordosis) when performing loading tasks to minimize the risk of low back injury."



*McGill SM. In Resource manual for **Guidelines for Exercise Testing and Prescription**. 3rd Edition, Williams and Wilkins, 1998.*







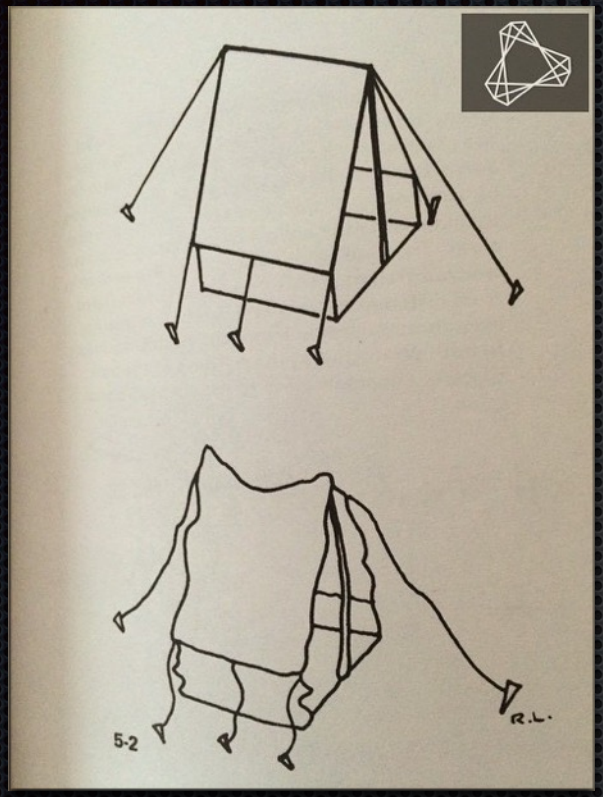
How does the body resist injury?

Antagonist muscle co-activation is necessary for aiding ligaments in maintaining joint stability during loaded tasks

Co-contractions increase spinal stability by 36% - 64%

- **W/out co-contraction the spinal column is unstable in upright postures!**

The Hollowing Myth



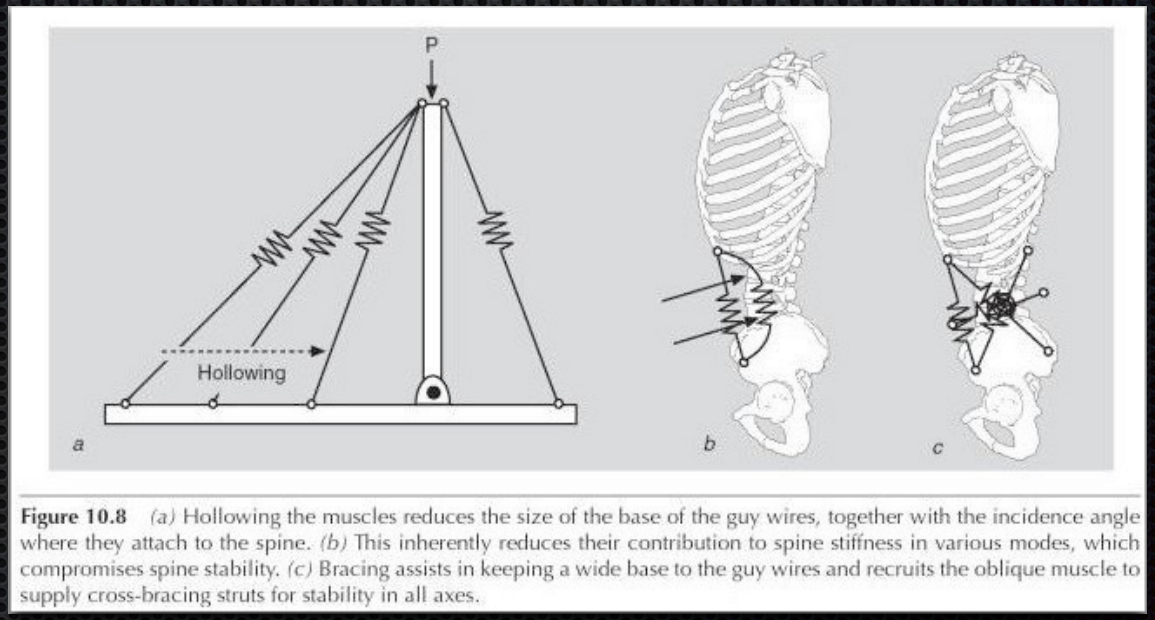
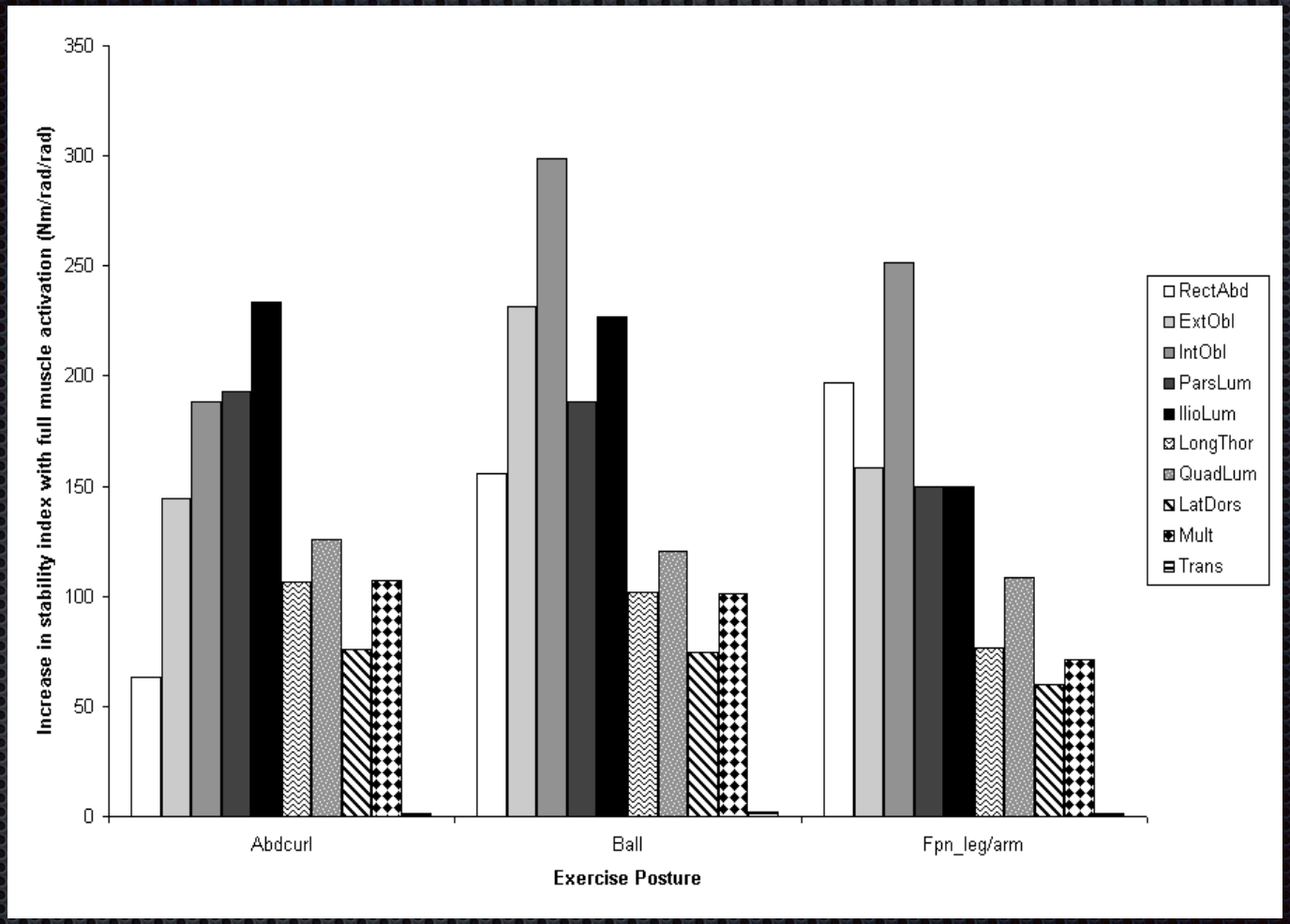


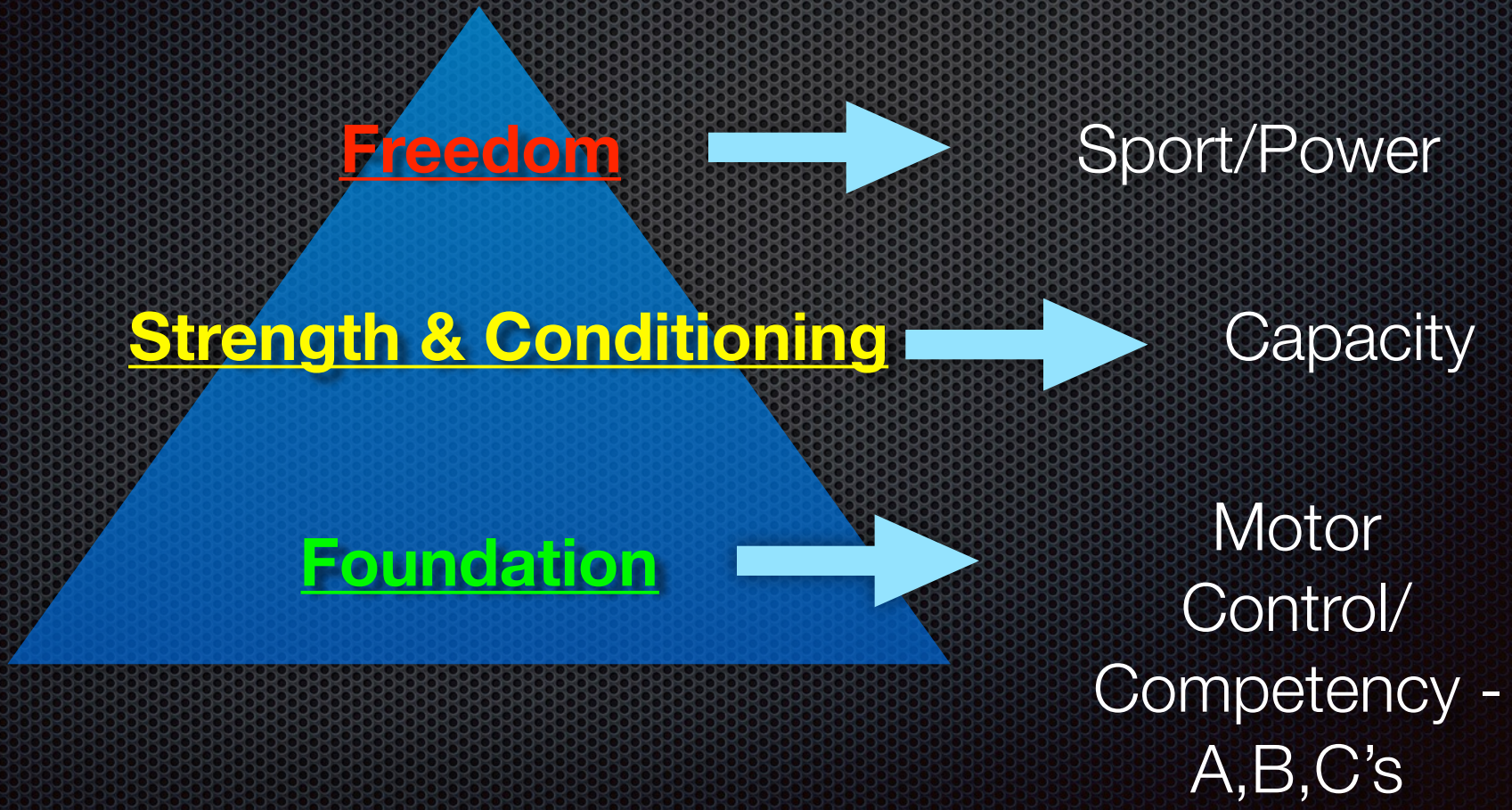
Figure 10.8 *(a)* Hollowing the muscles reduces the size of the base of the guy wires, together with the incidence angle where they attach to the spine. *(b)* This inherently reduces their contribution to spine stiffness in various modes, which compromises spine stability. *(c)* Bracing assists in keeping a wide base to the guy wires and recruits the oblique muscle to supply cross-bracing struts for stability in all axes.

The Orchestra



Kavcic N, Grenier S, McGill SM. Spine 2004, 29:1254-65.

Training Pyramid

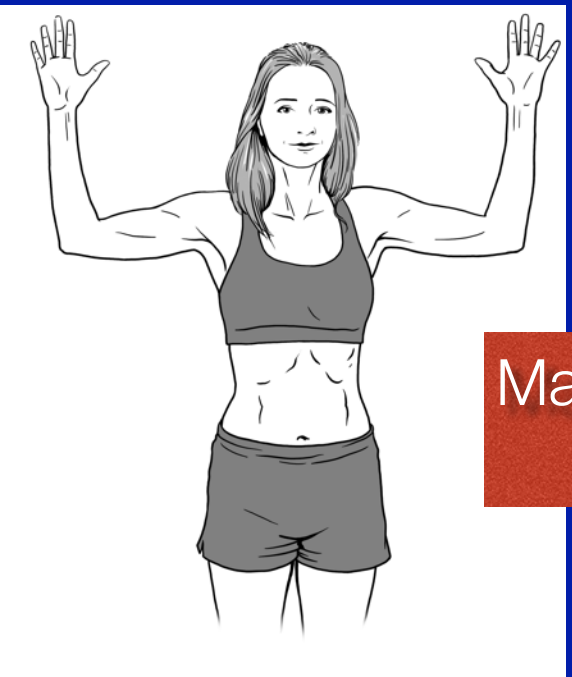


D) Multi (Tri)-Planar Function

- Sagittal
- Frontal
- Transverse

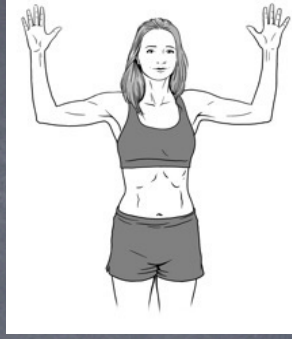
- Training should be **multi-planar.** Athletes stop/start, change directions, twist, etc. Therefore **sagittal, frontal & transverse planes** should all be assessed & trained.

1. Sagittal Plane

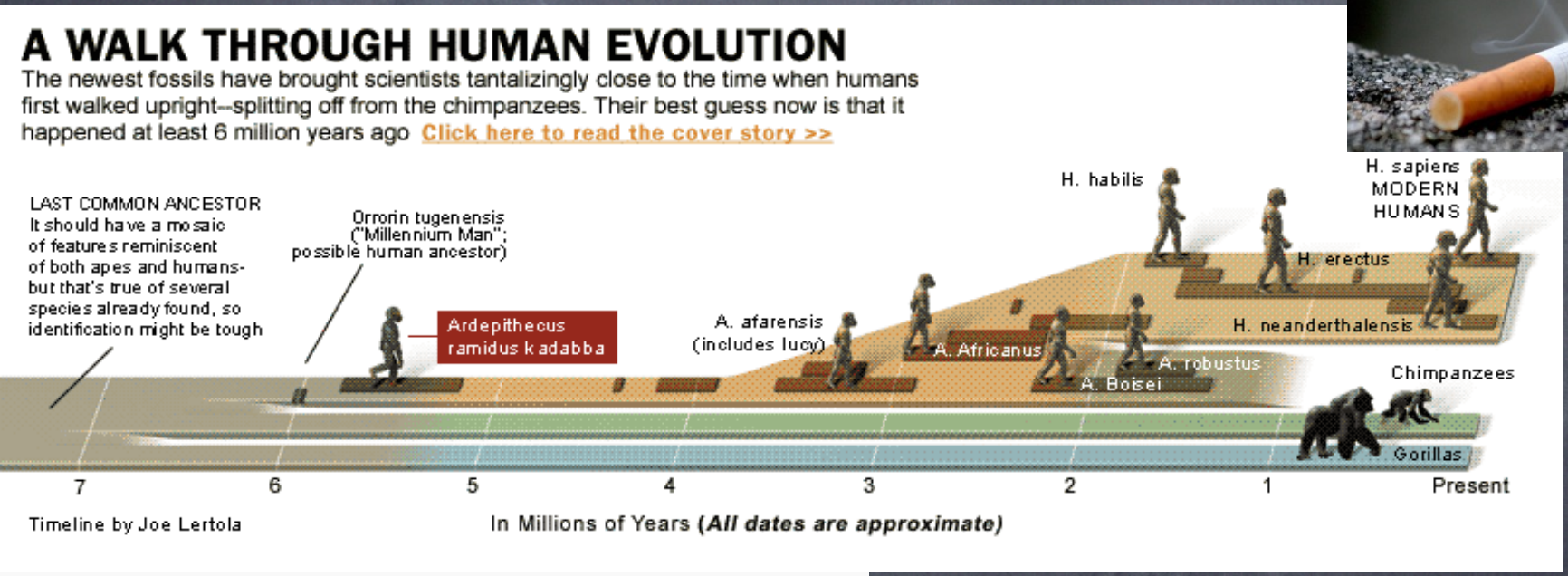


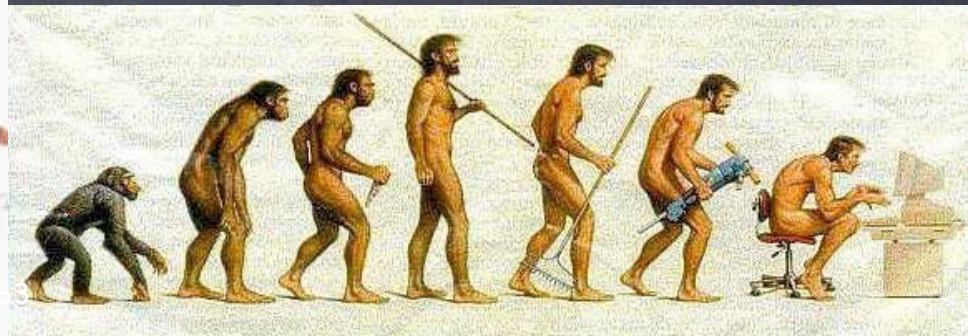
Mag 7

Mag 7

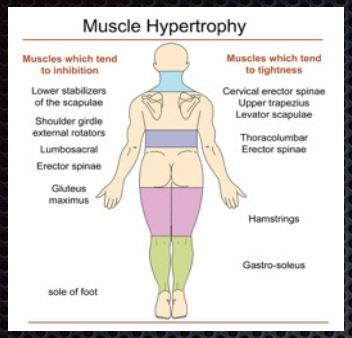


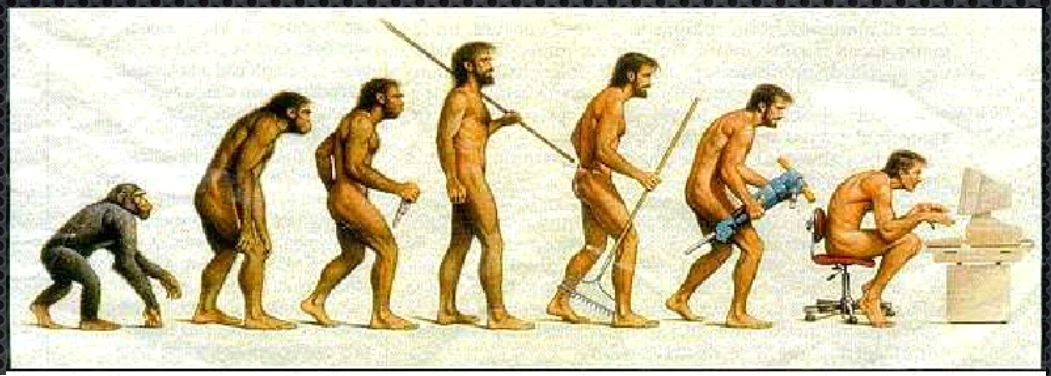
What is the Goal of Human Development?





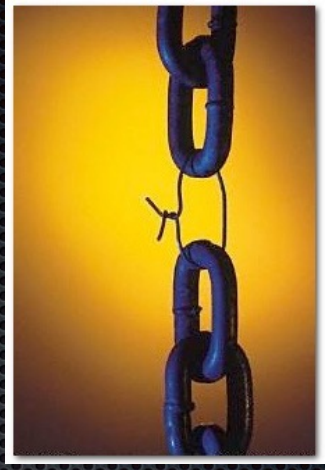
Sagittal Plane Function



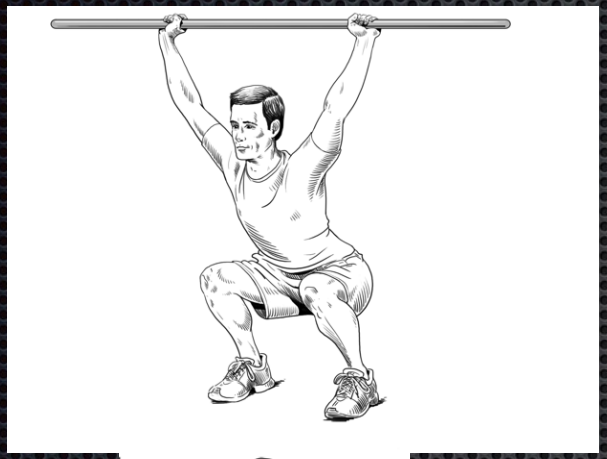


Somewhere, something went terribly wrong

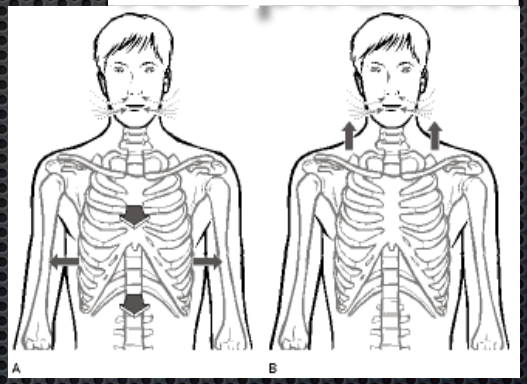
Fundamental "Weak Links"

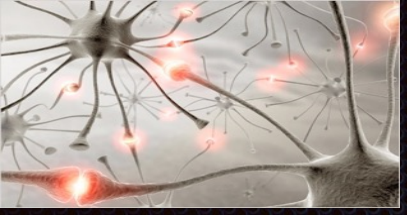


Overhead Squat



Core/ Respiration



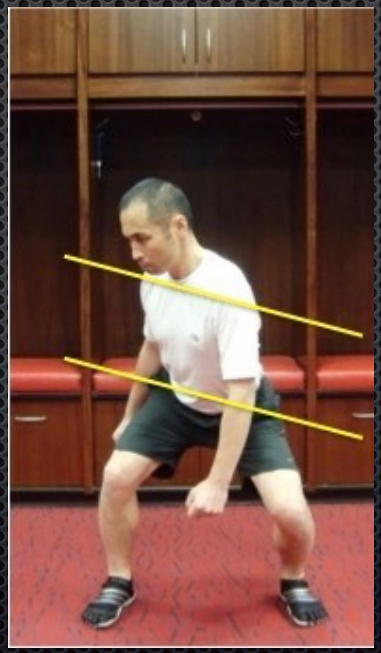


Triple Flexion for Triple Extension

Competency before Capacity

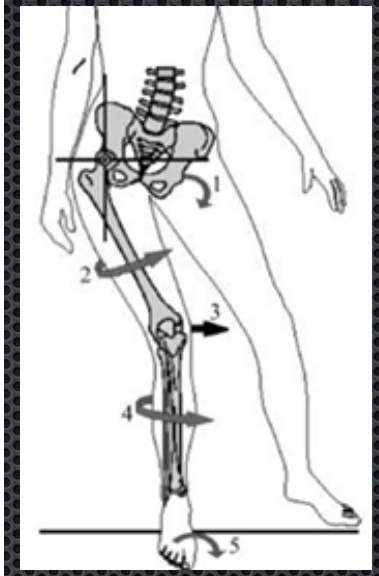
2. FRONTAL PLANE

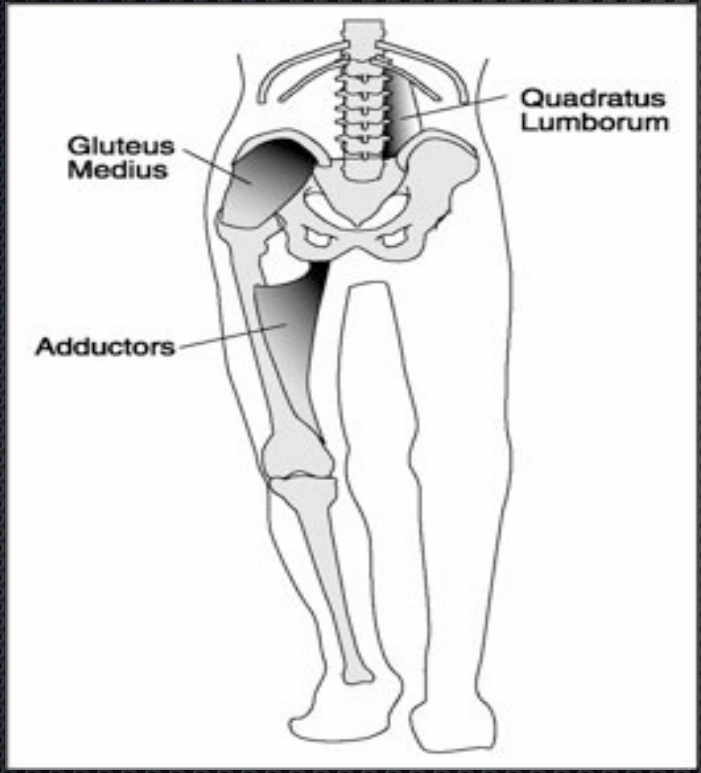
DEMO



Hip Extension

Frontal Plane -P822-823

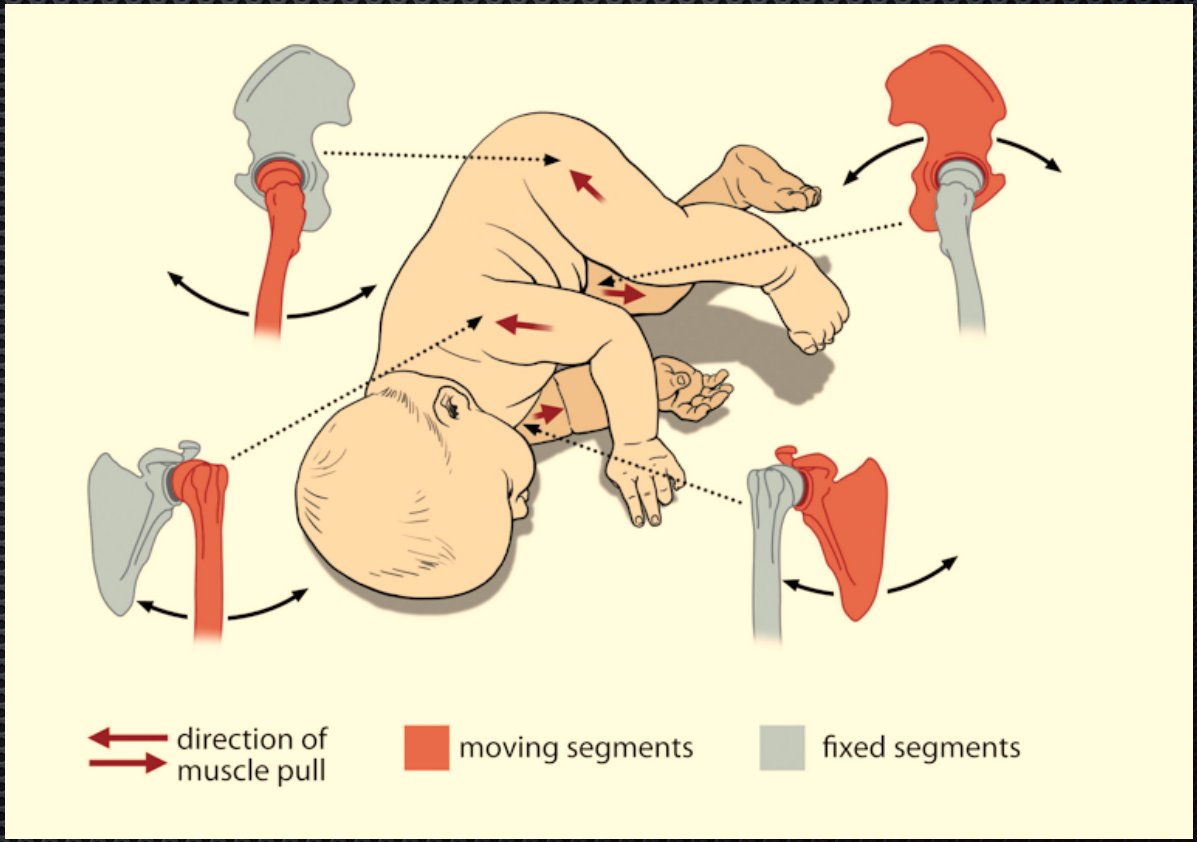



Quadratus
Lumborum
Gluteus
Medius
Adductors

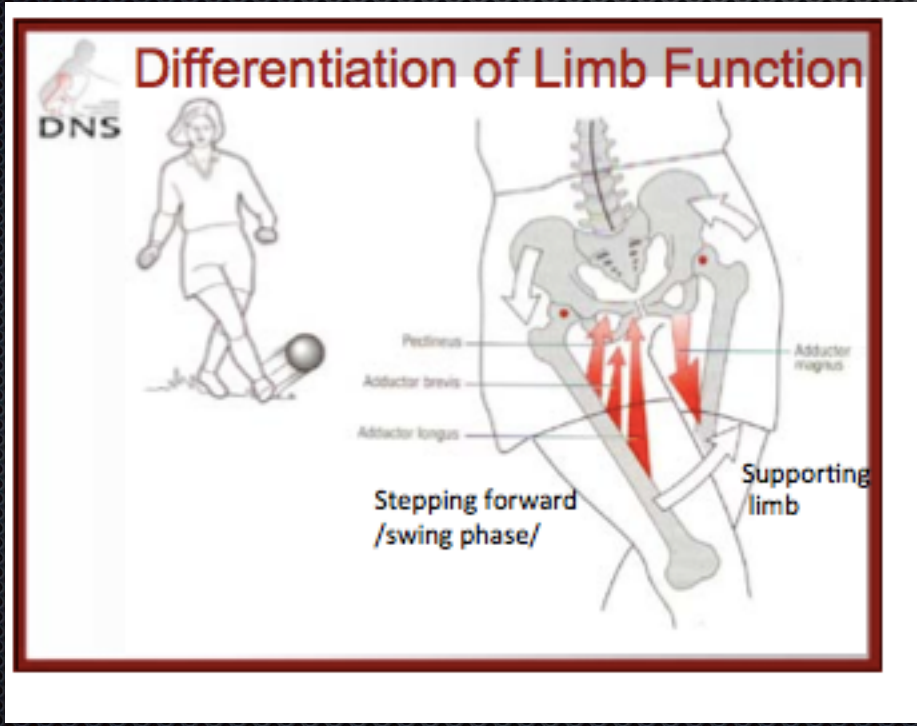

MIAMI
3

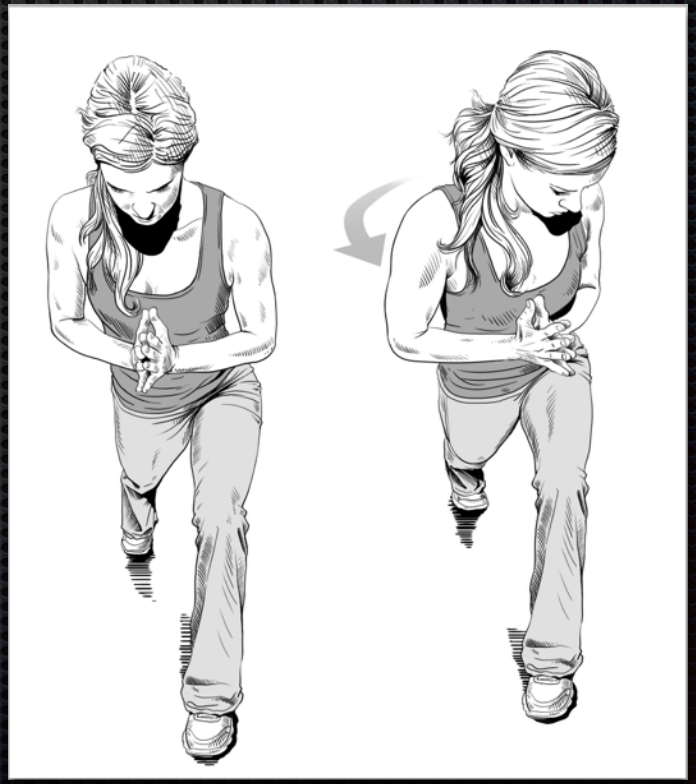
Mag 7

3. Transverse Plane

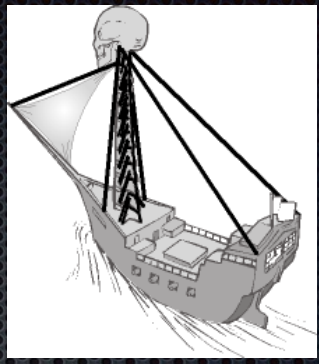


Tai Chi - Kua (Kolar) Functional Rolling

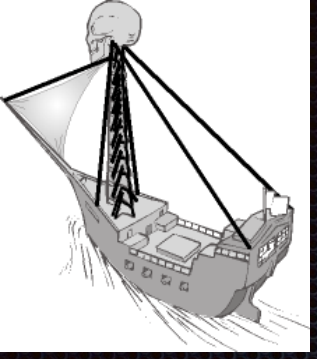




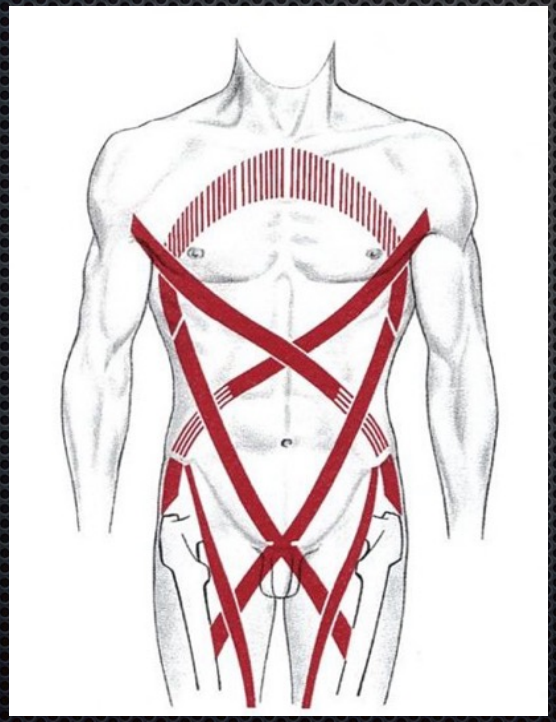
Myron's Discus Thrower
"Dynamic Tension"

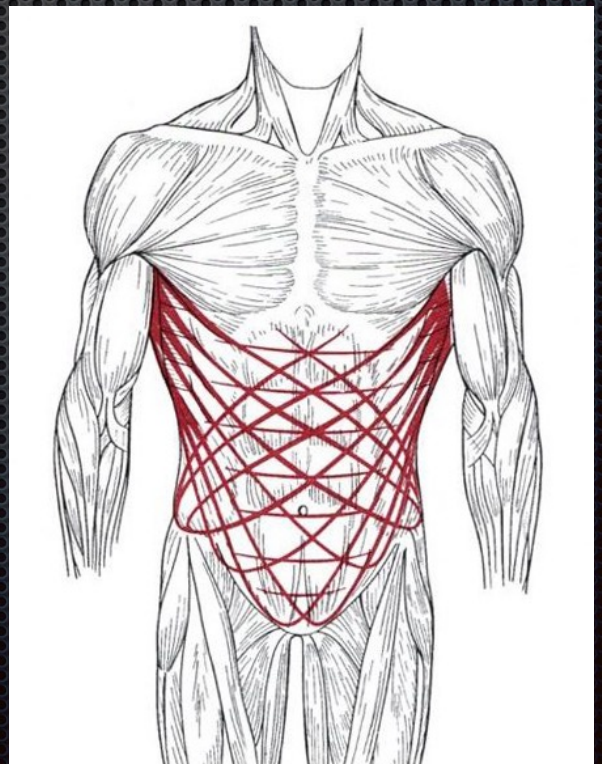


Jan Zelezny/ Barbora Spotakova



Punctum Fixum for Punctum Mobilum





Thomas Myers

Spiral Line

- If we attempt to train an exercise & it's a 1 then we look for ecologically valid moves that are nested to it that we think will re-set the weak link. For example –
- Anti rotation problem in 1 leg bridge >> Pallof press
- Poor 1LDL >>stretch posterior hip capsule
- Decreased T4 extension mobility >> squats
- Poor squats >> DL

Prevention/Warm-Up

"Given the enhancement of limb athleticism, this study gives some foundation to the practice of including isometric core exercises into athletes' training regimens and **pregame warm-up**. In fact, isometric core exercise programs are part of successful **injury prevention programs**."