www.vompti.com

LUMBAR SPINE
CASE 2

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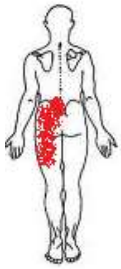
Orthopaedic Manual Physical Therapy Series
Richmond 2018-2019

VOMPTI_CLINICAL REASONING FORM



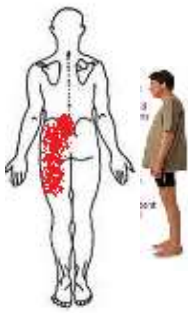
Body Chart – Initial Hypothesis:

- L4-5, 5-S1 disc, facet (somatic)
- L4-5, 5-1 radiculopathy
- SIJ pain
- Extra-articular hip pathology

SUBJECTIVE EXAM

Subjective 'Asterisks' Signs/Symptoms: (Aggravating/Easing factors, Description/location of symptoms, Behavior, Mechanism of injury)

- 37 y/o male computer programmer with 6 month history of LBP and left LE pain after unloading mulch.
- Symptoms gradually worsening
- Episodic history of LBP off and on for last 5 years. Episodes have become more frequent and more intense
- Previous history of L4/5 HNP and laminectomy which resolved LE symptoms > LBP 7 years ago.
- 1st return of LE symptoms since surgery.
- Constant, variable, deep central and L sided LBP
- Intermittent, variable, deep L post thigh dull ache with diffuse borders
- Still working but commutes 1 hr each way
- Aggs: Sitting 15-20 mins, shaving/brushing teeth, sit to stand transfers, prolonged walking 15 mins, rolling in bed
- Eases: changing positions, rest, activity modification, short distanced walking



- **Rate your assessment of Severity & Irritability**
  Justify your assessment with examples from the Subjective Exam &/or Objective Exam
  - Severity: Non / Min / **Mod** / Max

Continuous back pain, with intermittent leg pain

  - Irritability: Non / Min / **Mod** / Max

Pain comes on fairly quick and takes time to abate

- Stage & Stability?
  - Acute / Subacute / **Chronic** / Acute on chronic
  - Stable / Improving / **Worsening** / Fluctuating / Red Flags

Identify any potential risk factors (Yellow, Red flags, non MSK involvement, biopsychosocial)

STRUCTURE at Fault:

Joints: refer to the painful region	Myofascial tissue: refer to the painful region	Non Contractile tissue: refer to the painful region	Neural tissue: refer to the painful region	Other structures that must be examined – non MSK
L4-S1 facets SIJ Hip	Lumbar multifidus Glute med/min, max Piriformis, hamstrings	L4-S1 disc Iliolumbar ligament Pelvis/Sacrum	L4-S1 nerve roots	Visceral? Spondyloar thropathy? Mass?

Primary HYPOTHESIS after Subjective Examination:

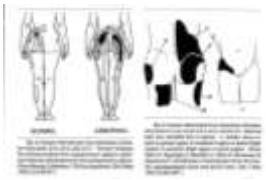
Differential List (Rank1 1st in order to rule out)

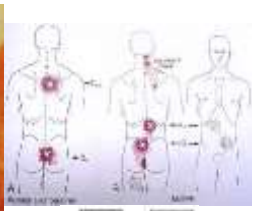
L4-5/5-S1 somatic/ facet due to clinical instability

SIJ
Hip Pathology

Facet Joint Pain

- Joint surface or restraining tissues being strained (capsule/ligaments)
  - Innervated by medial branch of the dorsal rami
- Irritation leads to local back pain and referred pain
  - Typically referred into the buttock and posterior thigh
    - Referral down the leg if stimulus is strong enough

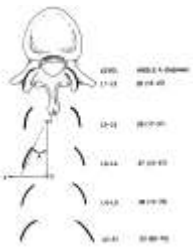




Lumbar Anatomy

Facet Joints

- Lumbar orientation
  - Vertical with "C" or "J" shape mostly in the sagital plane
    - Facilitates frontal plane motion, some sagital plane and limits rotation
      - Upper facets resist rotation
      - Lower facets resist anterior translation
  - L4-5 and L5-S1 facets allow more rotation for gait
    - That orientation allows for more torsional forces and annular damage



Lumbar Anatomy

Facet Joints

- Facet Orientation
  - Ideal orientation is 45° from sagital plane
    - Resists both anterior translation and rotation
      - Greater than 45° provides less resistance to rotation
      - Less then 45°provides more resistance to rotation

Lumbar Biomechanics

Flexion

- Vertebrae rotates anteriorly in the sagital plane
- Vertebrae translates anteriorly in the sagital plane
- Lordosis reverses in the upper lumbar spine and decreases in the lower lumbar spine
- Z Joints glide superior/anterior

Lumbar Biomechanics

Flexion

- Anterior sagital rotation restrained by
  - Joint capsule
  - Supra & Interspinous ligaments
  - Ligamentum flavum & PLL
  - IV Disc
- Anterior sagital translation restrained by
  - Facet contact
  - Supraspinous ligament
  - IV Disc

Lumbar Biomechanics

Extension

- Vertebrae rotates posteriorly in the sagital plane
- Vertebrae translates posteriorly in the sagital plane
- Accentuates lumbar lordosis especially in the lower lumbar spine
- Z Joints glide inferior/posterior
  - Z joint becomes WB

Lumbar Biomechanics
Extension

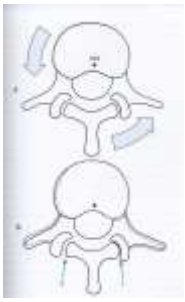
- Extension restrained by
  - Contact of SP's
  - Contact of facet processes
  - Contact of inferior facet process with lamina of subjacent vertebrae
  - ALL
  - IV Disc

Lumbar Biomechanics
Rotation

- Spin in the transverse plane around an axis in the posterior vertebral body
  - Very small amount of motion <5°

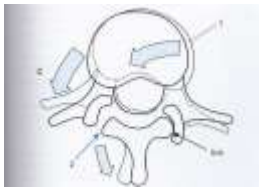
Lumbar Biomechanics
Rotation

- Rotation restrained by
  - Contact of contralateral facet joint
  - Ipsilateral facet joint capsule
  - IV Disc specifically the annular fibers



Lumbar Biomechanics
Rotation

- 1/2 of the annular fibers will slacken and the other 1/2 will become taught
  - 3° of rotation can lead to microscopic injury to the annulus
- IAP and SAP compress
  - If rotation continues IAR changes from vertebral body to facet joint
    - Distraction of ipsilateral facets increases and annular fibers are further stressed
    - 12°of rotation can lead to macroscopic injury



Lumbar Biomechanics
Side Bending

- Vertebrae rotates in the frontal plane
  - May involve conjunct rotation in the transverse plane that is not agreed upon
- Ipsilateral facet glides inferior/posterior (extension)
- Contralateral facet glides superior/anterior (flexion)

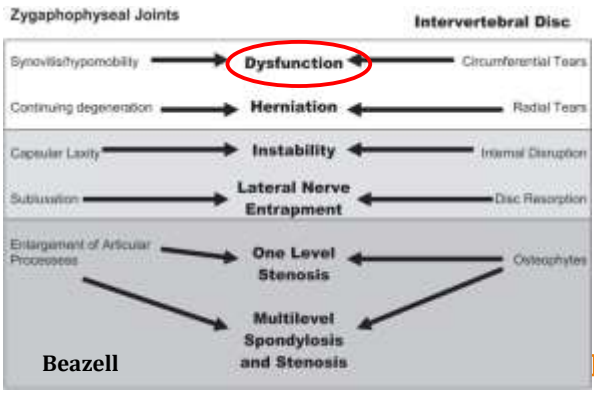
Lumbar Biomechanics
Motion Coupling

- No true consensus
  - May be ipsilateral
  - May be contralateral
  - May depend on starting position or which movement initiates

Lumbar Biomechanics
Motion Coupling

- Fryettes Concept for Thoracic and Lumbar Spine
  - In a neutral position, sidebending and rotation occur in opposite directions
  - In a flexed position sidebending and rotation occur in the same direction
    - Not in extension (still opposite)
  - If motion is introduced in one plane, motion in the other 2 planes will be restricted

Cascade of Spinal Degeneration

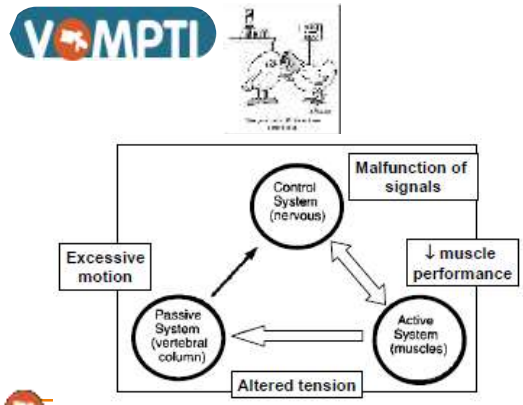


Manual Therapy

Subjective and objective descriptors of clinical lumbar spine instability: A Delphi study

Subjective factors of consensus and rank outcomes for clinical lumbar spine instability, listed in descending rank

Descriptor	Round III consensus status	Round II composite score	Round III composite score
Reports feelings of "giving way" or back "giving out"	CR	501	527
Self manipulator who feels the need to frequently crack or pop the back	CR	483	524
Frequent bouts or episodes of symptoms	CR	518	523
History of painful catching or locking during twisting or bending of the spine	CR	496	521
Pain during transitional activities (e.g. sit to stand)	CR	484	510
Greater pain returning to erect position from flexion	CR	493	509
Pain increased with sudden, trivial, or mild movements	CR	496	504
Difficulty with unsupported sitting and better with supported backrest	CR	477	500
Worse with sustained postures and a decreased likelihood of reported static position that is not painful	CR	470	491
Condition is progressively worsening (e.g. shorter intervals between bouts)	CR	471	480
Long-term, chronic history of disorder	CR	437	478
Temporary relief with back brace or corset	CR	463	478
Reports frequent episodes of muscle spasm	CR	482	474



Spine

Multifidus Muscle Recovery Is Not Automatic After Resolution of Acute, First-Episode Low Back Pain

- Normal back pain episodes last 2-4 weeks and pt becomes pain free
  - Pain free does not mean patient has recovered
  - No spontaneous recovery from the reflex inhibition

BMC Medicine

Are MRI-defined fat infiltrations in the multifidus muscles associated with low back pain?

BMC Medicine 2007,

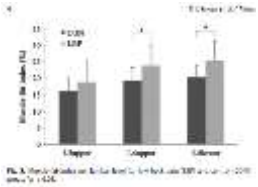
Long term inhibition leads not only to muscle atrophy, but fatty infiltration

Multifidus Atrophy Is Localized and Bilateral in Active Persons With Chronic Unilateral Low Back Pain

- Chronic unilateral LBP leads to segmental bilateral multifidus atrophy
- Acute LBP = unilateral loss
- Reduces capacity to control intersegmental motion

Manual Therapy

Increased intramuscular fatty infiltration without differences in lumbar muscle cross-sectional area during remission of unilateral recurrent low back pain



- Increased Muscle Fat Index found in subjects with previous history of LBP as compared with controls
- No noticeable difference in muscle CSA between groups
- Increased MFI may lead to poor muscle performance increasing likelihood of recurrence

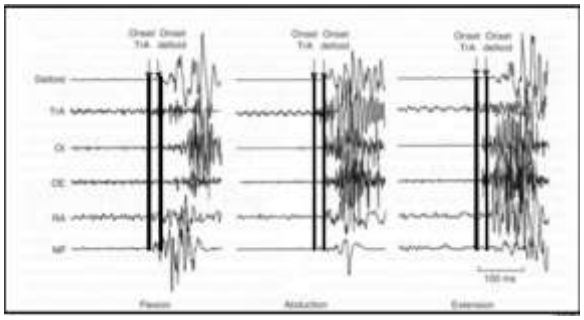
Multifidus Evidence

- 80% of all LBP demonstrated atrophy (Kader et al, 2000)
- LM atrophy more pronounced on side of surgery (Mattila et al, 1986; Hides et al 1994)
- Dec EMG activity at unstable segment (Sihvonen et al, 1995)
- Dec endurance if LBP in elite rowers
- Inc atrophy/fatty infiltrate in those with poor outcomes after surgery (Ford et al, 1983)
- Inc atrophy associated with poor outcomes after laminectomy (Rantanen et al, 1994)
- Inc recovery of muscle after surgery in those with favorable post-op outcomes (Sihvonen et al, 1995)

Evidence for altered neural and active control systems

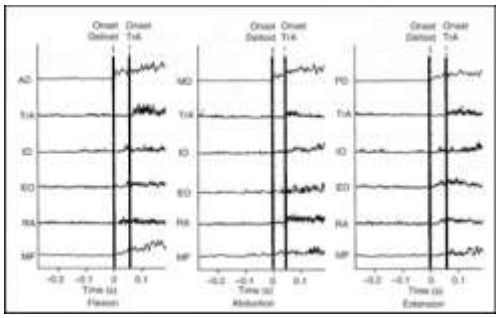
- Delayed TrA contraction in subjects with LBP
  - Hodges and Richardson, 1996, *Spine*
- Altered lumbopelvic recruitment in presence of SIJ pain
  - Hungerford, 2003, *Spine*
- Altered abdominal recruitment after exercise intervention
  - O'Sullivan, 1998, *JOSPT*
- RCT with improved outcomes in instability patients after stabilization training
  - O'Sullivan, 1997, *Spine*

Feed-Forward Mechanism of TrA

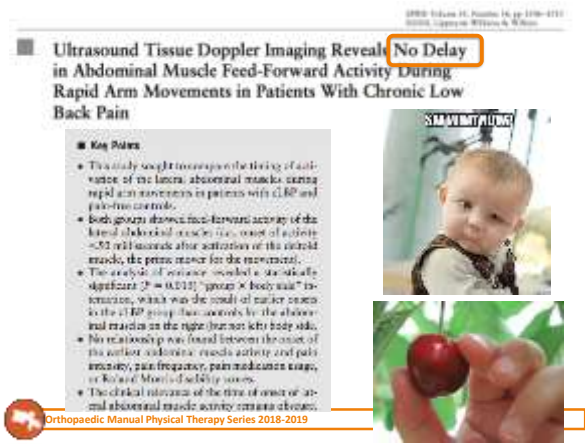


Hodges and Richardson, 1996

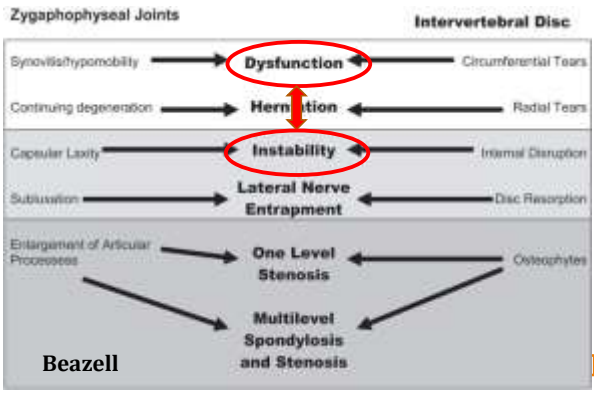
Delayed TrA Contraction with Pain



Hodges and Richardson, 1996



Cascade of Spinal Degeneration



Lumbar Objective Examination

- Observation/Postural Assessment/Functional Testing
- Lumbar AROM/PROM/Resisted Testing
  - Quadrants
- SIJ Screening
- Neurological Testing
  - Segmental
  - Central
- Neurodynamic Testing
- Provocation Testing
  - PA, Compression, torsion
- **What else to assist R/I primary hypothesis?**

Objective Examination Modification/Additional Testing

- Lumbar Instability pathology
  - Vertical Compression Test
  - Quadrant and H/I Test
  - Prone Instability Test
  - Endurance Testing

Vertical Compression Test

(+)

Lumbar ROM Quadrant Testing

- Quadrant Test: place the spine in the extreme combined movement. Performed when the cardinal planes have been negative or not reproduced all symptoms. May need to do this test to reproduce symptoms from a facet joint.
  - Pt standing
  - Therapist guides patient in each quadrant and overpresses movement
    - Looking for reproduction of symptoms and movement asymmetry
    - Sustain and/or add compression at end of motion if needed

Front Right Quadrant

Back Right Quadrant

Lumbar ROM Quadrant Testing

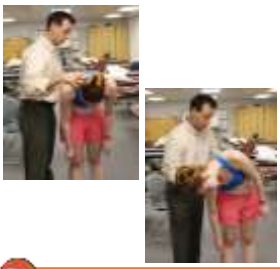
- Front Right Quadrant
  - Flexion/right SB/right rotation
    - Maximally flexes left facets
- Front Left Quadrant
  - Flexion/left SB/left rotation
    - Maximally flexes right facets
- Back Right Quadrant
  - Extension/right SB/right rotation
    - Maximally extends right facets
- Back Left Quadrant
  - Extension/left SB/left rotation
    - Maximally extends left facets

"H" & "I" Testing

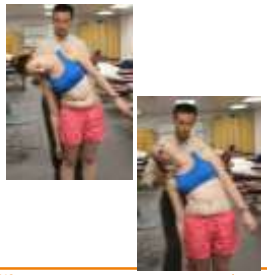
- H and I Test: helps to differentiate between hypomobilities and instabilities when there was limited motion during quadrant testing.
- Takes the patient in each quadrant using different movement orders.
- Inconsistent hypomobilities indicate an instability, consistent hypomobilities indicate true hypomobility.
- "H" test
  - Start with SB to one side then flexion, followed by extension
- "I" test
  - Start with flexion or extension, then SB to either side

"H" & "I" Testing (+)

"I" Test



"H" Test



"H" & "I" Testing

- "H" & "I" Interpretation
  - True hypomobility
    - Patient cannot achieve a quadrant regardless of which movement is initiated
  - Motor Control (segmental stability) Problem
    - Patient can achieve a quadrant depending on order of movement
    - Example: Limited back left quadrant
      - SB followed by extension (H test) = full motion
      - Extension followed by left SB (I test) = limited motion

Lumbar Objective Examination

- Observation/Postural Assessment/Functional Testing
- Lumbar AROM/PROM/Resisted Testing
  - Quadrants
- SIJ Screening
- Neurological Testing
  - Segmental
  - Central
- Neurodynamic Testing
- Provocation Testing
  - PA, Compression, torsion

Lumbar Objective Examination

- Observation/Postural Assessment/Functional Testing
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- Neurodynamic Testing
- Provocation Testing
  - PA, Compression, torsion
- **What else to assist R/I primary hypothesis?**

- Lumbar Instability pathology
  - Vertical Compression Test
  - H/I Test
  - Prone Instability Test
  - Endurance Testing

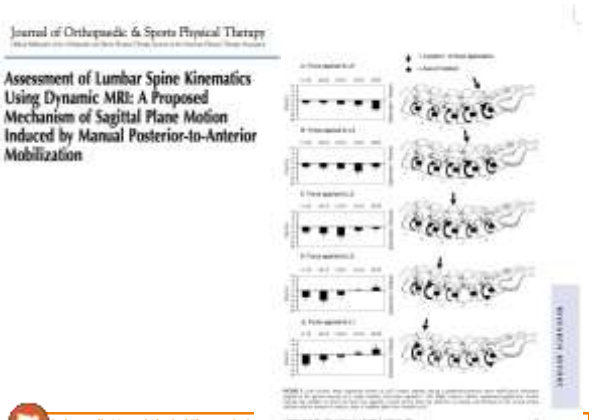
Lumbar Biomechanical Exam

PAIVM's

(+)
L4/5
Central and L


Segmental mobility of the lumbar spine during a posterior to anterior mobilization: assessment using dynamic MRI

- Assessing P/A pressure under MRI
  - Extension was always produced at the level being assessed
  - PA pressure to L3-4, L4-5 or L5-S1 produced extension at all other lumbar spinal levels
  - PA pressure to L1-2 or L2-3 produced flexion at the 3 caudal levels


Journal of Orthopaedic & Sports Physical Therapy

Assessment of Lumbar Spine Kinematics Using Dynamic MRI: A Proposed Mechanism of Sagittal Plane Motion Induced by Manual Posterior-to-Anterior Mobilization

PA Mobility Testing

- Good agreement for pain provocation
- Fair to poor agreement on mobility assessment
  - Better consensus with hypomobility than hypermobility
- Extension is always produced at the level being assessed
- PA to the upper lumbar spine seems to create a flexion moment to the lower lumbar spine

Objective Examination Modification/Additional Testing

- Lumbar Instability pathology
  - Vertical Compression Test
  - H/I Test
  - Prone Instability Test
  - Endurance Testing

The Interrater Reliability of Physical Examination Tests That May Predict the Outcome or Suggest the Need for Lumbar Stabilization Exercises

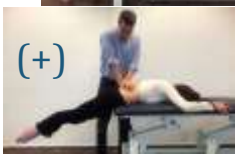
JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY | VOLUME 43 | NUMBER 2 | FEBRUARY 2013

- Good inter-rater reliability found for tests in CPR and additional testing
  - Aberrant motion with AROM
  - Passive SLR
  - Active SLR
  - Passive lumbar extension test
  - Prone instability test
  - Lumbar extension load test

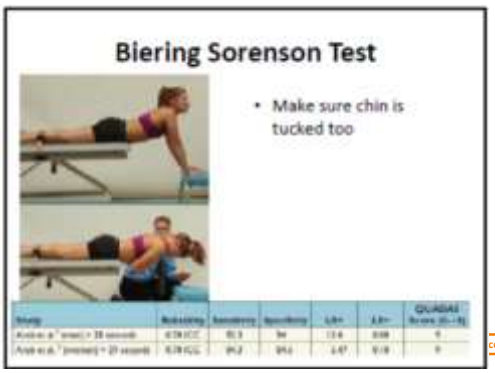
Lumbar Biomechanical Exam

Stability Testing

- Prone instability test
- Patient prone, with the trunk supported on the examining table and the feet resting on the floor.
- PT performs a PA pressure to each level of the lumbar spine.
  - If pain is provoked at a certain level, the patient lifts their feet off the floor and the PA pressure is repeated.
  - Positive test if the pt's pain goes away
- Can modify pending irritability and ability of patient



Lumbar Extensor Endurance Testing



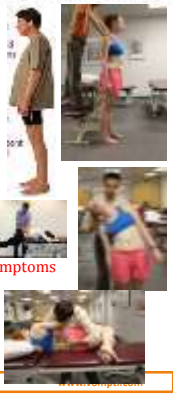
Clinical Tests to Diagnose Lumbar Segmental Instability: A Systematic Review

- Looking a tests able to identify structural instability (not functional instability) due to…
  - Severe disc degeneration
  - Discectomy's
  - Laminectomy's
  - Fusions (adjacent segments)
  - Spondylolisthesis

PLE found to be the only test with sufficient sensitivity and specificity and LR+ (8.8)

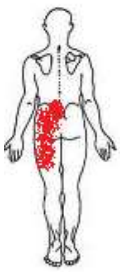
Physical Exam "Asterisks" Signs/Symptoms (Special tests, Movement/Joint Dysfunction, Posture, Palpation, etc)

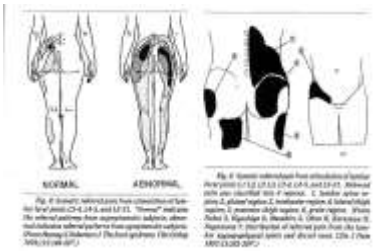
- "Lazy stander", hangs on "Y" ligaments
- (+) Vertical Compression Test
- Lumbar AROM: (+) Flexion, Ext, Ext/L SB Quadrant
- Poor control upon return from flexion, walks up thighs
- (+) H/I Test with inconsistent Ext/L SB quadrant
- Neuro (-)
- Neurodynamic testing (-)
- Hip and SIJ Clearing (-). Hip IR = 45 (R), 40(L)
- (+) PA for stiffness at T12-L2 and pain at L4-5
- (+) Prone Instability Test L4/5
- (+) PPIVM/PAIVM into Ext/inferior glide at L4/5 for symptoms and guarding/spasm more so than stiffness
- (+) PAIVM into extension glide L1/2 and L5/S1
- ODI = 32% perceived disability
- FABQ (W) = 15



- Are the relationships between the areas on the body chart, the interview, and physical exam consistent? "Do the features fit" a recognizable clinical pattern? Yes No

Lumbar facet pathology due to clinical instability





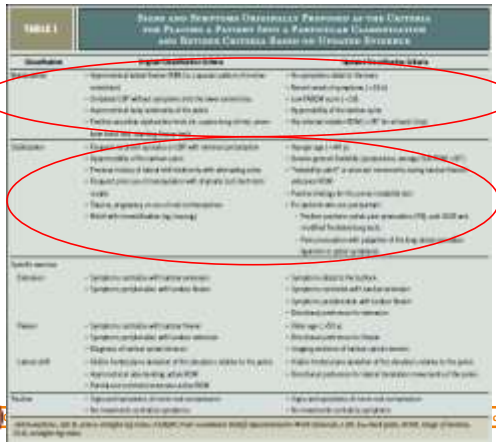
MANUAL THERAPY

Subjective and objective descriptors of clinical lumbar spine instability: A Delphi study

What About Classification?


[CLINICAL COMMENTARY]

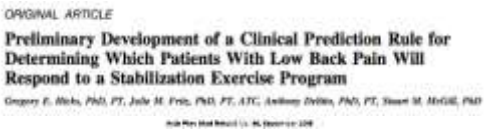
Subgrouping Patients With Low Back Pain: Evolution of a Classification Approach to Physical Therapy




ARTICLE

A Clinical Prediction Rule To Identify Patients with Low Back Pain Most Likely To Benefit from Spinal Manipulation: A Validation Study

- Predictor Variables
  - Pain does not travel below the knee
  - Onset ≤ 16 days ago
  - Lumbar hypomobility
  - Either hip has > 35° of internal rotation
  - FABQ Work score < 19
- 4 or more variables
  - +LR 24.4


ORIGINAL ARTICLE

Preliminary Development of a Clinical Prediction Rule for Determining Which Patients With Low Back Pain Will Respond to a Stabilization Exercise Program

- Predictive Variables for Stabilization Success
  - Age < 40 y/o
  - Average SLR > 91 degrees
  - Aberrant Movement Pattern
  - (+) Prone Instability Test (PIT)
- 3/4 Predictors: (+) LR = 4.0
- Predictor Variables for Stabilization Failure
  - (-) Prone Instability Test
  - No aberrant movement
  - FABQ score < 9
  - No hypermobility observed in the lumbar spine

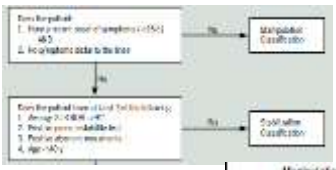
A Clinical Prediction Rule to Identify Patients With Low Back Pain Who Are Likely to Experience Short-Term Success Following Lumbar Stabilization Exercises: A Randomized Controlled Validation Study

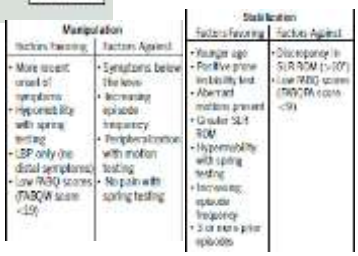
| JANUARY 2014 | VOLUME 44 | NUMBER 1 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

- Attempt to validate original study failed
- Aberrant movement and + prone instability test cluster was most responsive to stabilization exercises
  - "modified CPR"

Aberrant Movements

- Painful arc with lumbar flexion
- Painful arc with return from lumbar flexion
- Instability catch
- Gower's sign
- Reverse lumbopelvic rhythm

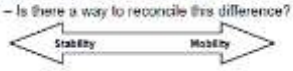


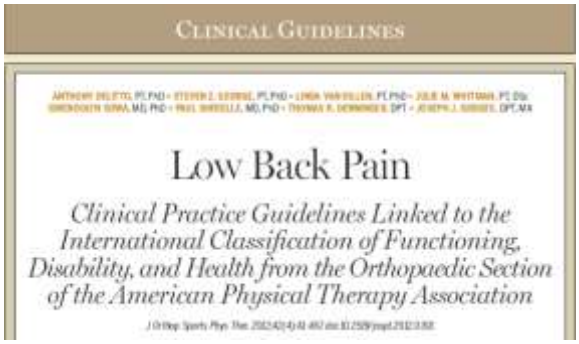


Clinical Dilemma??

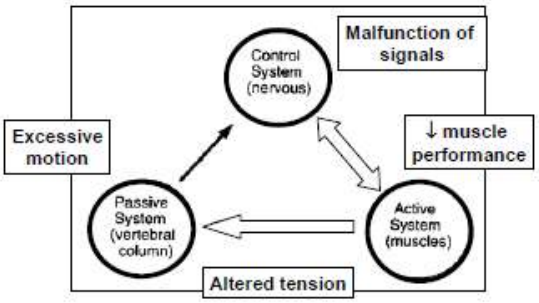
Manipulation	Stabilization
• Symptoms < 16 days	• SLR > 91 deg
✓ **FABQ (W) < 19**	✓ **Age < 40**
✓ **Hip IR > 35 deg**	✓ **Aberrant Movement Pattern**
✓ **Hypomobility of L/S**	✓ **Prone Instability Test**
✓ **No symptoms distal to knee**	

Interventions seem diametrically opposed
– Is there a way to reconcile this difference?





Initial Treatment?
Where Do We Start?



- **What is your primary treatment Objective after initial evaluation?**
  - **Education:**
    Educate pt on condition and importance of stability
  - **Manual Therapy:** (Specific Technique)
    Lumbar joint mobilization /manipulation to improve mobility adjacent to surgery
  - **Exercise Prescription:** (Specific)
    Lumbar stabilization therapy
  - **Other:**
    Belt?

Initial Treatment?

Comparison of the Effectiveness of Three Manual Physical Therapy Techniques in a Subgroup of Patients With Low Back Pain Who Satisfy a Clinical Prediction Rule

A Randomized Clinical Trial

Right Side Flexion/Gap Mobilization or Manipulation

Lumbopelvic Manipulation

Lumbopelvic / SIJ Regional Manipulation

Risks

- Haldeman and Rubenstein (spine 1992)
  - Reviewed literature over 77 year period
  - Ten episodes of cauda equina syndrome following lumbar manipulation reported
  - Estimated Risk: <1 per 100 million manipulations

Risks

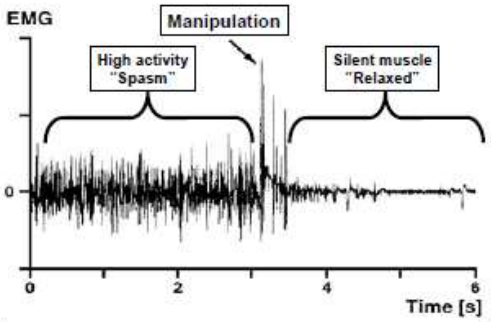
- Senstad et al (Spine, 1997)
  - Surveyed 1058 pts treated with spinal manipulation by DC's in Norway
  - 75% of all Rxs included manip to the Lx Spine
  - No severe complications noted
  - 55% reported at least one side effect: local discomfort – 53%, Fatigue – 11%, HA – 12%, Radiating discomfort – 10%

Why does manipulation work? One Theory

- Reflexogenic effect
- Resets signals
  - Between body and brain and spinal cord
- Allows muscle to reach optimal contraction
  - Breaks up spasm
  - Reduces inhibition

Evidence for reflexogenic effect

- Improves H-reflex: unilateral lumbar HNP
  - Floman, 1997, *Eur Spine J*
- Decreases in quadriceps inhibition in anterior knee pain patients with SIJ manipulation
  - Suter, 1999, *JMMT*
- Decreases EMG response in back muscles
  - Herzog, 1999, *Spine*



Electrical signal changes in a muscle spasm after manipulation
From: Herzog: Spine, Volume 24(2)January 15, 1999.146-152

Research article

Open Access

The influence of expectation on spinal manipulation induced hypoalgesia: An experimental study in normal subjects

Joel E Bialosky*[1], Mark D Bishop[1], Michael E Robinson[2], Josh A Barabas[1] and Steven Z George*[1]

BMC Musculoskeletal Disorders 2008, 9:19

- Significant increase in pain perception occurred following SMT in participants who received negative expectation suggesting a potential influence of expectation on SMT induced hypoalgesia in the body area to which the expectation is directed

Spinal Manipulative Therapy for Acute Low Back Pain

SPINE Volume 38, Number 3, pp E158–E177
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An Update of the Cochrane Review

- 20 RCT's examined
  - 6 had low bias risk
- "Manipulative therapy" was considered HVLAT, or mobilization
- No evidence to show that "manipulative therapy" was more effective than… when treating acute LBP
  - Adjunct therapy
  - Sham treatment
  - Inert intervention (eg: low grade US)

Spinal Manipulative Therapy for Acute Low Back Pain

An Update of the Cochrane Review

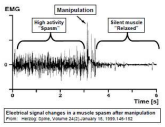
- Some short term pain relief and functional improvements seen in a few of the RCTs examined
- Most pts with acute LBP get better on their own so it is difficult to have interventions show significant improvements.

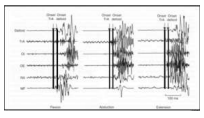
[CASE REPORT]

Improved Activation of Lumbar Multifidus Following Spinal Manipulation: A Case Report Applying Rehabilitative Ultrasound Imaging

Improved contraction of the transversus abdominis immediately following spinal manipulation: A case study using real-time ultrasound imaging

- Effects of spinal manipulation on TrA activation
  - Significant change in TrA resting and contracted "thickness" found with US immediately following HVLA

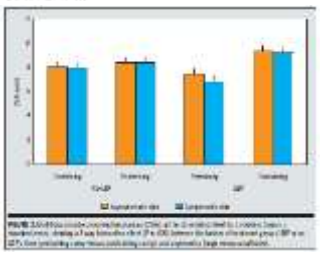




[RESEARCH REPORT]

Effect of Stabilization Training on Multifidus Muscle Cross-sectional Area Among Young Elite Cricketers With Low Back Pain

JOSPT, Vol 38, Number 3, March 2008



Changes in Deep Abdominal Muscle Thickness During Common Trunk-Strengthening Exercises Using Ultrasound Imaging

- Teyhen (JOSPT 2008)
  - US assessment of TA and internal oblique contraction (asymptomatic subjects)
    - Best recruitment of TA
      - DIM
      - Quadruped opposite UE/LE with DIM
    - Best recruitment of TA & Int. Oblique
      - Side plank with DIM
      - Abdominal crunch with DIM

Lumbar Stabilization

Teyhen et al. 2008

Exercise Progression – Hicks, et al.

Palpation of Multifidus

From Richardson: Therapeutic Exercise for Spinal Stabilization in Low Back Pain

- "Gently swell out your muscles under my fingers without moving your spine or pelvis. Hold the contraction while breathing normally."

The evaluation of lumbar multifidus muscle function via palpation: reliability and validity of a new clinical test

- Multifidus lift test
  - Pt in prone asked to raise contra-lateral UE 5 cm off table
  - Therapist assessed multifidus activation via palpations at L4-5 and L5-S1 interspace
- Inter-rater reliability: (K=.75-.81)
- Validity: Good at L4-5 not L5-S1
  - Reference standard: US

Multifidus Facilitation Techniques

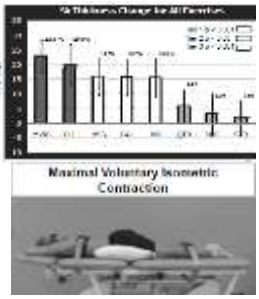
- Weight Shifts

- Contralateral Loaded Prone Arm Lift

Use 1.5-3.0 lbs load

Best Exercise for Multifidus?

- 8 commonly prescribed exercises for LM
- % thickness change measured with RTUS
- Prone MVIC best for thickness change



Balance and Perturbation Training

- Higher postural sway
  - Van Daele et al 2009
- Altered body inclination associated with anticipated postural instability
  - Brumagne et al 2008
- Decreased variability of anticipatory postural adjustments and increased stiffness with perturbations
  - Jacobs et al 2009, Mok et al 2007, Hodges et al 2009

RESEARCH ARTICLE Open Access

An update of stabilisation exercises for low back pain: a systematic review with meta-analysis

Smith et al. BMC Musculoskeletal Disorders 2014, 15:416

Conclusion: There is strong evidence stabilisation exercises are not more effective than any other form of active exercise in the long term. The low levels of heterogeneity and large number of high methodological quality of available studies, at long term follow-up, strengthen our current findings, and further research is unlikely to considerably alter this conclusion.

CRITICAL REVIEW

The myth of core stability

Journal of Bodywork & Movement Therapies (2010) 14, 84–98

- That certain muscles are more important for stabilization of the spine than other muscles, in particular transversus abdominis (TrA).
- That weak abdominal muscles lead to back pain
- That strengthening abdominal or trunk muscles can reduce back pain
- That there is a unique group of "core" muscle working independently of other trunk muscles
- That back pain can be improved by normalizing the timing of core muscles
- That there is a relationship between stability and back pain

CRITICAL REVIEW

The myth of core stability

- Weak trunk muscles, weak abdominals and imbalances between trunk muscles groups are not a pathology just a normal variation.
- The division of the trunk into core and global muscle system is a reductionist fantasy, which serves only to promote CS.
- Weak or dysfunctional abdominal muscles will not lead to back pain.
- Tensing the trunk muscles is unlikely to provide any protection against back pain or reduce the recurrence of back pain.
- Core stability exercises are no more effective than, and will not prevent injury more than, any other forms of exercise or physical therapy. Any therapeutic influence is related to the exercise effects rather than stability issues.
- Patients who have been trained to use complex abdominal hollowing and bracing maneuvers should be discouraged from using them.

Pattern Recognition

Identify the key subjective and physical features (i.e. **clinical pattern**) that would help you recognize this disorder in the future.

Subjective	Physical
Episodic nature becoming more frequent Transitional movements painful Back pain with referred pain into the buttock and thigh	Aberrant movement with ROM assessment Inconsistent ROM with H & I testing + stability testing

Prevalence of Adjacent Segment Degeneration After Spine Surgery

A Systematic Review and Meta-analysis

SPINE Volume 38, Number 7, pp 597–608
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TABLE 2. Subgroup Analysis by Diagnostic Time

Diagnostic Time, yr	Radiograph ASD		Symptom ASD	
	Range of Prevalence	Pooled Prevalence	Range of Prevalence	Pooled Prevalence
0.6 to <2	4.8%–82.6%	21.8% (16.0%–27.6%)	0.0%–24.3%	6.5% (4.0%–8.1%)
>2 to <5	8.7%–97.2%	33.6% (21.8%–45.4%)	0.0%–30.3%	12.1% (8.2%–16.0%)
>5 to <10	5.0%–60.6%	37.4% (10.7%–64.1%)	2.8%–29.0%	3.2% (2.3%–4.0%)

ASD indicates adjacent segment degeneration.

- 94 studies with 34,917 pts included for review
- Spine surgery is associated with significant risk for ASD
- Increased intradiscal pressure, annular stress and mobility found at adjacent segments

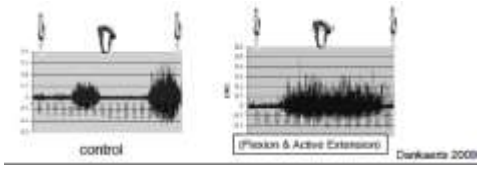
Risk for Adjacent Segment and Same Segment Reoperation After Surgery for Lumbar Stenosis

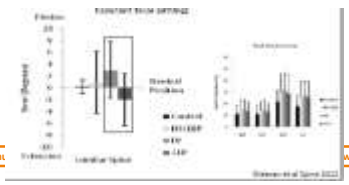
SPINE Volume 38, Number 7, pp 531–539
©2013, Lippincott Williams & Wilkins

- RCT
  - Examined the reoperation recurrence rate after surgery for lumbar stenosis
  - Variables examined for increased risk
    - Demographics
    - Severity of symptoms
    - Obesity
    - Location of surgery (fusion, lami, decompression)
    - Duration of symptoms
      - Only variable that increased risk for future reoperation
        - » Symptoms greater than 12 months prior to first surgery

Now, What About Them?

Muscle Activity and Maladaptive Patterns in Chronic LBP





Body and Mind Relationship

Trunk muscle EMG

Pain
Disability
Depression
Anxiety
Catastrophising
Fear
self efficacy

Denaekerts et al 2009
Lewis et al 2012

Treatment – Cognitive Functional Approach