

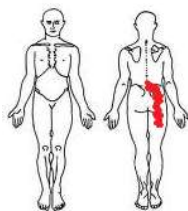


## LUMBAR SPINE CASE 1

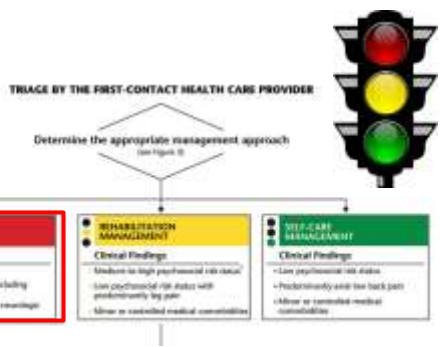
A.J. Lievre, PT, DPT, OCS, CMPT  
Aaron Hartstein, PT, DPT, OCS, FAAOMPT

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



### Differential Diagnosis "Red Flag screening"

## Lumbar Special Questions

- Previous Hx of CA
- Unexplained weight loss
- Night pain unrelieved with movement
- Bowel and bladder changes
  - Urinary retention
  - Bowel incontinence
- Saddle region anesthesia
- Recent infection
- Fever, malaise
- Hx of trauma
- Hx of corticosteroid use
- Hx bone disease
  - Osteopenia/porosis
- Pain with rigorous activity
- Hx Vascular disease
- Hx Connective tissue disorder
- Morning stiffness >60 minutes
- Additional aches and pains
  - Joints or tendons
- Eye symptoms

## Documentation of Red Flags by Physical Therapists for Patients with Low Back Pain

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**The Journal of Manual & Manipulative Therapy**  
Vol. 15 No. 1 (2007), 42-49

**TABLE 1. Red flags item description and rationale**

Red Flag Item	Description	Rationale
Trauma	History of motor or major trauma, motor vehicle accident, fall, strenuous lifting 50 years or more	Possible fracture, especially in an older or osteoporotic patient
Age	50 years or more	Increased risk of cancer, abdominal aortic aneurysm, fracture, infection
History of cancer	Past or present history of any type of cancer	History of cancer increases the risk of cancer-causing low back pain. Back pain may be caused by metastatic tumors arising from the kidney, thyroid, prostate, breast, lung
Fever, chills, night sweats	Fever over 100 degrees Fahrenheit, a sensation of being cold, waking up sweating, temperature changes at night	Constitutional symptoms may increase the risk of infection of cancer
Weight loss	Unexplained weight loss of over 10 pounds in 3 months, not directly related to a change in activity or diet	May be indicative of infection or cancer
Recent infection	Recent bacterial infection such as a urinary tract infection	Increases the risk of infection

**TABLE 1. Red flags item description and rationale**

Red Flag Item	Description	Rationale
Immunosuppression	Immunosuppression resulting from a transplant, intravenous drug abuse, or prolonged steroid use	Increases the risk of infection
Rest/night pain	Pain that is not relieved with rest or awakens a patient at night, unrelated to movement or positioning	Increases the risk of cancer, infection, or an abdominal aortic aneurysm
Saddle anesthesia	Absence of sensation in the second-fifth sacral nerve roots, the perianal region	Cauda equina syndrome
Bladder dysfunction	Urinary retention, changes in frequency of urination, incontinence, dysuria, hematuria	May indicate cauda equina syndrome or infection
Lower extremity neurological deficit	Progressive or severe neurological deficit in the lower extremity	May indicate cauda equina syndrome



- > 5 clinical features that should alert clinician of possible vertebral fracture
  - > >50yo
  - > Female
  - > Major Trauma
  - > Palpable Tenderness
  - > Distracting painful injury



Prevalence of and Screening for Serious Spinal Pathology in Patients Presenting to Primary Care Settings With Acute Low Back Pain

Table 3. Response rate to direct medical history\*

	Results for a possible case		
	of positive answers	of positive questions	of positive features
Screening (n)	88	88	88
Screening (n) (%)	121 (138)	101 (115)	104 (119)
Relative probability of related answers (95% CI)	1.3 (1.1-1.6)	1.1 (0.9-1.3)	1.2 (1.0-1.4)
Screening probability (95% CI)	0.12 (0.08-0.18)	0.10 (0.07-0.14)	0.11 (0.08-0.15)

Table 4. Prevalence of serious spinal pathology among the 100 patients with acute low-back pain presenting to a primary care setting

Spinal Pathology	% of screen positive for spinal pathology	Female:male ratio (95% CI)
Spinal fracture	6	62%:38% (5)
RA	3	83%:17% (2)
MS	1	100%:0% (0)
Cardiac disease (myocardial infarction)	1	50%:50% (0)
Subarachnoid hemorrhage	1	50%:50% (0)
Total	12	67%:33% (7)

Red flags to screen for vertebral fracture in patients presenting with low-back pain. 2013



- Available evidence does not support the use of many “red flags” to help identify vertebral fractures in pts with LBP
  - Combining “red flags” helps to improve usefulness
  - Most useful were trauma, old age, corticosteroid use
- Reliance on subjective “red flags” may lead to excessive imaging leading to increased medical costs and unnecessary exposure to radiation

Red Flags: Skeletal Metastases to the Spine

- Most common in CA of the:
  - Breast
  - Prostate
  - Lung
  - Kidney
  - Thyroid
- CA of breast
  - Metastasize in 47% to 85% of cases
  - Spine is most common site
  - Lumbar vertebral body specifically

## Red Flags: Skeletal Metastases to the Spine

- Clinical Features
  - Severe, incessant, pain
  - “Bone pain”
  - Other sources of pain
    - Nerve compression
    - Soft tissue involvement
    - Compression of viscera
  - Pathologic fracture

Condition	History and Physical Examination Data
Metastatic cancer	Greater risk of fracture by pathologic fracture; more often weight bearing, worse at night. Age over 50. History of cancer. Failure of conservative treatment or failure to improve within 30 days. Unexplained weight loss. Non-traumatic fracture.

Spine (2017) 40:111–119  
 DOI 10.1007/s00381-017-3422-0  
 ORIGINAL ARTICLE

### Screening for malignancy in low back pain patients: a systematic review

Scholar Bruchis · Christopher G. Maher · Kathryn M. Robinson

In conclusion malignancy is rare in low back patients. The most informative tests to screen for malignancy are a previous history of cancer, overall clinician judgement, elevated ESR, and reduced hematocrit. Popular red flags such as unexplained weight loss, age >50, and failure to improve after 1 month have only modest predictive ability and on their own are not useful to screen for cancer.

(Hypertext Text Accessory Article)  
**Red flags to screen for malignancy in patients with low-back pain**  
 2013



**Red flags to screen for malignancy and fracture in patients with low back pain: systematic review**  
 BMJ 2013;347:



## Red Flags: Cauda Equina Syndrome

- Due to massive protrusion, herniation or mass, trauma (manipulation, lumbar puncture etc...)
- Signs and symptoms
  - Mild or severe back pain
  - Bilateral leg pain
  - Multi-segmental weakness, sensory loss, hyporeflexia
  - Saddle paresthesia
  - Bowel and/or bladder dysfunction
  - Sexual Dysfunction

Study	Mean Age (years)	Gender	Duration (days)	Back Pain	Leg Pain	Weakness	Saddle Paresthesia	Bladder/Bowel	Sexual Dysfunction
1	42	50%	10	100%	100%	100%	100%	100%	100%
2	45	50%	10	100%	100%	100%	100%	100%	100%
3	48	50%	10	100%	100%	100%	100%	100%	100%

## Red Flags: Vascular Pain

- Vascular insufficiency or disease can refer to the back or present like referred or radicular pain from the lumbar spine into the lower extremity
  - Abdominal Aortic Aneurism (AAA) refers pain to lumbar spine
    - Risk factors for AAA
      - Cigarette smokers, men>women, >60yo, diabetes, arteriosclerosis, Ehlers-Danlos Syndrome, Marfans Syndrome
  - Intermittent Claudication
    - Activity increases pain, relieved with rest
      - Differentially diagnosed from stenosis with bike or inclined t-mill test

## Red Flags: Spondyloarthropathies

Spondyloarthropathy	Disease Manifestation	Distribution of Arthritis	Extra-Articular Manifestations
Psoriatic arthritis	Psoriasis	Any small or large joint, including DIP joints, sacroiliitis common	Psoriatic pitting of nails common, eye inflammation
Arthritis of inflammatory bowel disease (enteropathic arthritis)	Crohn's disease, ulcerative colitis	Peripheral oligoarthritis, usually knees, ankles Unilateral sacroiliitis to extensive spondylitis	Eye inflammation, mouth ulcers, skin ulcers (pyoderma gangrenosum)
Reactive arthritis (including Reiter syndrome)	After urethritis or dysentery	Sacroiliitis, peripheral oligoarthritis predominantly of large joints of lower extremities, Achilles tendonitis	Eye inflammation urethritis, mouth ulcers, rash, penile rash
Ankylosing spondylitis	Primary spinal arthritis	Spinal and pelvic articulations and entheses, including hips; occasional varying peripheral arthritis	Eye inflammation, aortitis with aortic murmur, lung fibrosis



Flag	Nature	Examples
Red	Signs of serious pathology	Cauda equina syndrome, fracture, tumor
Orange	Psychiatric symptoms	Clinical depression, personality disorder
Yellow	Beliefs, appraisals, and judgments	Unhelpful beliefs about pain: indication of injury as uncontrollable or likely to worsen Expectations of poor treatment outcome, delayed return to work
	Emotional responses	Distress and meeting criteria for diagnosis of mental disorder Worry, fears, anxiety
	Pain behavior (including pain coping strategies)	Avoidance of activities due to expectations of pain and possible injury Over-reliance on passive treatments (hot packs, cold packs, analgesics)
Blue	Perceptions about the relationship between work and health	Belief that work is too onerous and likely to cause further injury Belief that workplace supervisor and coworkers are unsupportive
Black	System or contextual obstacles	Legislation restricting options for return to work Conflict with insurance staff over injury claim Overly solicitous family and health care providers Heavy work, with little opportunity to modify duties

### Yellow Flags

Attitudes and Beliefs	Behaviors
<ul style="list-style-type: none"> <li>- Belief that pain is harmful or disabling resulting in guarding and fear of movement.</li> <li>- Belief that all pain must be abolished before returning to activity</li> <li>- Expectation of increased pain with activity or work, lack of ability to predict capabilities</li> <li>- Catastrophizing, expecting the worst</li> <li>- Belief that pain is uncontrollable</li> <li>- Passive attitude to rehabilitation</li> </ul>	<ul style="list-style-type: none"> <li>- Use of extended rest</li> <li>- Reduced activity level with significant withdrawal from daily activities</li> <li>- Avoidance of normal activity and progressive substitution of lifestyle away from productive activity</li> <li>- Reports of extremely high pain intensity</li> <li>- Excessive reliance on aids (braces, crutches, etc.)</li> <li>- Sleep quality reduced following the onset of back pain</li> <li>- High intake of alcohol or other substances with an increase since the onset of back pain</li> <li>- Smoking</li> </ul>

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### StArT Back Tool

Thinking about the last 2 weeks, list your responses to the following questions:

	Disagree	Agree
1. My back pain has spread down my leg(s) at some time in the last 2 weeks	<input type="checkbox"/>	<input type="checkbox"/>
2. I have had pain in the shoulder or neck at some time in the last 2 weeks	<input type="checkbox"/>	<input type="checkbox"/>
3. I have only realized about <i>distress</i> because of my back pain	<input type="checkbox"/>	<input type="checkbox"/>
4. In the last 2 weeks, I have <i>deserted</i> more often than usual because of back pain	<input type="checkbox"/>	<input type="checkbox"/>
5. It's not really safe for a person with a condition like mine to be physically active	<input type="checkbox"/>	<input type="checkbox"/>
6. <i>Worrying thoughts</i> have been going through my mind a lot of the time	<input type="checkbox"/>	<input type="checkbox"/>
7. I feel that my back pain is terrible and it's never going to get any better	<input type="checkbox"/>	<input type="checkbox"/>
8. In general I have not enjoyed all the things I used to enjoy	<input type="checkbox"/>	<input type="checkbox"/>

6. Overall, how bothersome has your back pain been in the last 2 weeks?

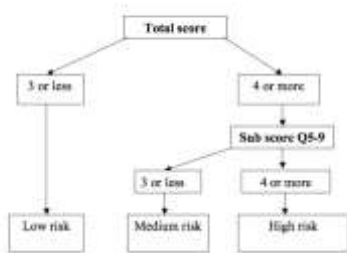
Not at all	Slightly	Moderately	Very much	Extremely
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Total score (0-9) \_\_\_\_\_ Sub score Q5-9 \_\_\_\_\_

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### StArT Back Tool

The StArT Back Tool Scoring System



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### Effect of Stratified Care for Low Back Pain in Family Practice (IMPACT Back): A Prospective Population-Based Sequential Comparison

- 3 Phases of the study
  - Phase 1 Usual Care
  - Phase 2 Implementation of Stratification Screening
  - Phase 3 Stratified Care
    - Low risk = advice, education and self management
    - Medium and high risk = physical therapy

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### Effect of Stratified Care for Low Back Pain in Family Practice (IMPACT Back): A Prospective Population-Based Sequential Comparison

- Phase 1
  - 40% of medium and high risk referred to PT
- Phase 3
  - 72% of medium and high risk referred to PT
- Decreased costs, disability, time off work, medication usage



### Fear Avoidance Belief Questionnaire (FABQ)

- Comprised of 2 subscales:
  - 5-item scale related to fear-avoidance beliefs about physical activity
  - 11-item scale related to beliefs about work
- Valid and reliable in a chronic LBP population
- Clinical usefulness
  - Screening tool for identifying acute LBP patients who will not return to work by 4 weeks



### Modified Oswestry Disability Index



38%



### Oswestry Disability Index - Interpretation

0% to 20%: minimal disability:	The patient can cope with most living activities. Usually no treatment is indicated apart from advice on lifting, sitting and exercise.
21%-40%: moderate disability:	The patient experiences more pain and difficulty with sitting, lifting and standing. Travel and social life are more difficult and they may be disabled from work. Personal care, sexual activity and sleeping are not grossly affected and the patient can usually be managed by conservative means.
41%-60%: severe disability:	Pain remains the main problem in this group but activities of daily living are affected. These patients require a detailed investigation.
61%-80%: crippled:	Back pain impinges on all aspects of the patient's life. Positive intervention is required.
81%-100%:	These patients are either bed-bound or exaggerating their symptoms.



### Treatment-Based Classification System for Low Back Pain: Revision and Update

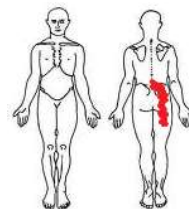
Physical Therapy Volume 36 Number 7



### SUBJECTIVE EXAM

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

- 28yo female onset of right lower back and buttock pain/post thigh pain
- 2 weeks ago Immediate back pain while lifting her 2 year old off the floor. Buttock/thigh pain followed the next day
- LBP and buttock/thigh is an ache which is continuous
- Aggs: sitting, long periods of standing, lifting especially her child
- Eases: walking, lying down
- Pain is activity and positional dependent, occasionally awakes her at night, seems to worsen through the day



### STRUCTURE at Fault:

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

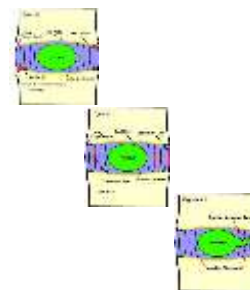
Primary HYPOTHESIS after Subjective Examination: L4-5/5-S1 disc pathology

Differential List (Rank/1 list in order to rule out)

- L4-S1 facet
- SIJ
- Hip Pathology

### Discogenic Pain

- Rim lesion: tears to the outer layer of the annulus
- Circumferential tears: rupture of annular fibers between lamellae
- Radial tears: Fissures from nucleus to outer annular fibers
- Irritation of free nerve endings lead to referral to buttock and posterior thigh
  - Referral down the leg with dural tissue involvement





## Lumbar Disc – Clinical Characteristics

- Protrusion/Prolapse/Annular tear
  - Young adult with history of a back injury
  - Pain in the back with possible referral to buttock and posterior thigh
  - Lateral deviation of the spine
    - Deviate away with posterolateral protrusion
    - Deviate towards with posteromedial protrusion
  - May or may not have neurological symptoms or radicular pain
  - Decreased WB through symptomatic LE if dural involvement
  - Aggravating factors include flexion postures and weight bearing postures



## Lumbar Disc – Clinical Characteristics

- Extruded/Sequestered
  - Moderate to severe back and leg pain
    - Leg pain often worse than back pain
  - Lateral deviation with decreased weight bearing through symptomatic LE
  - Limited trunk movement
  - Radicular pain and radiculopathy likely



## Lumbar Disc Pathology

### Mechanism

- Typical position of injury is forward bent under load with some rotation
  - Forward bent position pushes annulus posterior and stresses posterior annulus
  - Load increases compression and increases stress on annulus
  - Rotation stresses 1/2 annular fibers that are already fully on tension



## Lumbar ROM

- Function During Forward Bending
  - Anterior annulus is compressed and posterior annulus is placed on tension
    - NP is pushed posteriorly
    - If another force is applied in forward bending, most of that force is directed to posterior annulus



## Lumbar Anatomy

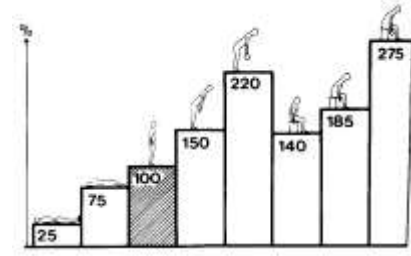
Intervertebral Disc

- **Function During Rotation**
  - Rotation is resisted by 1/2 of the annular fibers (lamellae) depending on their fiber direction
  - Since only 1/2 of the fibers are able to resist the movement, rotation is a motion responsible for injury



## Lumbar Anatomy

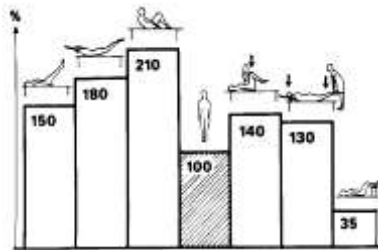
Intervertebral Disc



Comparative Loads on the Lumbar Discs

## Lumbar Anatomy

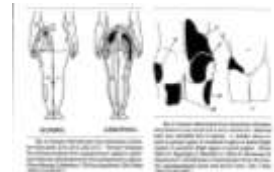
Intervertebral Disc



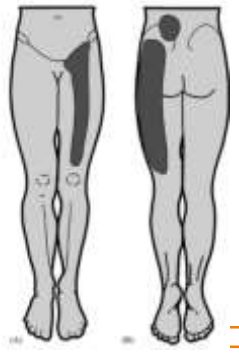
Comparative Loads on the Lumbar Discs

## 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



Original article  
The lumbar multifidus muscle and patterns of pain  
Manual Therapy 11 (2006) 48-53



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### Muscular Pain

- Multifidus
- Erector spinae



Travell & Simons

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### Muscular Pain

- Glute max
- Glute medius



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### Muscular Pain

- Glute Minimus



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## Muscular Pain

- Iliopsoas



## 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

## Observation/Postural Assessment

- Observe in weight bearing and non-weight bearing and in multiple planes

- Weight bearing
  - even/uneven
- LE position
  - Knee flexed, hip ER?
- Spinal alignment
  - Scoliosis
  - Lordosis/Kyphosis
  - Shifting
  - Deviation
- Creases
- Iliac crest height
- Scars (injury, previous surgery)
- Muscle tone (atrophy, spasm)



(+) Shift Trunk to Left

## Lumbar Objective Examination

- Observation/Postural Assessment/Functional Testing
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- Provocation Testing
  - PA, Compression, torsion

## Lumbar AROM Assessment

- Active Motion: assesses the patient's willingness to move and their perception of acuteness.
  - Is the motion limited in a capsular pattern (extension, SB & rotation limited) or non-capsular pattern?
    - Flexion
    - Extension
    - Side bending
    - Seated rotation



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## Lumbar AROM Assessment

- Active Motion
  - Observe for aberrant motion
  - Does the movement reproduce “their pain”
  - Measurements??



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## Lumbar PROM Assessment

- Passive Motion: passive over-pressure at the end of each active motion to assess end feel.
  - Pain experienced prior, at or after resistance helps to determine acuity



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## Lumbar Resisted Testing

- Resisted Testing: tests muscles in lengthened position (if no pain with overpressure) otherwise test in neutral.
  - Graded as painful/painless, weak/strong.



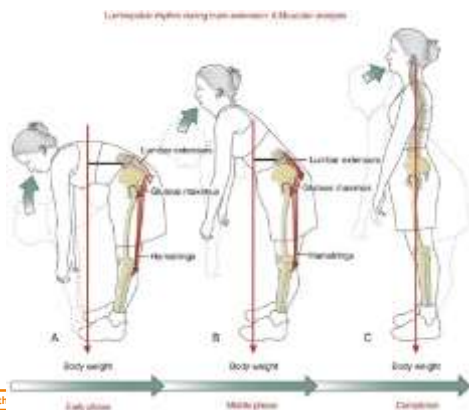
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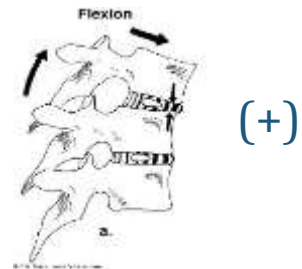
## Lumbar ROM

- Flexion
  - Pt asked to bend forwards
    - Lordotic or flatness at L4-S1 at end of motion is normal except in dancers or gymnasts
  - Over-press at the end of motion by stabilizing the sacrum
    - End feel assessed
  - Isometric resistance assesses lumbar extensors



## Lumbar ROM

- Function During Forward Bending
  - Anterior annulus is compressed and posterior annulus is placed on tension
  - NP is pushed posteriorly
  - If another force is applied in forward bending, most of that force is directed to posterior annulus



## Lumbar ROM

- Extension
  - Pt asked to bend backwards
  - Overpressure with caution
  - No resistance



## Lumbar ROM

- Function During Backward Bending
  - Posterior annulus is compressed and anterior annulus is placed on tension
    - NP is pushed anteriorly



REIS (+) for centralization

## Lumbar ROM

### L SB (+)

- Side Bending
  - Pt asked to bend side ways
    - Compare quantity and quality of movements to other side bend
  - Over-press at the end of motion by stabilizing the iliac crest
    - End feel assessed
  - Isometric resistance assesses contralateral SB's



## Lumbar ROM – Pelvic Translocation



- Passive shift correction (overcorrection?)
- With ROM?
- Centralize/Peripheralize
- Relates to HEP

## Lumbar Objective Examination

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



- 6 SIJ tests
  - Distraction, Compression, Thigh Thrust, Gaenslen's left/right, Sacral Thrust
  - **\*\*6 negative tests can rule out SIJ as source of pain\*\***

## Evidence-Based Diagnosis and Treatment of the Painful Sacroiliac Joint

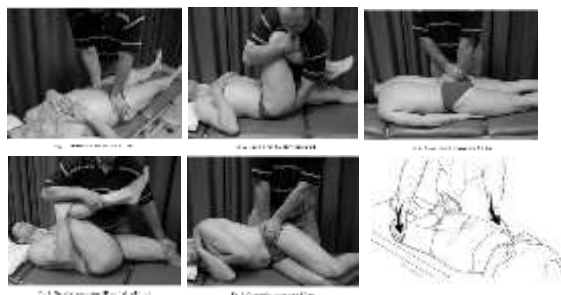
Mark Laslett, FNSCR, PhD, Dip. M.T., Dip. MDT

THE JOURNAL OF MANUAL & MANIPULATIVE THERAPY ■ VOLUME 16 ■ NUMBER 3

**TABLE 1.** Comparison between Laslett M et al<sup>11</sup> and van der Wurff et al<sup>12</sup> studies of the validity of multiples of positive pain provocation SIJ tests.

Diagnostic accuracy statistic	Number of positive provocation SIJ tests									
	1 or more		2 or more		3 or more		4 or more		5 or more	
	ML	PvW	ML	PvW	ML	PvW	ML	PvW	ML	PvW
Sensitivity %	100	100	93	93	91	85	90	26	27	0
Specificity %	44	42	66	58	78	79	11	82	88	100
Positive LR	1.8	1.7	2.7	2.2	4.3	4.0	3.2	1.4	2.1	0
Negative LR	0.0	0.0	0.10	0.13	0.08	0.19	0.69	0.91	0.84	1.00

(-)





## Lumbar Objective Examination

- Observation/Postural Assessment/Functional Testing
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## Lumbar Neurological Testing

- Key Muscle Testing: muscles predominately innervated by 1 nerve root. A maximal contraction is forced and if weakness is felt the test is repeated several times to test fatigueability. Myelopathy will lead to multi-segmental fatigueable weakness, radiculopathy will lead to segmental fatigueable weakness, neuropathy will lead to fatigueable weakness in the muscles innervated by that nerve.
  - L2: Psoas (hip flexion)
  - L3: Quad (knee extension), Hip Adductors
  - L4: Tib ant (ankle DF), Tib post (ankle inversion)
  - L5: EHL (big toe extension), glute med (hip abduction)
  - L5/S1: Peroneals (ankle eversion)
  - S1: Gastroc (heel raises)
  - S2: Hamstrings (knee flexion), Glute max (hip extension)



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## Lumbar Neurological Testing

- Sensation: tested with light touch and followed with sharp touch if light touch is positive. A radiculopathy will cause segmental anesthesia or hypoesthesia, a myelopathy will cause multi-segmental paresthesia or hypoesthesia, a neuropathy will cause anesthesia in a cutaneous distribution.
  - Light touch performed down the entire leg with a dab of tissue paper
  - Sharp touch performed in dermatomal or peripheral nerve pattern where light touch was positive



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## Lumbar Neurological Testing

- Reflexes: hypo-reflexia is due to lower motor neuron lesion, hyper-reflexia is due to upper motor neuron lesion.
  - L3: Patella tendon or hip adductors
  - L4: Tibialis posterior or anterior
  - L5: Medial hamstrings, peroneals or EDB muscle belly
  - S1/2: Achilles or lateral hamstrings

(-)



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## Lumbar Neurological Testing

- Upper Motor Neuron Test
  - Clonus
    - Pt supine, give rapid push into ankle DF
    - 1-2 beats is normal
    - 3-4 beats is positive
  - Babinski
    - Make an "L" shape up the bottom of the foot with end of reflex hammer
    - Toe flexion is normal
    - Toe extension and flare is positive
  - Hoffman's
    - Pt's nail of the 3rd digit is "flicked"
    - IP flexion of the thumb is positive



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## 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



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## Lumbar Neurodynamic Testing

- Slump
- Long-Sit/Sympathetic Slump
- Straight Leg Raise
  - Peripheral Nerve Bias
- Prone Knee Bend



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## Slump Test

(+)



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### Straight Leg Raise (+)



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### Prone Knee Bend Test/Femoral Nerve Test/Ely's Test (-)



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#### AGREEMENT AND CORRELATION BETWEEN THE STRAIGHT LEG RAISE AND SLUMP TESTS IN SUBJECTS WITH LEG PAIN

Jeremy White, PT/MS/ATC and Taly HAL, PT, DPT

Journal of Manipulative and Physiological Therapeutics, Volume 31, Number 1

- Substantial agreement b/w SLR and Slump (K = 0.69)
  - ROM in both significantly reduced vs opp side
- Appropriate test of mechanosensitivity for neural tissue



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#### The Sensitivity and Specificity of the Slump and the Straight Leg Raising Tests in Patients With Lumbar Disc Herniation

JCR: Journal of Clinical Rheumatology • Volume 14, Number 2, April 2008  
 Amir Haghighi, MD, \* Hakan Toprak, MD, † Hakan Ozkan, MD, ‡ and Sadiq Toprak, MD, §

- Slump
  - Sensitivity = 0.84
  - Specificity = 0.83
- SLR
  - Sensitivity = 0.52
  - Specificity = 0.89
- Slump used more to R/O
- SLR may especially help ID pts who have herniations with root compression requiring surgery

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**The Sensitivity of the Seated Straight-Leg Raise Test Compared With the Supine Straight-Leg Raise Test in Patients Presenting With Magnetic Resonance Imaging Evidence of Lumbar Nerve Root Compression** Arch Phys Med Rehabil Vol 90, July 2007

Alan Rehm, DPT, MS, Peter C. Gertzen, MD, MPH, For Karsanby, RN, DSN, Cherrise M. Beuker, PhD, Douglas M. Patten, PM, William C. Mutch, MD



- Sensitivity:
  - Supine SLR 0.67
  - Seated SLR 0.41
- Traditional testing in supine is more sensitive in reproducing leg pain than the seated SLR in patients presenting with s/s of lumbar radiculopathy and (+) MRI

**Upper Limb Neural Tension and Seated Slump Tests: The False Positive Rate among Healthy Young Adults without Cervical or Lumbar Symptoms**

D. Scott Dashi, PT, EdD, DCS, LA, BSN, Anderson, JPT, Mary Grace Carlson, MPT, Catherine L. Eason, MPT, Lindsay B. Stocker, JPT

THE JOURNAL OF MANUAL & MANIPULATIVE THERAPY ■ VOLUME 14 ■ NUMBER 1

- 28/84 asymptomatic had (+) SST at some point in the available range of knee extension
  - Relief of peripheral neural symptoms with cervical extension
- Mean knee extension angle for (+) was 15.1
- Authors suggest that criteria be determined for (+) test using ROM cut-off scores

## 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

## Provocation Testing: Heel Drop Test

- Compression: may identify disc lesions, end plate or vertebral body fractures, by increasing intra-vertebral or intra-discal pressure.
- Pt standing
  - Patient asked to raise up on their toes and drop down quickly onto their heels
  - The test will add compression and vibration to the spine
  - Positive test is reproduction of the pt's pain

(-)

### Provocation Testing: Torsion Test

- Torsion Test: Tests the lumbar spine's ability to tolerate torsional stress
  - May identify fractures, annular tears, joint capsule inflammation through rotation of the spine from below
- Therapist stands to one side of the bed and stabilizes lower T-spine with cranial hand
- Therapist caudal hand grasps opposite ilium and pulls superior



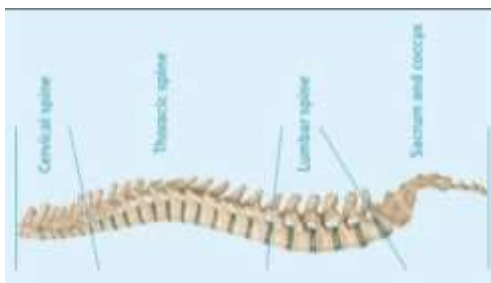
(+)

### Provocation Testing: PA Shear Testing (+)

- P/A Shearing: Tests the ability of the lumbar spine to tolerate shear stress
  - Testing for segment inflammation, mobility or "instability"
  - Helps to localize segmental dysfunction
  - Pain provoking
  - Neutral Zone assessment
- Central
- Unilateral



### Contours of the Spine

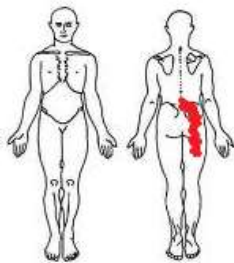


Physical Exam: \*Asthetics\* Signs/Symptoms (Special tests, Movement/Joint Dysfunction, Posture, Palpation, etc)

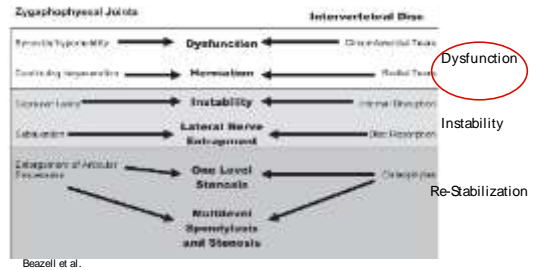
- Observation: Slight lateral shift to the left
- Lumbar ROM: P! lumbar flexion, lumbar L SB limited and P! reproducing LBP, Repeated extension centralized LBP
- (+) Torsion L4-5
- (+) SLR and slump reproducing buttock and posterior thigh pain
- (-) hip and SI clearing
- (+) PA right L4-5 P!
- Oswestry Disability Index = 38% perceived disability

> 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 disc pathology (annular tear/bulge) with dural irritation



## Phases of Degeneration



> What is your primary treatment Objective after initial evaluation?

- Education: **PT diagnosis and prognosis, addressing patient goals, questions and concerns, treatment expectations**
- Manual Therapy: (Specific Techniques): **PA mobilizations L4-5, manual distraction, nerve gliding**
- Exercise Prescription: (Specific): **Repeated movements, lateral shifting correction, squatting maintaining lordosis, extension biased exercises, progressing from NWB to standing to sitting**

What are you going to re assess at subsequent visit? **ROM, provocation testing, neurodynamics**

## The Therapeutic Alliance Between Clinicians and Patients Predicts Outcome in Chronic Low Back Pain

Physical Therapy Volume 93 Number 4 April 2013

- 3 components of therapeutic alliance
  - PT /pt agreement on goals
  - PT/pt agreement on interventions
  - PT/pt affective bond
- Higher levels of therapeutic alliance was associated with better clinical outcomes with pts with LBP

Lumbar MR Imaging and Reporting Epidemiology: Do Epidemiologic Data in Reports Affect Clinical Management?¹

McCullough et al, Radiology 2012



- Prevalence of MRI findings in people without back pain:
  - Disc degeneration 91%
  - Disc height loss 56%
  - Disc bulges 64%
  - Disc protrusion 32%
  - Annular Tears 38%



Radiological imaging for LBP results in:
 

- poorer health outcomes
- poor perceived prognosis
- more likely to have surgery (Sfoan & Walsh 2010)



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## How Do We Communicate This?

Jarvick, 2005, Spine

- The strongest predictor for LBP was depression not MRI findings (2.3x)
- Annular tears, disc degeneration and facet joint arthrosis did not predict LBP
- No relationship between MRI findings and pain/disability
- Our language: Hurtful or Helpful?

Spine MRI did not predict the probability of depression. Furthermore, the MRI report language showed to be linked to 20,000 operations of lumbar decompression surgery through a 10-year period. It is unclear to what extent information of your spinal health needs or concerns, diagnosis, writing, and handling of the report are causes of this information and subsequently back or leg pain.



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### What is your primary treatment Objective after initial evaluation?

- Education: **PT diagnosis and prognosis, addressing patient goals, questions and concerns, treatment expectations**
- Manual Therapy: (opposite, reassurance)
  - PA mobilizations L4-5, manual distraction, nerve gliding**
- Exercise Prescription: (Specific)
  - Repeated movements, lateral shifting correction, squatting maintaining lordosis, extension biased exercises, progressing from NWB to standing to sitting**

What are you going to re assess at subsequent visit? ... **ROM, provocation testing, neurodynamics**

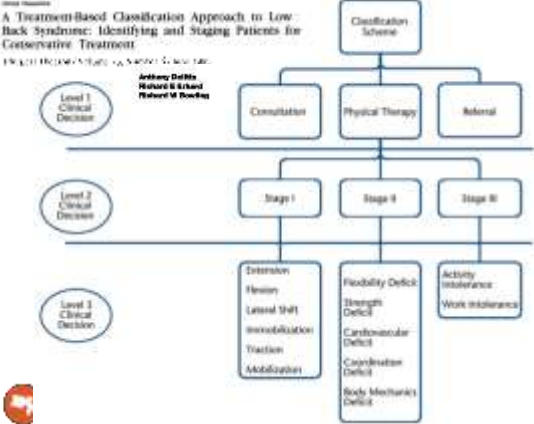


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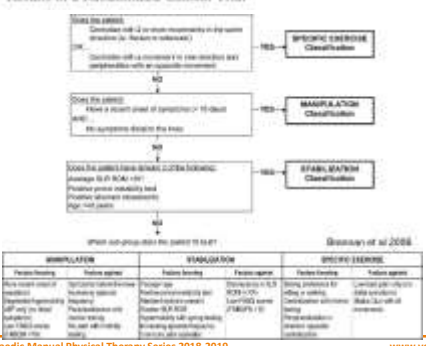
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## Classification Begins (1995)





**Identifying Subgroups of Patients With Acute/Subacute "Nonspecific" Low Back Pain**  
Results of a Randomized Clinical Trial



**Classification of ACUTE/Sub-Acute Low Back Pain**

**[ CLINICAL COMMENTARY ]**

DEB B. PHD, PT, PhD, ATC • JENNIFER S. DUBOIS, PT, PhD, DCS, MSPT • JENNIFER S. DUBOIS, PT, PhD, DCS, MSPT

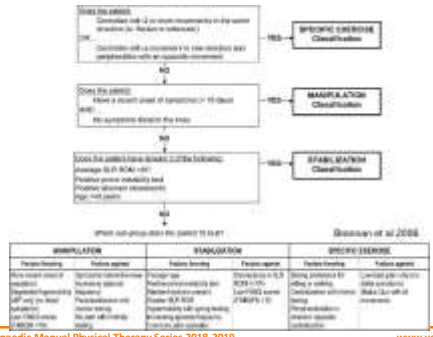
**Subgrouping Patients With Low Back Pain: Evolution of a Classification Approach to Physical Therapy**

**TABLE 1** **Basic and Intermediate Clinical Pathways to Sub-Clinical Pain, Fluctuating Pain, and Persistent Classification and Baseline Clinical Signs on Physical Examination**

Classification	Original Classification Criteria	Updated Classification Criteria
Stabilization	<ul style="list-style-type: none"> <li>Spinal motion restriction (SMR) on passive motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> </ul>	<ul style="list-style-type: none"> <li>No pain-free SMR on passive motion restriction</li> <li>No pain-free SMR on active motion restriction</li> <li>No pain-free SMR on active motion restriction</li> <li>No pain-free SMR on active motion restriction</li> <li>No pain-free SMR on active motion restriction</li> </ul>
Stabilization	<ul style="list-style-type: none"> <li>Spinal motion restriction (SMR) on passive motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> </ul>	<ul style="list-style-type: none"> <li>Spinal motion restriction (SMR) on passive motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> </ul>
Spicings	<ul style="list-style-type: none"> <li>Spinal motion restriction (SMR) on passive motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> </ul>	<ul style="list-style-type: none"> <li>Spinal motion restriction (SMR) on passive motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> <li>Spinal motion restriction (SMR) on active motion restriction</li> </ul>

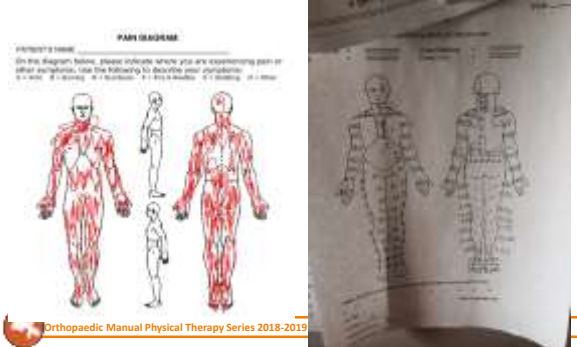


### What Was Classification Missing?



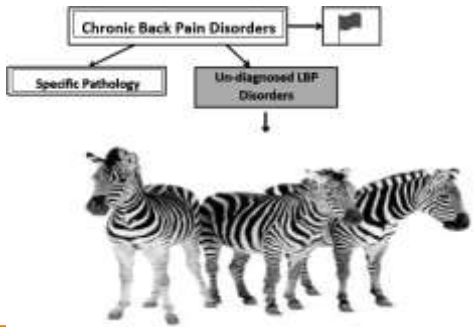
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### Classify This?



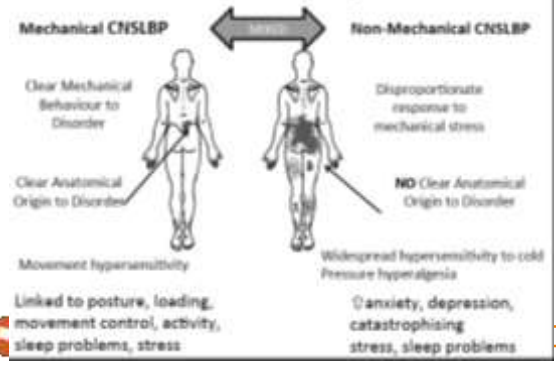
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### CHRONIC Low Back Pain Diagnosis



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### Persistent Back Pain Model Borrowed from O'Sullivan



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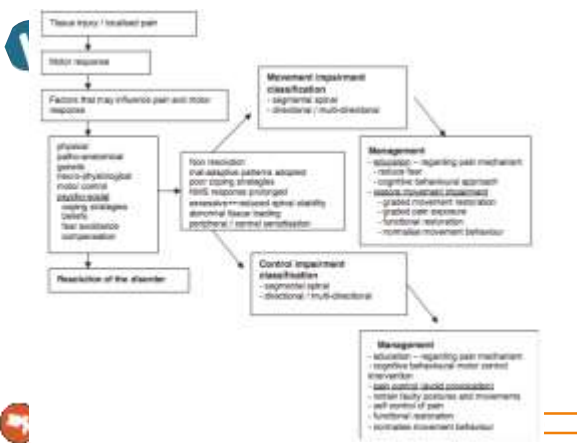
Masterclass

Diagnosis and classification of chronic low back pain disorders:  
Maladaptive movement and motor control impairments as underlying mechanism

Manual Therapy 10 (2018) 242-251

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<p><b>(A) Movement impairment classification</b></p> <p><b>Nature and mechanism of pain:</b> Localised pain +/- referral Severe pain of rapid onset <b>Movement impairment in direction of pain</b> Hyper-awareness of pain Exaggerated reflex withdrawal motor response Muscle guarding and abnormal tissue loading (spinal stability) <b>Avoidance of movement into painful range</b> Disability Directional (flexion, extension, rotation, lateral shift, loading) Multi-directional</p> <p><b>Result:</b> Peripheral pain sensitisation</p> <p>Anxiety related to movement pain <b>Fear avoidance when moving in direction of pain (pathological)</b> Hyper-vigilance <b>Belief that pain is damaging (pathological)</b></p> <p><b>Result:</b> Central pain sensitisation</p> <p><b>Normalisation of movement impairment leads to resolution / control of disorder</b></p>	<p><b>(B) Control impairment classification</b></p> <p><b>Nature and mechanism of pain:</b> Localised pain +/- referral Gradual onset of pain from repeated or sustained strain <b>No impaired movement in direction of pain</b> <b>Lack of awareness of pain triggers</b> Poor lumbo-pelvic position sense Absence of reflex withdrawal motor response Ongoing tissue strain (or, spinal stability) <b>Provocation into painful range</b> Avoidance of painful activity Disability Directional (flexion, extension, rotation, lateral shift, loading) Multi-directional</p> <p><b>Result:</b> Peripheral pain sensitisation</p> <p>Anxiety related to chronic disabling pain <b>Fear of activity (non-pathological)</b> Lack of control and awareness of disorder <b>Belief that activity is damaging (non-pathological)</b></p> <p><b>Result:</b> Central pain sensitisation</p> <p><b>Normalisation of control impairment leads to resolution / control of disorder</b></p>
--	--



“Pain” Subgroup?  
Fear and Catastrophization

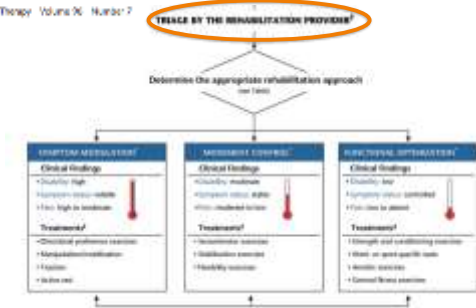
- Well established that cognitions and pain are inter-related
- Patient's beliefs
  - What do they KNOW about their pain?
  - What do they WANT TO KNOW about their pain?
  - What do YOU WANT them to know about their pain?
- Qualitative studies show patients like this want answers to the following:
  - What is wrong with me?
  - How long will it take?
  - What can I (the patient) do?
  - What can you (the PT) do?
  - How much will it cost me?
- To treat patients like this we much change cognitions, belief and fear, before engaging a movement-based approach of therapeutic exercise, manual therapy, pacing and graded exposure
- This cognitive restructuring is done via TNE
  - Therapeutic Neuroscience Education
- Pain is a multiple system OUTPUT activated by the brain based on perceived threat (Moseley)

**“What we think, we become.”**  
Aristotle

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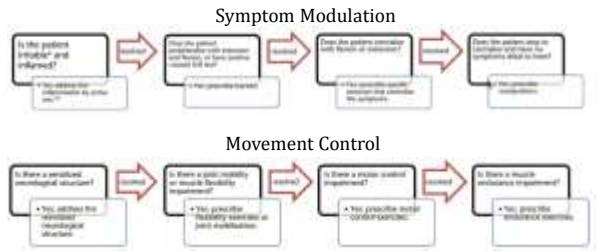
## Treatment-Based Classification System for Low Back Pain: Revision and Update

Physical Therapy Volume X Number 7



## Treatment-Based Classification System for Low Back Pain: Revision and Update

Physical Therapy Volume X Number 7



## What About Classification?

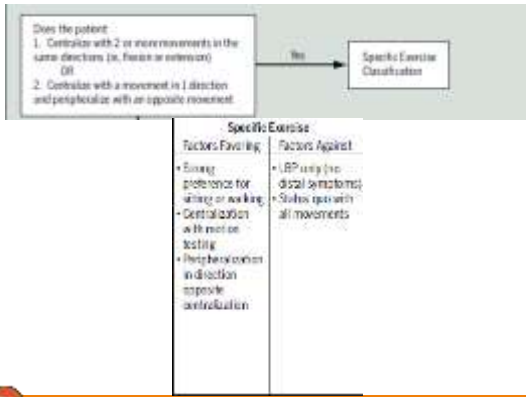
### [ CLINICAL COMMENTARY ]

DEB H. HOLT, PT, PhD, ET; JAMES S. SUDANO, PT, PhD, DPT, NPT; JAMES CHOI, PT, PhD, NPT, DPT, NPT

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

JUNE 2007 | VOLUME 17 | NUMBER 6 | JOURNAL OF ORTHOPAEDIC & SPORTS PHYSICAL THERAPY

TABLE 1	Basic and Hierarchical Classification Framework for Low Back Pain: Functional Classification and Behavior Classification Based on Treatment Evidence
<b>Classification</b>	<ul style="list-style-type: none"> <li>• Symptom modulation (SM) or movement control (MC) or neurologic optimization (NO)</li> <li>• Disability (D) or pain (P) or weakness (W) or high in weakness (H)</li> <li>• Pain (P) or disability (D) or weakness (W) or high in weakness (H)</li> <li>• Pain (P) or disability (D) or weakness (W) or high in weakness (H)</li> </ul>
<b>Behavioral</b>	<ul style="list-style-type: none"> <li>• Behavioral preference exercises</li> <li>• Manual mobilization</li> <li>• Traction</li> <li>• Heat/cold</li> </ul>
<b>Neuromuscular</b>	<ul style="list-style-type: none"> <li>• Neuromuscular exercises</li> <li>• Mobilization exercises</li> <li>• Flexibility exercises</li> </ul>
<b>Strength and conditioning</b>	<ul style="list-style-type: none"> <li>• Strength and conditioning exercises</li> <li>• Flexion or good specific tasks</li> <li>• Neuromuscular exercises</li> <li>• General fitness exercises</li> </ul>



MPH Volume 20, Number 10, pp 241-247 ©2019, Lippincott Williams & Wilkins, Inc.

### Comparison of Classification-Based Physical Therapy With Therapy Based on Clinical Practice Guidelines for Patients with Acute Low Back Pain: A Randomized Clinical Trial

**■ Key Points**

- Patients with acute, work-related low back pain treated using a classification-based approach to physical therapy instead of an approach based on the recommendations of clinical practice guidelines showed greater improvement in disability 4 weeks after initiation of treatment.
- Patients treated using a classification-based approach instead of an approach based on clinical practice guidelines were more likely to return to unassisted work within the first 4 weeks of treatment.
- Patients treated using a classification-based approach instead of an approach based on clinical practice guidelines were more satisfied with their treatment after 4 weeks.
- Treatment using a classification-based approach did not result in increased medical costs, and an overall adverse event trend toward decreased injury, as compared with an approach based on clinical practice guidelines.

**■ Conclusion**

Intermediate-term outcomes were found for patients with acute, work-related LBP when they were treated using a classification-based approach to physical therapy instead of an approach based on the recommendations of clinical practice guidelines without regard for an individual patient's signs and symptoms. Although the current study examined only one patient population and clinical presentation, the authors believe that identifying relevant classifications of patients with LBP might improve clinical outcomes, and will enhance the power of future clinical trials. Further research is needed to define optimum criteria for classifying and treating patients with acute LBP.

• Median total medical costs for 1 year after injury were \$1003.68 for the guideline-based group and \$774.00 for the classification-based group

2018-2019 [www.vompti.com](http://www.vompti.com)

MPH Volume 20, Number 10, pp 233-241 ©2019, Lippincott Williams & Wilkins, Inc.

### Identifying Subgroups of Patients With Acute/Subacute "Nonspecific" Low Back Pain: Results of a Randomized Clinical Trial

Geard P. Brennan, PhD, PT,\* Julia M. Fritz, PhD, PT, ATC,\* Stephen J. Hance, MS, PE, CSC,\* Anne Thackeray, PT,\* Anthony Delitto, PhD, PT, FAPTA,† and Richard E. Bradd, DC, PT†

• Better clinical outcomes (ODI) found when patients received matched treatment based on their classification

- Short term (4 weeks)
- Long term (1 year)

Figure 3. Oswestry scores for patients receiving matched or unmatched treatments (intention-to-treat analysis). P values represent differences between the baseline and follow-up scores.

Orthopaedic Manual Physical Therapy Series 2018-2019 [www.vompti.com](http://www.vompti.com)

MPH Volume 20, Number 10, pp 233-241 ©2019, Lippincott Williams & Wilkins, Inc.

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**■ Key Points**

- Identification of patient subgroups on the basis of their signs and symptoms allowed for more patients with low back pain, involving a diagnosis label of "nonspecific" low back pain, to be classified as patients with "nonspecific" low back pain based on signs and symptoms that were unaccompanied by mechanical and clinical, and supported by more evidence as a result of the study outcomes.
- The study physical therapists with standardized low back pain into one of three treatment subgroups based on their initial signs and symptoms (mechanical, nonmechanical, or specific diagnosis), then randomized patients to receive one of the three treatments.

• The most well-validated classification of LBP is based on the mechanical, nonmechanical, or specific diagnosis group and subgroup, since that patients requires the treatment matched to their signs and symptoms (nonmechanical, mechanical, or specific diagnosis).

• Treating a work-related injury patient with "nonspecific" low back pain can improve the outcomes of care.

**■ Conclusion**

The results of this study build on prior findings suggesting that "nonspecific" LBP is actually a heterogeneous condition. Identifiable subgroups of patients can be identified based on signs and symptoms from the clinical examination. Better clinical outcomes can be achieved when subgrouping is used to guide treatment decisions.

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Spine  
 VOLUME 42 | NUMBER 14 | SEP 15 2015 | 1114  
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RANDOMIZED TRIAL

### A Randomized Controlled Trial on the Effectiveness of a Classification-Based System for Subacute and Chronic Low Back Pain

Adri F. Apolunan, PhD;†; Raymond W. Christy, PhD;†; Hans van Tulder, MA;‡; John M. Fritz, PhD;‡; Dirk L. Bredt, PhD;†; Marcia W. van Tulder, PhD;†;† and Patricia CW de Vet, PhD;†

- No sig differences in any outcomes at 8, 26, and 52 weeks between classification group and “usual PT treatment” group
- Previous studies have shown modest sig improvements when pts are classified
  - Acute and subacute non specific LBP

CLINICAL GUIDELINES

ARTHUR REULTY, PT, PhD • STEPHEN J. GARDNER, PT, PhD • JONAS WIKELLINEN, PT, PhD • JESSE M. BRITTON, PT, PhD • BRIGITTE M. BIRNBAUM, MLT, PhD • PAUL BARNETT, L. MEd, PhD • THOMAS G. ZIMMERMAN, DPT • KRISTINA J. ZIMMERMAN, DPT, PhD

### Low Back Pain

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability, and Health from the Orthopaedic Section of the American Physical Therapy Association

J Orthop Sports Phys Ther 2015;45(11):652-662. doi:10.2519/jospt.2015.5202

**A INTENTIONS – MANUAL THERAPY**  
 Clinicians should consider offering thrust manipulative procedures to reduce pain and disability in patients with mobility deficits and acute low back and neck-related buttock or thigh pain. Thrust manipulative and nonthrust mobilization procedures can also be applied to shoulders and hips to help reduce pain and disability in patients with subacute and chronic low back and neck-related lower extremity pain.

**B INTENTIONS – LOW-DOSAGE MOVIE MOBILIZATION PROCEDURES**  
 Clinicians should consider offering lower-quarter cervical/thoracic procedures to reduce pain and disability in patients with a clearly established low back pain and existing gait.

**C INTENTIONS – TENSION**  
 There is conflicting evidence for the effectiveness of the tension method for patients with low back pain. There is preliminary evidence that a subgroup of patients with chronic low back pain, including patients with predominant or predominant/combined straight leg raises will benefit from extended lumbar traction in the same cohort as. There is moderate evidence that clinicians should not offer traction as a first-line treatment for reducing symptoms in patients with acute or chronic, nonradicular low back pain or in patients with chronic low back pain.

**INTENTIONS – CRYSTAL EXPOSURE AND DIRECTED PROPHYLACTIC AND PREVENTIVE**  
 Clinicians should provide crystal exposure treatments, such as heat, or procedures to provide or facilitate to reduce symptoms in patients with acute low back pain who do not respond to first-line care. Clinicians should consider using repeated sessions in a typical 2-week treatment course to reduce or prevent low back disability and reduce symptoms in patients with acute, subacute, or chronic low back pain with existing deficits.

Category of Evidence	Intervention	Intervention Details
Strong evidence	Thrust manipulative	Low back pain
	Nonthrust mobilization	Low back pain
Moderate evidence	Thrust manipulative	Low back pain
	Nonthrust mobilization	Low back pain
Limited evidence	Thrust manipulative	Low back pain
	Nonthrust mobilization	Low back pain
Insufficient evidence	Thrust manipulative	Low back pain
	Nonthrust mobilization	Low back pain
No evidence	Thrust manipulative	Low back pain
	Nonthrust mobilization	Low back pain

### Effectiveness of an Extension-Oriented Treatment Approach in a Subgroup of Subjects With Low Back Pain: A Randomized Clinical Trial

Physical Therapy Volume 87 Number 12 December 2007

- 48 subjects with LBP radiating into the buttock and thigh whose pain was found to centralize with repeated extension movements
- 2 groups
  - Extension oriented treatment approach (EOTA)
    - Repeated extension exercises
    - PA mobilizations
  - Stabilization group as described by Hicks et al
- EOTA showed sig improvements in disability measures at 1 week, 4 week and 6 month follow-ups

### Efficacy of Directional Preference Management for Low Back Pain: A Systematic Review

Luhe D, Surlitt, Josh E, Ford, Andrew J, Maher, Tania Pizzari, Joan M, McMeekin

Volume 92 Number 5 Physical Therapy May 2012

- Some evidence through RCT to support directional preference management
  - Short term and intermediate effects
  - However no significant evidence and some studies show no effect



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### The Immediate Reduction in Low Back Pain Intensity Following Lumbar Joint Mobilization and Prone Press-ups Is Associated With Increased Diffusion of Water in the L5-S1 Intervertebral Disc

MAY 2010 | VOLUME 40 | NUMBER 5 | JOURNAL OF ORTHOPAEDIC & SPIRITUAL PHYSICAL THERAPY

- Pt's with LBP who were classified into an extension based treatment group
- Looked at diffusion of water from the L5/S1 disc after press ups and PA mobs
- Relationship found between significant reduction of pain and significant increase in diffusion of water from the disc



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The effect of increasing sets (within one treatment session) and different set durations (between treatment sessions) of lumbar spine posteroanterior mobilisations on pressure pain thresholds.

Manual Therapy xxx (2012)

- Assessment of PPT at L4 before, during and after PA mobilizations
  - 19 asymptomatic subjects
- Compared up to 5 sets of either 30 or 60 seconds of mobilizations
- 4+ sets of mobilization achieved the greatest change in PPT
  - No sig difference between 30-60 sec



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### The Immediate Effect of Posteroanterior Mobilization on Reducing Back Pain and the Stiffness of the Lumbar Spine

Archives of Physical Medicine and Rehabilitation 2011;92(6):771-4

- Looked at the effects of grade 3 PA mobilizations to L4 on pain and mobility
  - Symptomatics and asymptomatics
  - No control
- Significant improvements in reported pain found in symptomatic group following 3 cycles of 60 second mobilizations
- Significant improvements in ROM flexion and extension for both groups after mobilizations



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## Lumbar Treatment PA mobilization



Central PA



Unilateral PA in extension

## Lumbar Treatment – Lumbar Extension in SB



- Control Group
  - Lumbar mobilization and exercise
- Experimental Group
  - Slump stretching, + control group treatment
- Sig improvement in all outcome measures for experimental group

## Slump Stretching

- Slump Stretch
  - Therapist OP cervical flexion in position shown
    - Holds 5 x 30 seconds
  - HEP in position shown
    - Holds 2 x 30 seconds



### Effect of slump stretching versus lumbar mobilization with exercise in subjects with non-radicular low back pain: a randomized clinical trial

Journal of Manual and Manipulative Therapy 2012 vol. 20 no. 1

- 60 pt with non radicular LBP and no neurological signs
  - Pt had pain > 3 months
- Control Group
  - Lumbar mobilization and ther-ex
- Experimental group
  - Control Rx plus slump stretching
- Sig improvement for all outcome measures for experimental group

### Slump Stretching

Journal of Manual and Manipulative Therapy 2012 vol. 20 no. 1



5 reps of 30 second holds  
2x week x 3 weeks



2 reps of 30 second holds  
Daily

#### Associated Factors for expected outcome

Favorable

- Centralizes with movement, age,
- first episode, recent onset

Unfavorable

- Radiating symptoms, no help at home

➤ If referral to other providers is indicated, identify Specific Recommendations:

Pain management for possible steroid injection or spine surgeon for consultation

#### Early Intervention for the Management of Acute Low Back Pain

A Single-Blind Randomized Controlled Trial of Biopsychosocial Education, Manual Therapy, and Exercise

- Control group (assess/advise/wait)
  - Entry into PT after 6 weeks of symptom onset
- Experimental group (assess/advise/treat)
  - Entry into PT within 6 weeks of symptom onset
- 6 month follow-up
  - Experimental group demonstrated significantly better outcomes in Disability, Mental Health, Anxiety, General Health, Vitality, **Depression**, Social Function
  - Control group was 31% more likely to develop **depression** compared to experimental group



## Primary Care Referral of Patients With Low Back Pain to Physical Therapy

Impact on Future Health Care Utilization and Costs

Julie M. Fritz, PT, PhD, ATC,\* John D. Childs, PT, PhD,† Robert S. Wainner, PT, PhD,‡ and Timothy W. Flynn, PT, PhD§

SPINE, Volume 37, Number 25, pp 2114-2121  
© 2012, Lippincott Williams & Wilkins

- 76,967 pt with diagnosis of LBP presenting to primary care identified over 18 month
- PT utilization associated with higher healthcare costs over 18 month period
  - Early PT associated with significantly less healthcare use compared to delayed PT
    - Decreased advanced imaging, additional physician visits, surgery, injections and opioid use



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Review article

## Centralization and directional preference: A systematic review

Stephen May<sup>1,2</sup>, Alessandro Aina<sup>3</sup>

Manual Therapy 2002; 11-31

- Centralization is a common clinical finding that can be reliably identified
- Phenomenon has important therapeutic and prognostic value
  - Centralization associated with good prognosis in 21/23 studies examined
  - Significantly less likely to have surgery
- Non-centralization associated with poorer prognosis



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## Which Prognostic Factors for Low Back Pain Are Generic Predictors of Outcome Across a Range of Recovery Domains?

Chad E. Cook, Kenneth E. Coombes, Bryan J. O'Neilson, Christopher E. Shevchenko, Vincent J. Sabharwal, Adam F. Gooch, Heidi A. Wright

Volume 93 Number 1 Physical Therapy | January 2013

- 10 prognostic variables were selected
- Meeting the CPR for lumbar manipulation was greatest predictor of positive outcome regardless of treatment choice
  - Initial symptom irritability and age were next variables



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SPINE, Volume 37, Number 1, Jan 1, 2013  
DOI: 10.1227/00006123-201301000-00010

## Prognostic Factors for Low Back Pain in Patients Referred for Physiotherapy: Comparing Outcomes and Varying Modeling Techniques

- Most gains made occur within first 3 months after intervention
  - Modest gains beyond that
- Most consistent prognostic variable was duration of symptoms prior to intervention
  - Paying job
  - Intensity of symptoms
  - Functional disability index



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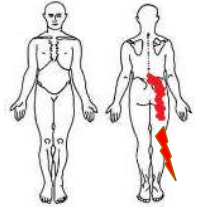
## Pattern Recognition

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

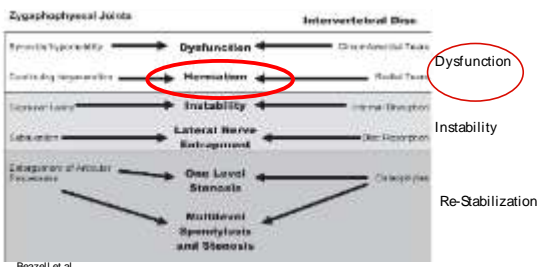
Subjective	Physical
<p>MOI: lifting injury</p> <p>Back pain with referred pain into the buttock and thigh</p> <p>Pain exacerbated with lifting and flexion postures</p> <p>Pain alleviated with extension postures</p>	<p>Flexion motion of the lumbar spine increases lumbar spine pain and referred pain</p> <p>Lateral shift posture</p> <p>Repeated extension centralizes pain</p> <p>+ neurodynamic testing reproducing their peripheral symptoms</p>

## Alternate Ending – Case 1b

- Same patient, 5 yrs later
- Another episode of symptoms after catching her 7 y/o jumping off the couch, describing flexion/rotation mechanism
- Describes similar LBP as previous episode but now with sharp, shooting, burning, radiating symptoms along posterior-lateral hamstring, lateral calf and dorsal foot with occasional numbness/tingling into toes
- Symptoms described as severe with more constancy and chemical irritability



## Phases of Degeneration



## Lumbar Disc – Clinical Characteristics

- Extruded/Sequestered
  - Moderate to severe back and leg pain
  - Leg pain often worse than back pain
  - Lateral deviation with decreased weight bearing through symptomatic LE
  - Limited trunk movement
  - Radicular pain and radiculopathy likely



## Radicular Pain

- Pain as a result or irritation of a nerve root or spinal nerve
  - Can occur without radiculopathy
- Quality of radicular pain is “lancinating”
  - Thin band traveling down an extremity
- Disc herniation is the #1 cause of radicular pain
  - Nuclear material starts an inflammatory response
    - Chemicals of inflammation irritate nerve root
    - Edema can lead to compression causing radiculopathy
    - Inflammation also irritates dura leading to somatic referred pain



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## Radiculopathy

- Neurological condition where nerve conduction is compromised
  - Due to compression or ischemia
  - Leads to weakness and/or sensation loss not pain
    - Pain is due to noxious stimuli to somatic structure (referred) or nerves (radicular)
      - Compression and ischemia is not noxious



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## Lumbar Radiculopathy

- Epidemiology
  - Prevalence of lumbosacral radiculopathy is approx. 3% - 5%
  - Distributed equally in men and women
  - Men most likely to develop symptoms in 40s
  - Women most likely to develop symptoms between 50-60



**Degenerative**  
Intervertebral disk herniation  
Degenerative lumbar spondylosis

**Neoplastic**  
Primary tumors:  
Ependymoma  
Ependymoma  
Neurofibrosarcoma  
Lymphoma

**Systemic**  
Diabetes  
Eosinophilia  
Hemangioendothelioma  
Paraneoplastic  
Sarcoidosis  
Tuberculosis  
Pneumocystis  
Mycobacterium  
Lymphomatous metastasis

**Infectious**  
Herpes zoster (VZV)  
Coccidioidomycosis (Coccidioides immitis)  
HIV/AIDS (central pontine myelinolysis)  
Lyme disease

**Allopathic/radiation-induced**  
Epididymo-orchitis  
Ampylous spondylitis  
Paget's disease  
Avascular necrosis  
Sarcoma

**Developmental**  
Tethered cord syndrome  
Diastematomyelia

**Other**  
Lumbar spinal cysts  
Pars interarticularis



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## Lumbar Radiculopathy Presentations

Root level	Pain	Weakness	Sensation	Motor
L1	Inguinal region	None	None	None
L2	Groin, anterior thigh	Anterior thigh	None	None
L3	Anterior thigh to knee, anterior leg	Medial thigh and knee	Quadriceps, hip adduction	Knee jerk
L4	Medial thigh	Medial lower leg	Tibial extension, quadriceps, hip adduction	Knee jerk
L5	Lateral thigh and lower leg, dorsum foot	Lateral lower leg, dorsum foot, peroneus	Toe extension and flexion, ankle dorsiflexion, peroneus anterior and lateral, hip abduction	Ankle jerk
S1	Posterior thigh, calf, heel	Heel, lateral foot and ankle, lateral two toes	Plantar flexion, inversion, eversion, toe flexion	Ankle jerk
S2-4	Medial back/heel	Medial back/heel, posterior region	None unless S2-3 involved	Reflexes: none, and weak, ankle jerk if S3 involved



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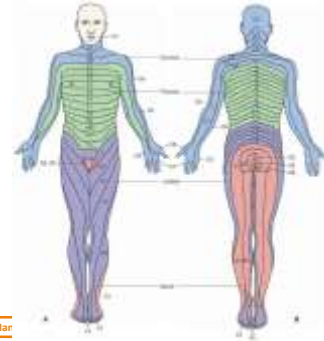
## Lumbar Disc Pathology Herniation

- Vertical orientation of the L/S roots
- Typical posterolateral disc herniation may effect the nerve root exiting the IVF below
  - L4-5 disc effects L5 nerve root
- Posteromedial disc herniation may effect the nerve root exiting 2 IVF below
  - L4-5 disc effects the S1 nerve root



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## Lumbar Radiculopathy Lower Extremity Dermatomes



Orthopaedic Man [www.vompti.com](http://www.vompti.com)

## Lumbar Mobilization with Neurodynamic Positioning (Elvey)



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Manual unloading of the lumbar spine: can it identify immediate responders to mechanical traction in a low back pain population? A study of reliability and criterion referenced predictive validity  
*Journal of Manual and Manipulative Therapy* 17(6)

- Test shows good predictive validity for those who would benefit from mechanical traction



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### Manual Traction/Unweighting Options



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### The Effectiveness of Mechanical Traction Among Subgroups of Patients With Low Back Pain and Leg Pain: A Randomized Trial

NUMBER 2019 | VOLUME 46 | NUMBER 6 | JOURNAL OF ORTHOPAEDIC & MANIPULATIVE PHYSICAL THERAPY

No difference found between EOTA and an EOTA with mechanical traction for treatment of lumbar radiculopathy

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### Combined Movement Treatment



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### Lumbar Treatment – SB PPIVM Progression



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## Lumbar Treatment PA mobilization



Central PA



Unilateral PA in extension

