



**Rehabilitation
& Performance**
INSTITUTE

The Lumbar Spine



The Lumbar Spine

ASSESS

Initial Observation

- Posture of the spine
- Gait, limp, foot drop, decreased weight bearing
- Facial expressions
- Posterior Inspection: medial arches, calcaneal deviations, popliteal folds, gluteal folds, PSIS, Iliac crests, greater trochanter, waist angle, scapular levels, head position.
- Lateral Inspection: knee, hip, pelvic angle, spinal curves, position of head
- Anterior Inspection: mortise angle to the tibial tuberosity, patellar direction and level, Q angle, iliac crests, navel position, clavicles, nose position, and head position

Active ROM

- Quick tests for general function
 - Take a deep breath and hold, then bear down-increase in thecal pressure and referred pain from ribs
 - Go up on balls of feet and drop down quickly. Causes compression of the spine. **Do not perform with questionable disk problem.
 - Walk on balls of feet-S2, then on heels-L5. Look for fatigue on a neuromuscular basis
 - Squat-L2,3,4
 - Trendelenburg sign-L5
- Weight Bearing ROM
 - Check forward flexion, extension, rotation and sidebending
 - Repeated movements-10 repetitions each
 - Assess combined movements
 - Flexion, rotation and SB to same side and opposite sides
 - Extension, rotation and SB to same side and opposite sides
- SFMA
 - Assess standing forward flexion, extension, and rotation for general movements of the lumbar spine, coordination, and deviations

Multi-segmental Flexion Breakout	Multi-segmental Extension Breakout
Single Leg Forward Bend Long Sitting Active SLR (70) Passive SLR (80) Prone Rocking Supine Knee to Chest	<u>Spine extension (Part 1 of 3)</u> - Backward bend w/o UE (ASIS in front of toes, spine of scapula behind heels, uniform curve) - Prone press up with airex under thighs (elbows fully extended, ASIS stays in contact with airex, uniform curve) - Active LL IR rot/ext test (50 deg) - Passive LL IR rot/ext test (50 deg) - Active prone on elbow ext/rot test (30 deg) - Passive prone on elbow ext/rot test (30 deg)

Passive Movements-to be done with pt sitting in abducted position, arms crossed over chest

- Flexion-therapist supports under pts arms and lowers into flexion
- Extension-therapist supports under pts arms and raises pts arms with other hand at the apex of the lordosis
- Sidebending-therapist reaches arm through pts folded arms and supports at far side of shoulder and pulls pts toward his/her body
- Rotation-therapist reaches through pts arms and rotates pt toward him/her on a vertical axis.
- Three dimensional flexion, SB and rotate toward therapist, extend SB toward and rotate away from therapist

Resisted movements: done in ABD seated position. Patient's arms folded across chest

- Flexion-therapist resists under pts arms in neutral spin
- Extension-therapist resists extension on top of pts folded arms
- Side Bending-therapist supports pts far side shoulder and hip. Therapist resists SB against chest
- Rotation-support posterior shoulder and far side posterior hip. Resist rotation away from therapist.

Palpation

- Posterior-pt prone
 - Temperature and moisture
 - Histamine reaction by scratching thumbs along both sides of the spine
 - Skin roll test
 - Iliolumbar ligaments
 - Glute medius and maximus
 - All bony structures

Neurology

- Dermatomes
 - L1,2,3-superior anterior thigh
 - L3-Medial aspect of the knee
 - L4-lateral aspect of the knee to medial malleolus
 - L5-lateral leg and dorsum of the foot
 - S1-lateral side of foot and plantar aspect of foot
 - S2-posterior medial thigh
- Myotomes
 - L1-3-iliopsoas-Femoral N

- L2-4-quadriceps-Femoral N
- L4-anterior tibialis-deep peroneal N
- L5-extensor hallucis longus-deep peroneal N
- S1-peroneus long and brev-sup. Peroneal N
- S1-2-gastrocnemius-tibial N
- Secondary tests
 - Hip adductors-obturator N
 - Gluteus Medius-superior gluteal N
 - Gluteus Max-inferior gluteal N
- Reflexes
 - L4-patellar tendon; L5-hamstring tendon; S1-achilles tendon

Special Tests

- Neurological
 - Babinski sign
- Neuro tension tests (**YouTube**)
 - Slump Test
 - Femoral N tension test (Ely's Test)
 - Kemps Test
 - Laseque's Test-differentiates back vs hip pain
 - Cram's Test
- Perform special testing of SI, Hip and thoracic spine to rule in/out involvement of these structures.

Specific Mobility Testing-see manual therapy section for appropriate techniques

RESET THE SYSTEM

Lumbar Spine Mobilizations

- Sidelying Cranial to Caudal Rotation



- Flexion



Make sure patient's spine is straight and NOT rotated.

- Extension
- Sidebending (assessing)



Clinician leans back and bends knees to SB. Palpation is between the 2 spinous processes. Can also assess in prone.

Lumbar Spine Manipulations

- Sidelying- there are multiple ways of achieving SL manipulation; will review.

Prone PA glides and UPA Glides

Considerations:

- Mechanoreceptors=type I/II
- Block at appropriate segment
- Make sure spine is supported (no sinking in around waistline)
- Pre-rotate with lumbar rotation

Manual Techniques to Reset MSF Breakout:

Purpose	Technique	Set Up	Direction of Force
Improve hip flexion JMD	Post. Glide of joint	Pt supine hip at 90 degrees and adducted	Give Pressure down and lateral
Improve hip flexion JMD	Distal Glide of femur	Pt supine, pelvis fixed to table with belt. Pt distracts at Malleoli	Leg at 30 degrees flexion, 30 degree abduction, pull
Resolve hip flexion TED from Ant Impingement	STM or IATM to Rectus, Psoas, and Iliacus	Supine	Ant to post pressure, technique can vary
Improve lumbar flexion JMD	Lumbar flexion mobs/Manipulation	Manip- SI, knee flexed, and shoulder and body rotated Mobs- SL with flexion and post force through knee. PT stabilize at L5	
Resolve lumbar flexion TED	STM to paraspinals and QL	Prone or SL	TRP, AMP, FDN
Resolve sacral flexion JMD	Ant glide of base of sacrum SI manipulation	Prone pillow under hips Supine, body	Give anterior force at base
Resolve Post Chain TED	IASTM/STM to HS	Prone/Supine	AMP, TPR, FDN
Thoracic Flexion JMD	Thoracic spine flexion based manipulation	Patient in supine with arms crossed	Wrap arm around patient and grip spinous process; traction down; put pressure through the patient's elbows and thrust

Manual Techniques to Reset MSE Breakout:

Purpose	Technique	Set Up	Direction of Force
Resolve TED for extension/rotation limitation	Pick your flavor of soft tissue work		The one that gets the CNS and/or local response you trying to accomplish
Resolve JMD for TS ext/rot limitation	Prone PA manipulation	Prone	PA
Resolve JMD for LS ext/rot limitation	Gapping	https://www.youtube.com/watch?v=C_r38DPL7wE	
Resolve TED for hip extension	Pick your flavor		The one that gets the CNS and/or local response you are trying to accomplish
Resolve JMD for hip extension	Prone PA mob	Prone, pt. relaxed, hypothenar aspect of hand over proximal femur	PA
Resolve TED for shoulder flexion limitation	Use local exam to determine where limitation is coming from		The one that gets the CNS and/or local response you are going for
Resolve JMD for shoulder flexion limitation	Inferior G-H mobs	Supine, shoulder open packed, web space just off acromion	Mob inferiorly toward pt. feet
Resolved JMD for shoulder flexion limitation	Posterior G-H mobs	Supine, shoulder open packed, can adjust shoulder position for different feel, web space just off acromion	Mob posteriorly toward floor
Resolve JMD for shoulder flexion limitation	AC and SC joints	Supine – stabilize at clavicle with hook grip, mob at acromion or sternum; you may also be able to stabilize at acromion and mob distal clavicle	As tolerated posteriorly
Consider ankle DF ROM if everything else looks good – you should find this elsewhere in SFMA exam though			

REINFORCE THE CORRECTION

Patient Education:

- Activity modification- ADLs/ ANLs
- Driving
- Sleeping positions/ hygiene
- Breathing
- Postural education
- Lifting mechanics
- **Chronic Pain Management**
 - Educating the patient about chronic pain and understanding their circumstances.
 - If they are experiencing a chronic pain problem, it does not take much activity to stimulate extra-sensitive nervous tissue, which impacts their ability to move and perform activities.

Basic Reinforcement Interventions:

- “The Stick” – Reinforces any soft tissue work and helps remove additional TEDs
 - Along ITB and piriformis
- Foam Roller- Reinforces any soft tissue work and helps remove additional TEDs
 - Along lumbar spine paraspinals, ITB, hip flexors, piriformis
- Stretches- assisting with various TEDs
 - Quadriceps, hamstrings, gastrocnemius/ soleus, ITB, hip flexors, piriformis, adductors, hip internal and external rotators, quadratus lumborum, pretzel stretches, quadruped rock backs, butterfly stretch, DKTC, lumbar paraspinals

Reinforcement Techniques for MSF Breakout Pattern:

Purpose	Technique	Set Up or Directions
Reduce Tone of hip flexor limiting hip flexion	Foam roller on hip flexor	Pt prone, roll just under hip flexors
Reduce tightness in gluts and lat Rotators	Foam Roller	Pt seated on roller, hands behind body, roll back and forth
Reduce paraspinal and QL tone to improve lumbar flexion	Foam Roller	Supine or SL for QL
Improve Sciatic N Tension	Seated Sciatic N. Glides	In sitting; With ball in supine; or in supine with varying levels of hamstring tension
Improve Hamstring Flexibility	Foam Roller Door way Contract/Relax Stretch	

Reinforcement Techniques for MSE Breakout:

Purpose	Technique	Set Up or Directions
Self-reset for increased muscular tone	Foam rolling	TS, LS (I have no idea why people avoid this), lat, pec, rectus femoris, TFL
Self-reset for reduction in abdominal tone	Lying prone over a ball (won't work if there is significant adipose tissue) – size of ball varies by person, but relatively firm	Allow abs to sink into and around ball
Self-reset for reduction in abdominal tone	Diaphragmatic breathing	In the most challenging position they can do it in
McConnell taping for scap ret/dep – use with excessive upper trap or pec tone after treating	Seated or standing	Tape from anterior acromion to below inferior angle of ipsilateral scapula. Pt. takes deep breath in, and on breath out, pull tape inferiorly/medially using your off hand to tack down to cover roll
Maintain thoracic extension	Leukotaping for thoracic extension	Start tape just lateral to neck, pull inferiorly as patient breathes out and use off hand to tack tape down to cover roll as you pull. Use the length of tape you need to cover the segments you worked on getting moving
Reduce femoral nerve tension	½ prone hip mobility – can also do full prone if unable to attain position SL is also an option	Prone with involved LE on bed and uninvolved LE hanging off, foot flat on floor Hamstring curl, maintain full contact with be Ankle PF is additional stretch is needed

RELOAD THE SOFTWARE

Once mobility is established at the dysfunctional joint, treat as a SMCD and reload the system so that the patient can utilize their new mobility in a functional manner.

<i>Corrective Matrix To increase lumbar flexion</i>				
<i>Posture</i>	Standing	Wall Roll downs with assist to flexion	Wall Roll Downs	Wall Roll Downs with resistance to flexion
	Stacked Spine (Kneeling)	Tall Kneeling Chops with assist	Chop Pattern	Chop with Resistance
	Suspended Spine (Quadruped)	Cat and Camel with Tband for assist	Quadruped with flexion rock backs	Quadruped rock back with T-ball resist
	Supported Spine (Supine/Prone)	Curl ups with assist UE and LE Rolling with band for assist	UE and LE Rolling-Independent Curl Ups-Independence	Curl up with Resistance
		Facilitate (Expresses Mobility)	Demonstrates (Expresses Competency)	Challenges (Expresses Motor Control)

<i>Corrective Matrix – Spinal Extension Focus</i>				
<i>Posture</i>	Standing	Assisted TB extension – TB at hips, could also use for assisting shoulder flexion	Lunge	Resisted TB extension
	Stacked Spine (Kneeling)	Tall or ½ kneeling rotation or spine extension; can be assisted with band when combined with shoulder flexion	Tall or ½ kneeling rotation	Tall or ½ kneeling rotation holding KB
	Suspended Spine (Quadruped)	Assisted quadruped rotation – can move into heel sitting to isolate TS	Quadruped thoracic rotation	Resisted quadruped thoracic rotation
	Supported Spine (Supine/Prone)	SL thoracic/shoulder rotation/ext	UE/LE segmental extension rolling – consider starfish rolling if hamstring dominant - - Snake (excessive LS ROM)	Resisted UE/LE extension rolling
		Facilitate (Expresses Mobility)	Demonstrates (Expresses Competency)	Challenges (Expresses Motor Control)

Improving Long-Term Outcomes for Chronic Low Back Pain: Time for a New Paradigm?

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These are exciting times for physical therapists who treat people with chronic low back pain (CLBP). Many of the mysteries of this condition are starting to be revealed, and it appears that major breakthroughs are on the way. Advances in neuroimaging, coupled with increased understanding of the molecular and submolecular events associated with the symptoms of back pain, are helping us reconceptualize the etiologies and mechanisms

of this condition.^{3,6-8,11,15,34,36,41} Clinical decision making has been assisted by high-quality research that has yielded an array of useful measurement tools and clinical prediction aids. Intervention approaches that utilize developments in modern neuroscience, coupled with cognitive retraining and innovative applications of motor control tasks, look very promising.^{28,33} The result of these advances is that physical therapists now have a wide range of potential “treatment packages” that can include patient education, manual therapy, and a wide variety of exercise options for people with CLBP.^{28,31,32}

The evidence base that addresses the efficacy and effectiveness of these interventions is also growing rapidly.^{14,37} Here is where a major challenge emerges. Virtually all systematic reviews of high-

quality outcome studies investigating the application of these interventions for CLBP report similar findings. Minimal to moderate improvements are consistently observed upon completion of a “course” of therapy; however, these improvements typically decrease substantially by the time long-term follow-up measures are obtained.^{10,14,20,37,38} Thus, the best evidence suggests that current physical therapy interventions for CLBP are likely to be helpful for many people in the short term (during and immediately after completion of a traditional 12-visit episode of outpatient care for therapy⁴) but are not likely to lead to better long-term outcomes (beyond 3 to 6 months after completion of the episode of care) when compared to no treatment. Considering this, the ability to increase the long-term

impact of physical therapy interventions for CLBP represents a key missing link for clinicians and researchers.

Historically, a common strategy to address the long-term rehabilitation of patients with CLBP has been to instruct them to perform a “home program” following discharge from physical therapy.²⁷ These programs have typically been developed and administered at the end of outpatient care and usually include a combination of general and spine-specific exercises, with an emphasis on using proper body mechanics. More recently, such programs have often included pain-coping strategies. These interventions make sense biologically and psychologically, and, when adhered to, should theoretically provide patients with a safe and cost-effective way to self-manage symptoms through maintenance of strength and motion, reduction of injury-causing activities, and “healthy” reconceptualization of back pain as a nonthreatening condition.

Unfortunately, recent evidence has suggested that these traditional self-management/home-program approaches for CLBP have not been effective. For

example, a systematic review by Oliveira and colleagues²⁹ reported that self-management approaches for CLBP were not associated with clinically meaningful improvements in pain and disability at long-term follow-up. The reasons for this lack of effectiveness are unknown but represent an important area that should be investigated. The question is, "How can long-term, self-management programs become more effective?" To address this, it is important to consider that many patients will fail to comply with long-term home exercise programs and are, in essence, being "underdosed" over time. Arguably, the key challenge is to maximize the patient's adherence to the exercises, activities, and lifestyles that are most likely to reduce the physical and emotional "triggers" that provoke symptoms of back pain.³⁵ Here are a few strategies that may help to achieve this:

1. Emphasize the importance of self-management by making it a fundamental goal of treatment right from the beginning. Quite often, the physical therapy approach to CLBP has been to try and "fix the problem" with a short, intense period of intervention. Many patients never get the message that self-management is necessary for long-term episodic conditions, such as CLBP.¹² For example, studies addressing patient satisfaction with physical therapy care consistently find that respondents are less satisfied with the degree of instruction that they receive toward performing a home program and preventing future injuries than with any other aspect of the therapeutic encounter.^{1,2,13,21} Making self-management a key philosophical component of the physical therapy interaction will send an early message that the patient must be responsible to be a major player in his or her health.⁹ This also creates an excellent opportunity to help patients make commitments not just to exercise but also to other aspects of healthy lifestyles, such as smoking cessation and appropriate dietary choices. The potential impact

of poor nutritional habits and back pain is illustrated by recent research that demonstrates meaningful linkages between CLBP and the oxidative stress associated with impaired blood glucose, obesity, and hypertension.⁴² Consultation with nutritionists may help patients understand the previously underplayed impact of diet on their pain.

In addition, the early involvement of the patient in the management of his or her CLBP will help to nurture beliefs and attitudes consistent with "demedicalizing" this condition.⁴⁰ This is an important selling point because self-management may result in less long-term dependency on the health care system.

2. Consider patient preference as the fundamental construct of the program. Continued adherence to active participation by the patient in his or her program is critical for the success of self-management. A key advantage to long-term self-management is that the cumulative dosage of exercise intervention can be substantially increased over time. This could be a very important issue, as evidence suggests that meaningful strength and motor control gains for atrophied back muscles in people with CLBP may take considerably longer to achieve.^{18,23} Research consistently suggests that patient preference and expectation play a large part in adherence to exercise programs.^{5,16,22,25} This can be an important issue when the physical therapist and patient do not agree about the specific type of exercises that should be done in the self-management program. An interesting study by Jeffrey and Foster²² found that physical therapists often face conflicts with patients regarding treatment approaches. It may be that prescribing a program that is suboptimal in the physical therapist's opinion, but with which the patient will comply, is a better option than insisting the patient perform a program that is favored by

the clinician but not by the patient. For example, the physical therapist may strongly recommend core stabilization approaches, but the patient may prefer to attend yoga classes. In this case, the physical therapist, patient, and yoga instructor may confer to find a program that has the best overlap between these approaches.

3. Maintain the therapeutic alliance with long-term follow-up visits. The natural history of CLBP is to have substantial variation in symptoms over time.^{24,39} Considering this, effective programs will take time to evolve and will require modifications in response to status changes.²⁶ Arguments can be made that the value of physical therapy for CLBP will improve if patients can attend periodic follow-up visits for "tune-ups." This will provide a huge advantage by allowing the program to be more congruent with the symptom variation associated with the natural history of CLBP. It is important to note that patient satisfaction with these long-term follow-up treatments is likely to improve if the patient establishes an ongoing relationship and therapeutic alliance with a specific individual (longitudinal continuity) to be the "go-to" physical therapist.^{1,17,19,30} Continued access to the physical therapist will also provide a support mechanism that is not available through web-based resources and will likely evolve into a preventive approach once symptoms have diminished. Current payment models are often not supportive of long-term involvement by the physical therapist; however, many health care insurers are exploring options to pay providers who incentivize patients to make healthy lifestyle choices (including ongoing exercise). Thus, an opportunity exists for a reconceptualization of the role of physical therapists in the treatment of patients with CLBP that includes a strong emphasis on patient empowerment and support. Arguments can be made that this delivery

model has the potential to decrease overall health care usage; however, high-quality studies are needed.

This philosophic approach of a long-term, actively evolving program will not be optimal for all people, especially those individuals who are averse to exercise. However, for many of our patients, taking a more aggressive, long-term, patient-centered approach to self-management is likely to increase the cumulative dosage of exercise, which may allow them to achieve effective control over symptoms. This program may also result in meaningful improvements in attitudes and beliefs, as well as the quality-of-life benefits associated with health and fitness. A better patient-centered, long-term approach might just be the next big breakthrough for CLBP. ●

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