EXERCISE PRESCRIPTION
FOR LOW BACK CARE

LEARNING OBJECTIVES

- Understand what is low back pain and its consequences
- Recognize what and how muscles control the lumbar spine for developing and maintaining lumbar stability
- Understand what exercises are recommended for low back care

REFERENCES


LOW BACK PAIN (LBP) (1)

- Definition:
  - Pain and discomfort, localized below the costal margin and above the inferior gluteal folds, with or without leg pain
  - Pain: occur suddenly or be unclear in onset
  - Origins of pain: muscle, joint, or disc (or more than one of these)
    - Inflammatory, nociceptive, and neuropathic components
LBP(2)

- Three categorizations in U.S. clinical practice guidelines
  - Potentially serious spinal conditions (e.g., spinal tumor, infection, fracture, osteoporosis)
  - Sciatica: back-related lower limb symptoms
  - Nonspecific LBP (the most common): pain occurring primarily in the low back and is not attributed to a specific pathologic entity (e.g., infection, tumour, osteoporosis, fracture, inflammatory process).

IMPAIRMENTS AND FUNCTIONAL LIMITATIONS DUE TO LBP (SUBACUTE / CHRONIC PHASE)

- Pain
- Impaired posture
- Impaired mobility and flexibility
- Impaired muscle performance
  - Poor neuromuscular control of stabilizing muscles
  - Decreased muscle strength and endurance
- General de-conditioning
- Inability to perform high-intensity physical demands for extended periods of time

LUMBAR STABILIZATION – MUSCLE CONTROL

- The global muscle systems (trunk movers): superficial & multi-segmental
  - Trunk extensors: erector spinae
  - Trunk flexors: rectus abdominis
- The local (core) muscle system (trunk stabilizers): deep & individually segmental (primary)
  - Lumbar multifidus
  - Transversus abdominis (TrA)
  - Lateral flexors (pelvic stabilizers): quadratus lumborum
  - Trunk stability: coordination among core muscles, global muscles, and pelvic stabilizers (especially deep portion of the quadratus lumborum)
**Role of Global and Core Muscles**

Unstable Deep core muscles

Superficial global muscles

Coordination between the global and core muscles

Stable

Modified from Kisner & Coby. Therapeutic Exercise. 5E. PP385 & 387.

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**Cross-Sectional View of the Trunk Muscles**


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**Exercise Testings**

- Flexibility
  - Trunk, hips, thighs, and legs
- Trunk mobility
  - Impaired spinal extension/flexion
- Muscle control and coordination: related to spinal stabilization
- Muscle strength & endurance
  - Hips and trunk
- Cardiovascular endurance
- Function

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**Isometric Muscle Endurance Tests**

- Trunk extensors
- Trunk flexors
- Trunk lateral flexor (the pelvic stabilizer)
ISOMETRIC ENDURANCE OF THE TRUNK EXTENSORS

**FIG. 22-21.** Back extensor endurance test. The subject is positioned in prone with the pelvis and lower limbs supported on the table with the ankles secured. The upper body is held in a neutral position out over the end of the treatment table. Failure occurs when the upper body drops from the horizontal position.

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ISOMETRIC ENDURANCE OF THE TRUNK FLEXORS

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ISOMETRIC ENDURANCE OF THE LATERAL FLEXORS

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GENDER-SPECIFIC REFERENCE DATA FOR THE ISOMETRIC ENDURANCE TESTS

| Table 10.7 Reference Values for Isometric Lumbar Stabilization Tests in Healthy Adults |
|-------------------|-----------------|-----------------|-----------------|
| **Test item**     | **MEN**         | **WOMEN**       |
|                   | **Endurance time (sec)** | **Ratio** | **Endurance time (sec)** | **Ratio** |
| Trunk extension   | 148             | 1.00            | 189             | 1.00          |
| Trunk flexion     | 144             | 0.99            | 149             | 0.79          |
| Side bridge (right)| 94              | 0.64            | 72              | 0.38          |
| Side bridge (left)| 97              | 0.66            | 77              | 0.40          |

*Ratio is calculated by dividing endurance time of each test by trunk extension endurance time.


Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 278.
EXERCISE PROGRAMS

- Goals
  - Improve flexibility and maintain spinal mobility
  - Increase core stability and trunk/hip muscle strength/endurance
  - Return to full participation without pain

- Exercises
  - Stretching and maintenance of spinal mobility
  - Core muscle reeducation and retraining for co-activation
  - Strengthening: both the abdominal and low back extensor muscles and hip muscles

STRETCHING EXERCISES (FLEXIBILITY EXERCISES)

- Trunk: anterior, posterior, and lateral trunk regions
- Hips: anterior, posterior, lateral and medial thigh regions
- Legs: anterior and posterior regions

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TRADITIONAL EXERCISES FOR LBP

(1) — WILLIAMS’ FLEXION EXERCISES

- Emphasize trunk flexion (including activities)
  - Accomplish a proper balance between the flexor and the extensor groups of postural muscles

- Six exercises
  - Exercise #1: (posterior) pelvic tilt
  - Exercise #2: sit-up in a flexed-knee position
  - Exercise #3: single/double knee-to-chest
  - Exercise #4: hamstring stretching
  - Exercise #5: hip flexor stretching
  - Exercise #6: a full squat

WILLIAMS’ FLEXION EXERCISES (1)

Houglum PA. Therapeutic Exercise for Musculoskeletal Injuries. 3E. P 507.
**Williams’ Flexion Exercises (2)**

**Traditional Exercises for LBP (2) – McKenzie Back Program**

- Developed by Robin McKenzie, a New Zealand physiotherapist
- Emphasize *trunk extension* aimed at relieving posterior pressure on discs
- Six exercises
  - Exercise #1: prone lying
  - Exercise #2: prone lying on the elbows
  - Exercise #3: prone lying on the hands (press-ups)
  - Exercise #4: trunk extension in standing
  - Exercise #5: cat-cow (cat-camel)
  - Exercise #6: double knee-to-chest

**Disk Herniation & Reduction**

**McKenzie Back Program (1)**
MCKENZIE BACK PROGRAM (2)

Cat-Cow (Cat-Camel)

STANDING CAT AND CAMEL

CAT AND CAMEL

PRINCIPLES OF LUMBAR STABILIZATION EXERCISES

- Maintaining a neutral lumbar spine ("pelvic neutral")
- **Muscle endurance exercise** is better than strengthening exercise for reducing LB injury.
- Not maintaining a static position but maintaining a controlled range of motion (dynamic control)
- **Normal rhythmic diaphragmatic breathing** is emphasized.
- Integrated the position into the functional activities
**Stabilization Exercise (1) — Pelvic Neutral**

- A position where the least amount of stress is placed on the lumbar spine.
- One of the ways to achieve **pelvic neutral**,
  - Sit down, place fingers on the left and right ASIS.
  - Instruct the subject to rock the pelvis as far as possible posteriorly and then anteriorly, noting the end position.
  - Ask the subject to subtly adjust the pelvis in the mid-position between the two ends of motion.
- Emphasize the need to maintain this position during all activities.

**Stabilization Exercise (2) — Abdominal Hollowing (1)**

- Muscle recruitments: transverse abdominis (TrA) and multifidus muscles.
- Procedure:
  - Supine in a hook-lying position with hips/knees flexion.
  - Instruct the subject to maintain the neutral spine position.
  - Hollow the abdomen by pulling in the navel in and up towards the spine.
  - Hold 5 sec to start and repeated.
  - Increase the hold duration up to 30 sec.

**Stabilization Exercise (2) — Abdominal Hollowing (2)**

- A sustained submaximal contraction (25% of maximal contraction) is enough.
  - A maximal contraction is not necessary.
- Tactile feedback to facilitate better TrA activity: place fingertips just distal to the anterior superior iliac spine (ASIS) and lateral to the rectus abdominis.

**Stabilization Exercise (3) — Multifidus Recruitment Activities**

- Difficult to determine whether or not the subject is using the muscle correctly.
- Activated by activating the pelvic floor muscles.
  - In a supine hook-lying position and in pelvic neutral.
  - Provide the verbal cue, “Tighten muscles as if you are stopping urination at mid-flow.”
  - Place finger tips adjacent the subject’s lumbar spinous processes to feel the muscle contraction.
- The combined activity to activate transverse oblique and multifidus muscles.
**Stabilization Exercise Progression (1) – Dead Bug Exercise**

- Performed in the early stages
- Involve moving the arms and/or legs in a supine position while maintaining neutral spine
- Progression:
  - Arm movement → leg movement → arm/leg movement → arms and unsupported legs
  - Motion pattern: straight-plane pattern → diagonal pattern

**Dead Bug Exercise (1)**

- Arm Movement
- Leg Movement

**Dead Bug Exercise (2)**

- Arm and Leg Movement
- Arms and Unsupported Legs

**Stabilization Exercise Progression (1) – Bird Dog Exercise**

- A progressive manner
- Performed in a quadruped position
- Progression:
  - Arm raise → leg raise → arm/leg raise → arm/leg raise with manual resistance
**BIRD DOG EXERCISE (1)**

**Arm Raise**

**Leg Raise**

*Houglum PA. Therapeutic Exercise for Musculoskeletal Injuries. 3E. P 544.*

*Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 406.*

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**BIRD DOG EXERCISE (2)**

**Arm and Leg Raise**

*Houglum PA. Therapeutic Exercise for Musculoskeletal Injuries. 3E. P 544.*

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**DON’T: LEG LIFTS WITH TRUNK HYPEREXTENDED**

*Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 401.*

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**STRENGTHENING EXERCISES**

- Abdominal muscles
- Lumbar/hip extensor muscles
- Trunk lateral flexor (the pelvic stabilizer)
**POSTERIOR PELVIC TILT**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 404.

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**Curl-Up with Leg Extension**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 406.

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**PARTIAL SIT-UP**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 405.

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**BENT-KNEE CURL-UP**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 407.
**PARTIAL SIT-UP: DON’T HEAD THROW IN A CRUNCH**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 399.

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**PARTIAL SIT-UP: DON’T V-SITS**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 400.

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**TRUNK EXTENSIONS**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 400.

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**SINGLE-LEG EXTENSION**

Heyward, VH. Advanced Fitness Assessment and Exercise Prescription. 6E. P 406.
**SUMMARY**

- Stretching and combinations of core and global muscles strengthening are recommended to prevent LBP.
- Muscle endurance exercises may be more effective than strengthening for the prevention and treatment of LBP.