Session 4: Exercise Prescription for Musculoskeletal Disorders: Low Back Pain

Course: Designing Exercise Prescriptions for Normal/Special Populations

Presentation Created by
Ken Baldwin, M.ED, ACSM-H/FI

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NOTE:

This lecture is to serve as an example of the structure for your presentation for this course in terms of depth of topic, length, and specifics of exercise prescription for your chosen topic.
Demographics of Low Back Pain

- 80% of adults will experience low back pain (LBP) at some point in their lives
- Low Back Pain is a disease of the sedentary
  - Being sedentary leads to deconditioning, muscular atrophy, weakness, and high fatigue
- Costs of Low Back Pain: billions of dollars, lost work time, inability to perform activities of daily living (ADLs), associated with psychological problems
Low Back Anatomy

- Lumbar Region (Lower back): T12 – S1 (Thoracic vertebra 12 - Sacral 1)
- Complex system of:
  - Multiple Joints: vertebral body, facets, sacral/spinal articulations, hip joints
  - Multiple Muscles:
    - Lumbar extensors: Multifidus, Erector Spinae
    - Lateral Flexors: Quadratus Lumborum
    - Trunk Flexors: Abdominals
    - Rotators: Oblique Abdominals
    - Intersegmental Stabilizers: Multifidus
    - Trunk Stabilizers: Transverse abdominus
    - Hip Extensors: Gluteals, hamstrings
  - Multiple Ligaments and Fascial connections:
    - Anterior/ posterior longitudinal ligament, thoracolumbar fascia
  - Multiple Intervertebral Discs
Spinal Posture: Side View
Pathophysiology of Low Back Pain

- Many pain producing sources:
  - Sprain/ Strain
  - Facet injury
  - Joint hypo/ hyper mobility
  - Arthritis
  - Spinal Stenosis
  - Disc Injury: Herniation, bulge, etc.

- Termed “mechanical low back pain” since specific pain producing structure is often unknown

- Classified in context of onset
  - Acute: < 3 months since onset of pain
  - Chronic: > 3 months since onset of pain
Signs/ Symptoms of Low Back Pain

- Pain
  - low back, buttock, legs
- Neurological Problems
  - numbness, tingling, muscular weakness and atrophy in lower extremity, bowel/bladder dysfunction
Red Flags: Reasons to suspect serious problems as cause of LBP

- Bowel / Bladder Dysfunction
- No identifiable cause of pain: e.g., trauma, lifting, overexertion
- History of tumor/ cancer
- Pain at night
- Numbness/ Tingling in groin/ rectal area
- Extreme leg weakness
- Severe pain
- > 50 years of age
Treatment of Low Back Pain

- Medication
- Surgery
- Spinal Manipulation
- Physical Modalities
- Return to normal ADLs as soon as possible
- EXERCISE
Specific Exercise Prescription for Low Back Pain

- While exercise has been shown to be effective for treatment of LBP, no specific exercise has been clearly demonstrated to be superior.
- Contraindications to resistance exercise:
  - Red Flags
- Important to use objective measures
  - Chart progress: improvement/decline/maximum medical improvement
- Most patients who present for exercise therapy will have chronic LBP
- Goal of exercise for chronic LBP should be to improve function, NOT to resolve pain.
Specific Exercise Prescription for Low Back Pain

Exercise program should address all components:

- Muscular Strength/ Endurance
- Balance/ Coordination
- Flexibility
- Posture
- Cardiovascular
BACK SAFE © (J.M. Mayer 2002)

B - Balance/ coordination
A - Alignment/ Posture
C - Cardiovascular Exercise
K - Kick the habit, don't smoke
S - Strength/ endurance - resistance exercise
A - Attitude - maintain psychological well-being
F - Flexibility - muscles/ joints
E - Eat well - maintain ideal bodyweight
1. Muscular Strength/Endurance

- Probably most important for low back pain is to work on muscular strength and endurance.

- Note: Start program with most relevant muscle group: Lumbar Extensors (erector spinae & multifidus) are most deconditioned in low back pain patients (NOT Abdominals – particularly trunk flexion exercises for the rectus abdominus, which may aggravate low back pain).

- Objective Measures for Lumbar Extensor Muscle Performance:
  - Isometric Testing
    • Dynamometer (strength)
    • Biering-Sorensen Test (endurance)
  - Dynamic Testing
    • Rep max
  - Measure every 4 weeks
1. Muscular Strength/ Endurance

**Mode**
- Isometric versus dynamic
  - Exercise in pain-free range of motion
  - Early stages: isometric
  - Latter stages: dynamic
- Machines
  - High tech – dynamometer
  - Low tech – Roman chair
    - Increase activity of lumbar extensor muscles by
      - Internally rotating hips & pointing toes to middle
      - Maintaining lumbar lordosis during dynamic exercise
- Floor Exercises
  - Spinal stabilization/ trunk stabilization/ core exercises
- Free weights – may incorporate during latter stages of program
  - Deadlifts and squats
    - Squats – during phase of exercise where legs / trunk are flexed
      make sure that toes are posterior or in the same plane as the knees – safest position for the knees
1. Muscular Strength/Endurance

- **Intensity**
  - 15+ repetitions per set; initiate at 30 – 40% peak strength
  - To volitional fatigue (healthy) / pain tolerance (pain)

- **Volume**
  - 1 set is usually enough

- **Frequency**
  - 1-2 times per week – allow for adequate recovery

- **Progression**
  - Progress approximately 5% at next raining session when patient can exceed 15 reps (or per Roman chair protocol)

- **Duration**
  - 12 weeks - usually sufficient to determine effectiveness of program
2. Balance/ Coordination

- **Mode**
  - Lumbar/ Trunk/ Core Stabilization
  - Pilates, Yoga
  - Gym balls

- **Intensity**
  - Low Intensity

- **Volume**
  - 1 set

- **Frequency**
  - 3x/week

- **Duration**
  - At least 12 weeks
3. Flexibility

- **Mode**
  - McKenzie – back extension
  - Williams
  - Extremity stretches – particularly hamstrings
  - Pilates
  - Yoga
4. Posture

- **Mode**
  - Home exercise
  - Posture-specific exercise equipment
- **Education/ reinforcement is key**
- **IMPORTANT:** Correct posture should be stressed by trainer throughout all movements during course of training session
5. Cardiovascular

- **Mode**
  - Various
    - Usually exercise while standing (eg, walking) with erect trunk is preferred versus any exercise in seated position (eg, bike) with a flexed trunk
Examples of Specific Low Back Exercise – see following slides

Notes:
- Do not start any exercise program without your doctor’s ok
- All exercises should be performed under the supervision of a certified personal trainer, licensed physical therapist, or other qualified exercise professional
- Always use proper form & execution
- DO NOT ATTEMPT THESE EXERCISES WITHOUT SUPERVISION
Low Back Exercise: Range of Motion
Low Back Flexibility: Press up
Lower Extremity - Flexibility

HAMSTRING

QUADRICEP
Posture Exercise: Posture Point
Low Back Stabilization: Bridge
Low Back Strength: Lumbar Extension
Low Back Strength: Roman Chair
Oblique Abdominal/ Low Back Strength: Torso Rotation