



CLINICAL EXERCISE SPECIALIST MANUAL

A Fitness Professional's Guide
to Training People with
CHRONIC DISEASE

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**A FITNESS PROFESSIONAL'S GUIDE TO
EXERCISE AND CHRONIC DISEASE**

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CHAPTER 22

LOW BACK PAIN

By the end of this chapter you will understand:

- Prevalence and definition
- Pathophysiology of low back pain
- Factors leading to low back pain
- Treatment protocols
 - Education
 - Pharmacology and surgical intervention
 - Exercise
- Core musculature and stabilization
- Exercise progression and examples

The Prevalence of Low Back Pain

Back pain is the leading cause of disability worldwide, and an estimated 80% of adults will suffer from low back pain (LBP) during their lifetime. In the United States, back pain accounts for more than 264 million lost workdays per year, and is thought to cost over \$100 billion per year in lost wages, lost productivity, and increased healthcare costs (American Chiropractic Association, 2019; National Institute of Neurological Disorders and Stroke, 2019). Risk factors for LBP are age, sex, height, weight, sedentary lifestyle, depression, anxiety, insomnia, and smoking (Sharp, 2018). Fortunately, most patients require minimal treatment for recovery, and most LBP can be relieved once an underlying cause is treated (American College of Sports Medicine [ACSM], 2018; Casazza, 2012). However, to stay within a fitness

professionals' scope of practice it is important to understand the various causes of LBP. LBP is defined as localized pain or ache below the costal margin (lower edge of the chest) and above the gluteal folds (below the buttocks but above the thigh) as shown in Figure 22.1. Acute LBP is pain generally experienced for 6–12 weeks, and chronic LBP is pain experienced for greater than 12 weeks (Sharp, 2018; Wheeler et al., 2017).

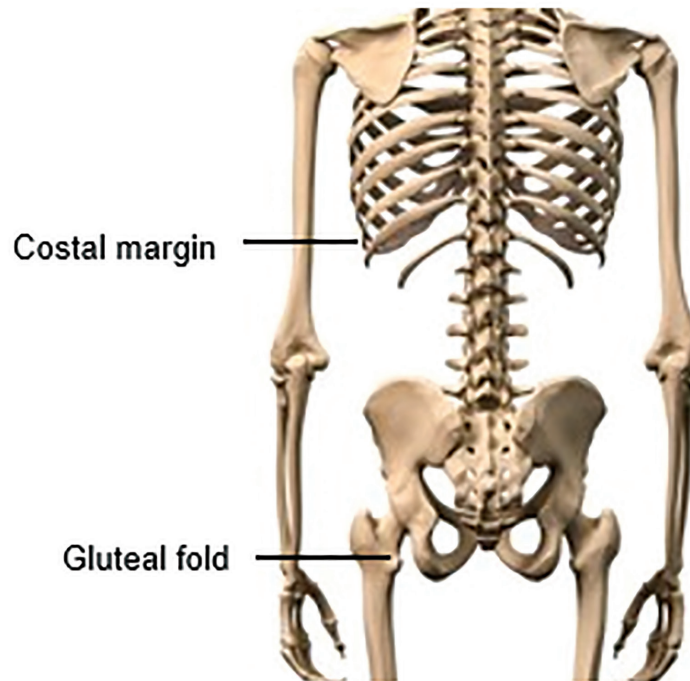


Figure 22.1 Low back pain is pain that occurs anywhere from the costal margin to the gluteal fold.

Although muscle strain and imbalance, ligament sprain, and soft tissue damage account for almost all LBP, often times the pain is non-specific, meaning it has no identifiable underlying condition or origin (Solomon, 2015; Wheeler et al., 2017). Because the core is a complex structure of spinal components, discs, intervertebral joints, muscles, and nerves, LBP can present with the same symptoms for different causes it is important to recognize the etiology. However, if a client presents with any type of back pain, it is strongly suggested the client be referred to a physician for a thorough exam prior to an exercise intervention. Table 22.1 details some differential diagnoses and key displays of LBP.

Table 22.1

Conditions, signs, and symptoms associated with low back pain

Condition	Cause	Signs/Symptoms
Abdominal aortic aneurysm*	Weak spot in the aorta/smoking	Abdominal discomfort/pulsating abdominal mass
Arthritis	Various	Morning stiffness/improves with activity
Compression fracture	History of trauma	Spinal tenderness/pain with flexion/and some movements

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Discogenic back pain	Degeneration caused by age, obesity, smoking, excessive axial loading, resulting in reduced water in the disc nucleus	Inflammation /pain increases with forward flexion, sitting, or coughing/ Spinal instability/ limited controlled spinal mobility
Herniated disc	A portion of the nucleus pushes through a crack in the annulus	Pain mostly in leg, but also in back, radiating below the knee
Lumbar sprain/strain	Poor mechanics/over activity	Diffuse back and buttock pain that worsens with movement and is alleviated with rest
Metastatic cancer	Cancer	Sudden severe pain/spinal instability
Pelvic/renal/gastrointestinal issues	Various	Abdominal distress or pain/nausea/vomiting/ abnormal urinalysis
Sciatica	90% caused by a herniated disc Up to 6% caused by nerve impingement by the piriformis	Radicular pain down the thigh to the lower leg and foot
Spinal cord compression	Herniated disc	Pain/weakness/motor control dysfunction
Spinal stenosis	Thickening of the ligament in flavum (bands that cover the spinal canal)	Pain in the calf and distal lower extremity that may be alleviated when flexed or seated/sensory loss/weakness in the legs
Spondylosis	Degeneration of disc or facet arthropathy caused by repetitive impact or hyperextension	Disc pain worsens with flexion and sitting/facet pain worsens with extension/standing/walking
Spondylolisthesis (fractured vertebra)	Slipping of the vertebra relative to the one below it, caused by repetitive impact or hyperextension	Pain mostly in leg, but also in back, which worsens with standing and walking/is alleviated with rest
Vertebral osteomyelitis or infection	Spinal trauma/bacteria in intervertebral disc space	Gradual onset of pain, becoming constant /fever

Casazza, 2012; Hu, Tribus, Diab, & Ghanayem, 2008; Hicks, & Varacallo, 2018; Kinkade, 2007; Solomon, 2015; Wheeler et al., 2017

*This is considered a medical emergency

Treatment Protocols

Education

Even though the primary treatment goal for LBP is to relieve pain and improve activities of daily living (ADLs), the chance of recurrence is as high as 60% in the first year. Education along with an active recovery plan is the generally accepted protocol (ACSM, 2018; Solomon, 2015). Education should focus on psychosocial aspects of managing chronic pain such as encouraging activities, and discouraging bed

rest, as well as reassuring the client the condition can improve. Education also needs to address misconceptions regarding LBP as there is little evidence to support back exercises and general stretching alleviates LBP, and because each client situation is different, there is no standard protocol or template for assessment or treatment (McGill, n.d; Sharp, 2018).

Pharmacology and surgery

Pharmacological therapies include NSIADs for acute LBP, as well as some narcotics and muscle relaxers. Medications that act on the central nervous system can be used for neuropathy or to assist in nerve stabilization. Steroid and local anesthesia injections may relieve pain and inflammation and allow less invasive therapies such as physical therapy to progress (Solomon, 2015). If conservative treatments do not relieve the symptoms, surgery may be necessary. Procedures such as a laminectomy or discectomy can be performed to relieve compression or impingement, and spinal fusion can be performed to stabilize degenerated discs.

Exercise

Because 97% of LBP is due to muscle strain, ligament sprain, and soft tissue damage, exercise is the primary means of treatment. Additionally, because core muscle activity is known to be dysfunctional in patients with LBP, early intervention should focus on re-education of faulty motor patterns through core activation, keeping in mind the muscles of the core function differently than muscles that control extremities (ACSM, 2018; Dalcourt & Comana, 2015; McGill, 2010). Because the spine is inherently unstable, core muscles co-contract and act in concert as synergists, and therefore need to be trained differently than muscles that control extremities (Faries & Greenwood, 2007; McGill, 2010). Local muscles are generally shorter than global muscles, attach to the spine, and are used mostly to provide segmental stability; whereas, global muscles (remember the slings from Chapter 16) produce speed and power, function in multiple planes of motions, and transfer loads to and from the extremities (Faries & Greenwood, 2007). Table 22.2 details core muscles and their actions.

Table 22.2

Core musculature and movements

Local muscles—Stabilization	Action	Global muscles—Mobilization	Action
Transversus abdominis	Draws abdominal wall to the spine, helps maintain abdominal pressure	Rectus abdominis	Flexes vertebral column
Multifidi	Extension, contraction, and rotation of vertebral column	Lateral fibers of external oblique	Helps increase intra-abdominal pressure
Internal oblique	Helps with respiration, aids in raising abdominal pressure, helps with trunk rotation	Psoas major	Assists with the flexion and external rotation of the hip

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Medial fibers of external oblique	Helps with ipsilateral side-bending and contralateral rotation	Erector spinae	Extension of vertebral column
Quadratus lumborum	Helps with extension and lateral flexion of the vertebral column	Iliocostalis (thoracic portion)	Extends and laterally flexes the thoracic spine
Diaphragm	Through contraction and relaxation, alters the volume of the thoracic cavity and lungs, producing inspiration and expiration	Longissimus thoracis	Flexion and extension of vertebral column
Iliocostalis and longissimus (lumbar portions)	Helps with posture, transfers loads, stabilizes the spine for flexion and extension		
Thoracolumbar fascia	Supports vertebral column flexion via fascial tension		
Intertransversarii	Proprioception		
Interspinales	Proprioception		
Rotatores	Proprioception		

ACSM, 2018; Donatelli, 2007; Faries & Greenwood, 2007

The goal of exercise treatment for LBP is to alleviate pain, restore spinal stability, and help a client return to normal ADLs. The first step is to remove the cause of pain, or faulty movement patterns. Although each client situation is different, there are a number of concepts that apply universally (McGill, 2010; Solomon, 2015):

- Many back injuries are the result of cumulative trauma rather than a single event.
- Individuals with a greater range of motion of the back are at a greater risk for LBP.
- Most back injuries result in spinal instability; therefore, exercises to enhance spinal stability and posture may be the best intervention for acute LBP.
- A greater degree of back strength does not equate to back health and has not been shown to be of more benefit for clients who suffer from LBP; endurance of the back muscles is more important.
- Due to excessive forward flexion and a high degree of spinal loading, sit-ups may induce LBP.
- A combination of low intensity activity, such as walking, coupled with condition-specific back exercises offers the best results for resolution and prevention of LBP.

- Due to osmotic hydration, vertebral discs are more hydrated in the morning following bed rest, and more susceptible to injury, particularly during forward flexion.
- The first time a new movement is performed it should be considered an assessment. If it causes pain, adjust the movement as needed.
- Although most exercise plans are programed for 2–3 days per week, core training can be performed daily.

Exercise treatment for LBP should start with correcting faulty motor patterns, followed by increasing muscular endurance, then strength and power. To accomplish this, the following training progression is suggested, and examples of exercises for each stage are in Table 22.3.

1. Corrective, therapeutic, and perfect motion motor patterns exercise as determined by the initial assessment.
 - a. Identify and remove movements that cause pain.
 - b. Ensure proper posture and gluteal activation during ADLs.
 - c. Form, form, form.
 - d. Perform abdominal bracing to encourage co-contraction (not to be confused with abdominal hollowing that may be counterproductive as it engages only one or two core muscles).
2. Build whole-body and joint stability (mobility at some joints such as the hips and stability through the lumbar/core region).
 - a. These exercises increase stability without exacerbating the original injury.
 - b. These movements should challenge endurance and increase motor control.
 - c. Bracing and co-contraction of the core should be performed during these movements.
3. Increase endurance.
 - a. Isometrics should be held for less than 10 seconds; to increase endurance, increase repetitions.
 - b. A pyramid pattern (5 reps on each side, 4 reps, 3 reps, 2 reps, 1 rep) allows the most repetitions to be performed with the least fatigue.

For occupational/athletic clients:

4. Build strength.
 - a. Build on an achieved foundation.
 - b. Match skills and exercises with abilities and ADLs.
5. Develop speed, power, and agility.
 - a. Power requires a stiff torso with relaxed (not to be confused with loose) extremities.
 - b. Focus should be on required performance movements.

Table 22.3

Example exercises for low back pain

Corrective and Therapeutic	Whole body—joint stability	Endurance	Strength	Power	Avoid (until appropriately progressed)
Abdominal bracing	Cat-camel stretch	Start with 0-10 second isometrics	Focus on ADLs	Plyometrics	Heavy lifting
Wall roll	Modified curl up		Unilateral farm-ers walk	Medicine ball slams	Prolonged sitting
Floor roll	Opposite arm/leg raise	Increase the number of reps not the length of the isometric hold	Lateral cable hold-press	Whirling m/b to slams	Twisting movements
Glute bridges	Quadruped bird-dog	A pyramid pattern can provide ample repetitions as well as ample rest		Medicineball catch	
Clamshell	Side bridge/modified				
Single leg squat matrix	Plank				
Low-load cardiovascular exercise such as walking	Rolling bridge				
	Push-ups				
	Modified				
	Staggered hands				
	Unstable surface				
	Body rows				

McGill, 2010, Solomon, 2015

Discussion and application

1. Discuss different types/causes of LBP, and what are risk factors associated with LBP?
2. What are some common misconceptions regarding exercise treatment for LBP?
3. Design a program for an individual experiencing LBP. Discuss the progressions and provide example exercises.

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