

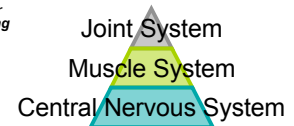
III) Core Stability Training “Agonist-antagonist” co-activation



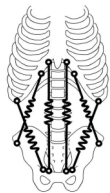
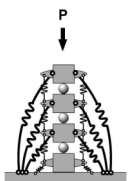
A) Stabilization Principles

- 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!**



Agonist-Antagonist Dysfunction

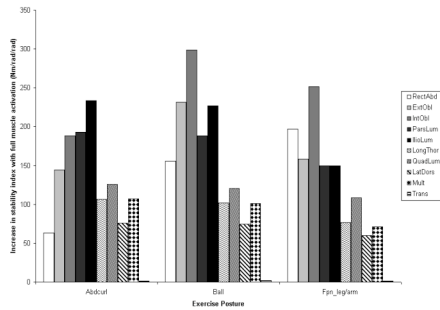
Muscle response pattern to sudden trunk loading in LBP individuals

- Delayed activation
- Over-activation
- Delayed relaxation

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



The Orchestra



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

Ideal Exercises



- Establish a "positive slope"
- Challenge muscle
- Impose minimal joint loads to spare the spine
- Train joint stability in a "neutral posture"
- Reinforce whole body stabilization principles
- Train functionally



The Functional Range

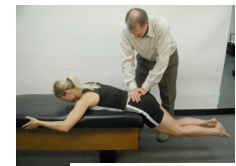
- CAP**
- According to Dennis Morgan "the functional range is the most stable and asymptomatic range of the spine for the task at hand."



Stabilization Classification



- Avg. SLR > 91°
- Positive prone instability test
- Aberrant motions present (e.g. instability catch, reversal of L/P rhythm)
- ≥ 3 past episodes
- If ¼ present positive LR (likelihood ratio) 4.0
 - 95% CI (confidence interval)
 - The LR represents the change in odds favoring success given a positive diagnostic test result.



Stabilization Exercise Progressions

- **Intensity** – less than 50% of MVC (maximum voluntary contraction)
- **Repetitions** - 10-12 reps slowly (5-6 sec/rep)
- **Frequency** - at least 2x/day
- **Duration** - up to 3 months



Basics of Exercise

- Stabilization exercise is generally safe
- Mild discomfort is alright
- If pain increases stop the exercise
- Perform slowly, with good form
- Breathe normally
- **Repetitions:** 8-10 repetitions
- **Frequency:** Twice/day

Less is More!

- Dutch trainer Henk Kraayenhof,
- "Do as little as needed, not as much as possible."

Karel Lewit

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



Rehab Principle

Stages of Motor Learning

- Conscious awareness
- Associative
- Autonomous control
- **Janda** emphasized that patients don't comply well if they have to be hypervigilant
- Minimize the **Conscious Awareness** stage & find something which the patient automatically does well - **"Attacking Success"**



Stabilization Training Skills

1. Prone Instability Test
2. Abdominal Bracing
 - Janda's Perturbation Test
 - Abdominal Hollowing
3. Cat-Camel
4. Bird Dog
5. Dying Bug
 - Vleeming's SLR Test
 - Kolar's IAP Test
6. Side Bridge
 - Plank Endurance Test
7. Stir the Pot
8. Curl-up
9. Back Extensor Training

1. Prone Instability Test – p802



Prone Instability Test



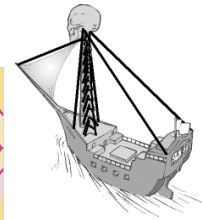
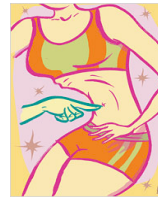
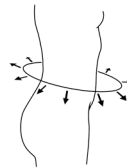
- Patient is prone with hips at edge of table & feet dangling off table
- Dr. performs P to A compressions
- If painful, then have patient raise legs up & rev
- If P to A compressions are now less painful, then stabilization training is indicated since muscle activity ↓ed pain

How to Use This Test

- General test indicating Stabilization Training
- Stabilization exercises will be safe
- If patient is not better with leg raising it does not mean stabilization is contraindicated, but patient will be more complex and progress slower



2. Bracing (& Breathing) – p561 & 622



Bracing - Indications

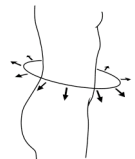
- General:
 - Back pain
 - Exposure to high lumbar load
 - Fail Prone Stability Test
- Specific:
 - Kolar's Diaphragm Test



Bracing

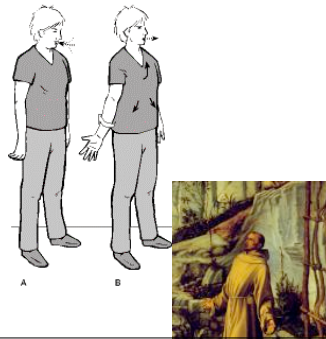


- Tighten core.
- Imagine someone is going to punch you
- That is a brace
 - Hollowing is something different. The abdomen can go out w/ a brace
- The brace can be gentle though
- Goal is to brace **without holding breath**
- **External perturbations** are an excellent facilitation of the ability to stiffen the spine



Brügger's Relief Position – p302

- Drop your arms
- Turn hands out (supinate)
- Spread fingers (abduct)
- Blow breath out as if you are making a candle flicker
- Perform 1-2X for every 20 minutes of sitting throughout the day



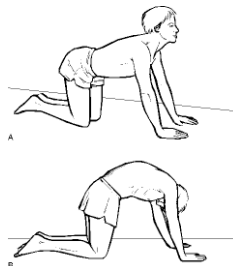
Janda's Perturbation Test/Training

- Janda's test of external perturbations
 - Give perturbations to sacrum
 - Observe instability at L/P junction
 - Ask patient to “brace” abdomen &/or grip floor
 - Patient should “sense” that they gain stability with bracing or gripping
 - Can the foot stabilize the spine??



3. Cat - Camel - p621

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



❖ Cat-Camel



- Why (rationale)
 - “Warm-up”/nourish L/P tissues in unloaded environment
 - Re-educate L/P movement control
- When (indications)
 - Acute or chronic LBP
 - Prevention of LBP
- What (skill)
- How (integration)
 - Explain to pt why it is being Rx'd (to “warm-up” & nourish the tissues)
 - First-aid/palliative
 - Give hand-out
 - Document home exercise Rx in Patient Profile

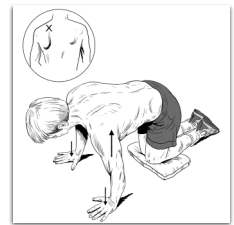
4. Bird-Dog - p623

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



Quad Arm Reach

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



Quad Leg Reach

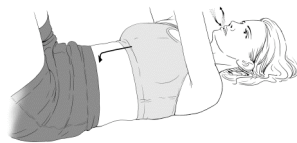
- reach behind you w/ your foot
- then progress to opposite arm/leg



Common Errors



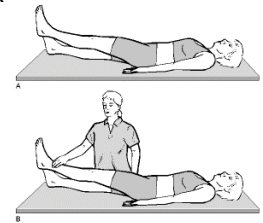
5. Dying Bugs – p627



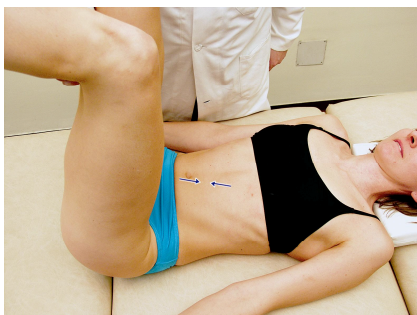
Vleeming's Active SLR "The Core Screen"

Test

- Supine have patient perform SLR 20 cm up & note if there is:
 - Pain
 - Significant trunk rotation
- If the test is negative add resistance/ $\sqrt{\text{strength}} _5$



Kolar's Intra-abdominal Pressure Test (p555)



Intra-abdominal pressure test

Initial position

- Patient supine
- Triple flexion of the legs
- The lower legs supported
- Hip abduction corresponds to the width of the shoulders, slight external rotation at the hips



Intra-abdominal pressure test

- The therapist brings the patient's chest passively into the caudal, expiratory position
- Then the support is removed from under the patient's legs
- The patients holds this position actively



Poor activation

- Activity of the upper part of the rectus abdominis predominates
- Inspiratory position of the chest
- The umbilicus is pulled in a cranial direction
- Concavity of the abdominal wall above the level of the groin

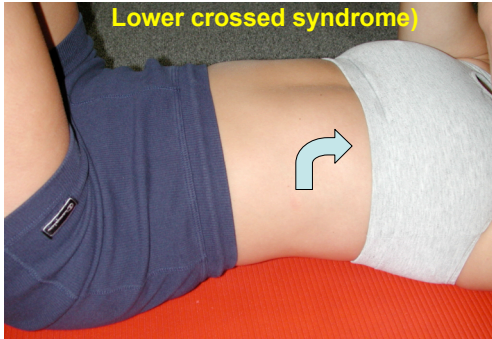


Dying-Bug Technique – p627

- 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

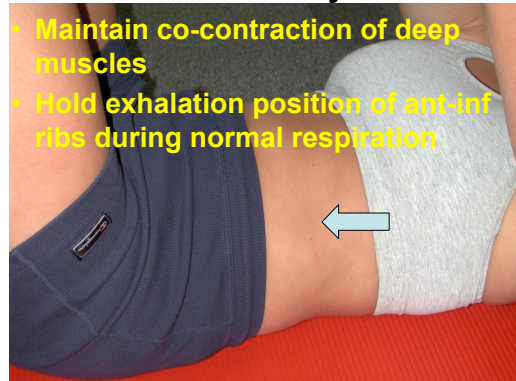


**Training L/S hyperextension
w/ poor anterior rib stability
(Lower crossed syndrome)**

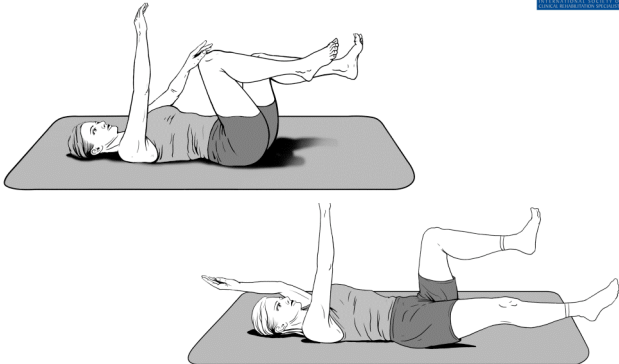


L/S stability w/ good lower rib stability

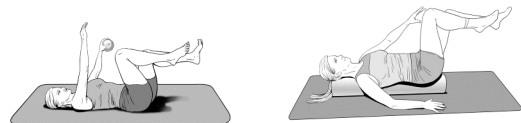
- Maintain co-contraction of deep muscles
- Hold exhalation position of ant-inf ribs during normal respiration



Dying-Bugs



Progressions w/ hand wts or foam roll

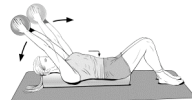


Foam Challenges

Marching



• Overhead Reach



• Bicycle Kicks



Wall Bug (Kolar)



To train the Tr Abd load the transverse



Manual Resistance Technique



6. Side Bridge – p624

❖ Side bridge/lateral corset



Side Bridge Endurance Test

- Indications
 - Subacute MSP
 - In particular
 - LBP



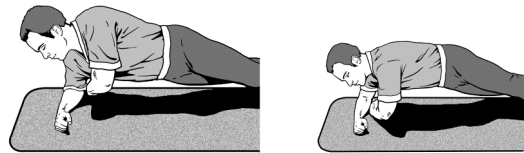
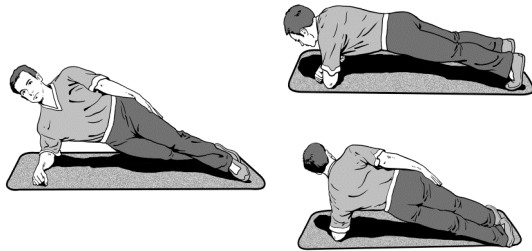
Side Bridge Technique

- Relax on your forearm w/ hips & knees bent
- Then, straighten your spine & brace your “core”
- Then, hinge your hips forward & up so your knee, hip & shoulder are all in a line



- Why (rationale)
 - Train spine stability patterns involving the oblique abds & QL
 - Build endurance of the oblique abds & QL
- When (indications)
 - LBP (acute – chronic)
 - Disc patients
- What (skill)
- How (integration)
 - Explain to pt why it is being Rx'd (to spare the spine & stabilize the spine)
 - Give hand-out
 - Document home exercise Rx in Patient Profile

Plank Rolls



7. Stir the Pot

- If you can perform 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

- Progressions:
 - Perform in a plank on your toes
 - Narrowing your base of support
 - Place toes on a bosu

8. Curl-ups – p630



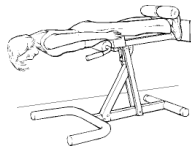
Curl-up Technique

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



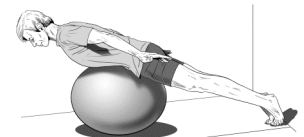
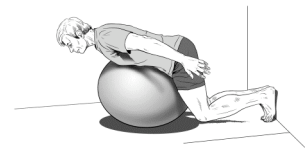
9. Back Extensor Training – p635

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



Superman - p635

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



Poor
Stability w/
Head
Forward &
Chin
Poking

