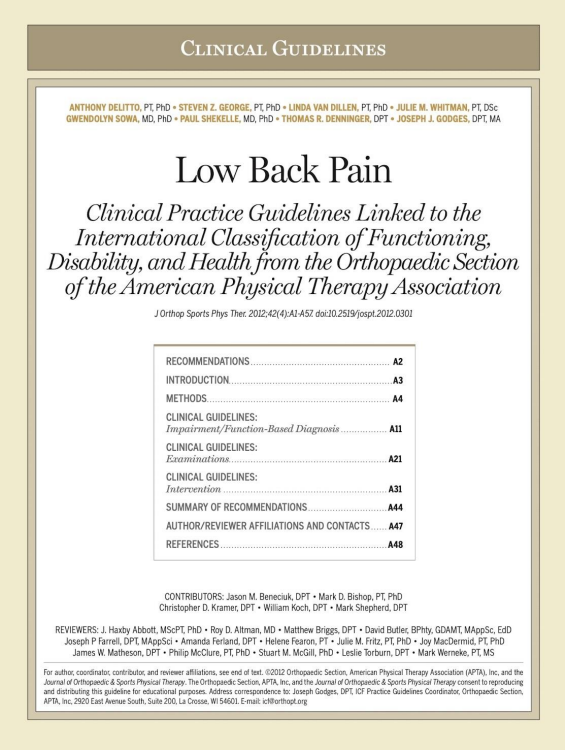
Why do most people have Low-Back Pain? Where is it coming from?



CLINICAL GUIDELINES

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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

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- The clinical course of low back pain can be described as acute, subacute, recurrent, or chronic. There is a high prevalence (70 to 80% by age 20) of recurrent and chronic low back pain. So how can we manage/fix this?
    - **Understanding the different classification and root causes of Back pain**
        - Mobility impairments in the thoracic, lumbar, or SI regions
        - Referred or radiating pain into a lower extremity
        - Generalized pain
        - Spinal instabilities
        - Flat back syndrome
        - Displacement of Intervertebral disc
        - Sciatica

- Examination- Outcome Measures
    - Clinicians should use validated self-report questionnaires, such as Oswestry Disability Index.
    - These tools are useful for identifying a patient's baseline status relative to pain, function, and disability and for monitoring a change in a patient's status throughout the course of treatment. This is based on strong research evidence!

1. **Segmental mobility assessment**
2. **Pain provocation with segmental mobility**

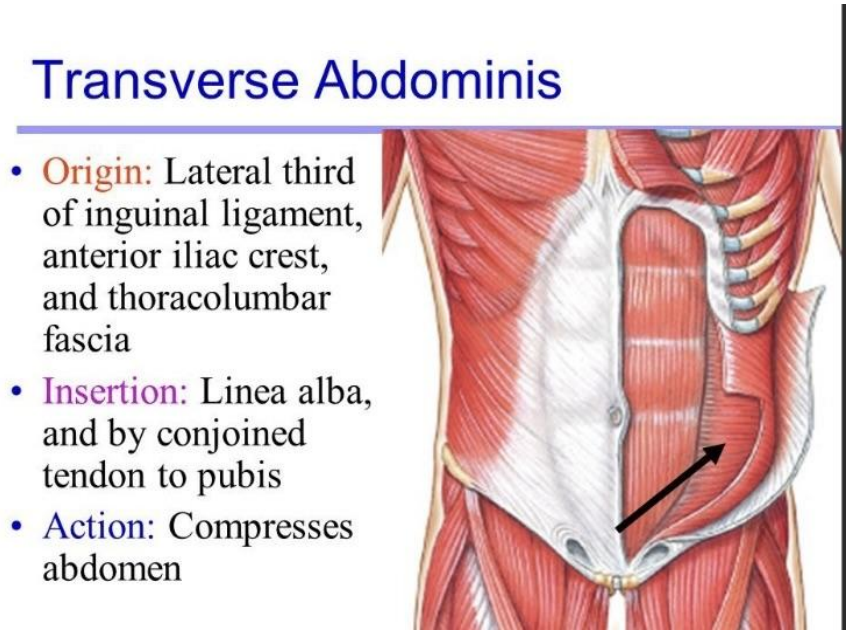
a. Clinician judges the behavior of symptoms in response to movement testing to assess whether centralization or peripheralization occurs. Judgements of centralization require that an accurate assessment of the patient's baseline location of symptoms is made, followed by the precise application of active or passive movements and the associated assessments of any changes in the patient's baseline location of symptoms in response to the movements.
b. Centralization: occurs when the location of the patient's symptoms, such as pain or paresthesias, is perceived by the patient in a more proximal location in response to single and repeated movements or sustained positions.
c. Peripheralization: occurs when the location of the patient's symptoms is perceived in a more distal location, such as the calf or foot, in response to single and repeated movements or sustained positions.

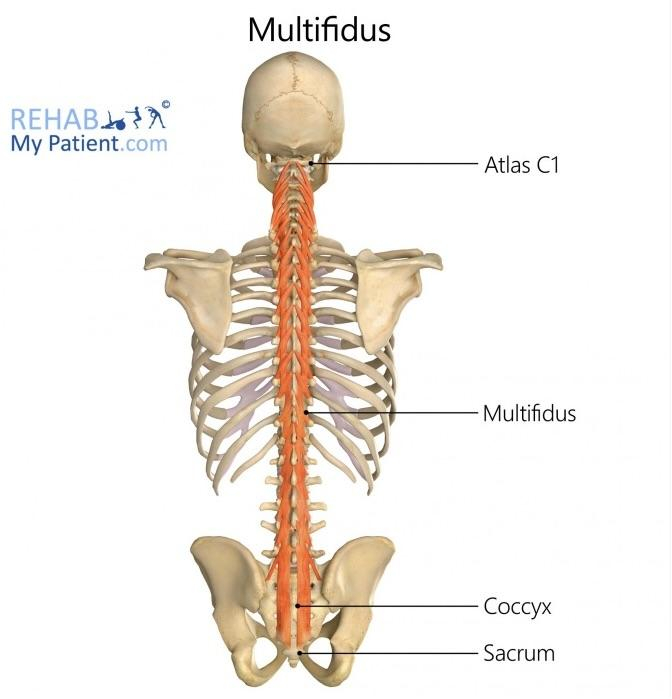
3. **Prone instability test**
4. **Judgments of the presence of aberrant movement**
    a. "Abberant movement" includes the presence of any of the following; painful arc with flexion or return from flexion, instability catch, Gower sign, and reversal of lumbopelvic rhythm
    b. Painful arc with flexion or return from flexion is positive is the patient reports pain during movement but not at the end ranges of the motion.
    c. Instability "catch" is positive when patient deviates from straight plane sagittal movements during flexion and extension.
    d. Gower sign is positive if the pt uses "thigh climbing" on return from flexion, to diminish the load on the low back when returning to upright position.
    e. Reversal of lumbopelvic rhythm is positive if the patient, upon return from a forward bent position, suddenly bends his/her knees to extend the hips/ shifting pelvis anteriorly, as he/she returns to the standing position.
5. **Straight leg raise**
    a. Patient is supine and the therapist passively raises the LE, flexing the hip with an extended knee. A positive test is obtained with reproduction of LE radiating/radicular pain.
6. **Trunk Muscle Power and Endurance**
    a. Trunk extensors: patient is positioned in prone with hands behind the back or by the sides, patient is instructed to extend at the lumbar spine and raise the chest off the table to approx 30 deg. And hold the position, the test is timed until the patient can no longer hold the position.
    b. Lateral abdominals: The patient is positioned side-lying with hips in neutral, knees flexed to 90deg and resting the upper body on the elbow. The patient is asked to lift pelvis off the table and to straighten the curve of the spine w/o rolling forward or backward. The position is held and timed.
    c. Transversus Abdominis: The patient is positioned in prone over a pressure biofeedback unit that is inflated to 70mmHg. The patient is instructed to draw in the abdominal wall for 10 seconds without inducing pelvic motion while breathing normally.

d. Hip abductors: The patient is positioned in side lying with both legs fully extended, in neutral rotation and a relaxed arm position, with the top upper extremity resting on the ribcage and hand on the abdomen. Pt then keeps the top leg extended and raised toward the ceiling, keeping the limb in line with the body.
e. Hip extensors: Supine glute bridge

7. **Assessing Hip mobility, ROM, and strength**

- **INTERVENTIONS- What kinds of exercises are you giving your clients that come in with low back pain??**
  - **Trunk coordination, strengthening, and endurance exercises**
    - Lumbar coordination, strengthening, and endurance exercises are another commonly utilized treatment for patients with low back pain.
    - Motor control exercises
    - Transversus abdominis training
    - Lumbar multifidus training
    - Dynamic lumbar stabilization exercises
  - These kinds of exercises are commonly prescribed for patients who have received the medical diagnosis of spinal instability.
  - PUTTING IT TOGETHER!!
    - As a group we can come up with a spinal stability protocol
      - Pt with low back pain gets referred to PT—> I assess them and gather objective/subjective data that demonstrates spinal instability—> this is added to their client records (personal trainer is now made aware of this) —> we add the spinal stability protocol to their workout regimen.
      - Then we reassess after a couple weeks if there is a change in their symptoms.





1. **Bird dogs**
2. **Dead bugs**
3. **Paloff press**
4. **Standing OH carry marches**
5. **Half-kneeling lifts with rotation**

- **Appropropriate regressions and progressions**
    - Regressions: limited ROM, have clients stay in pain-free range if it is an acute case. Give another exercise to related joint (ex- hips and glutes)
    - Progressions: introducing rotational movements in the spine. Multifidus muscle fibers have diagonal distribution to contribute to side-bending and rotation movements.

- **Spinal Stability**
    - The spine is a complex system to understand accurately
    - Understanding the shift from a static mechanical concept to a dynamic control concept.
    - Dynamic control concept: incorporating the effects of sudden, unexpected loading events believed to contribute to severe back injuries, to explore the relationship between delayed trunk muscle reflex responses and back pain and future back injuries, and the potential role of modified preparatory trunk control in advance of predictable spine perturbations.
    - The static characterization of spinal stability had shown the magnitude of trunk muscle activity required to prevent the spine from buckling, but it omitted an important aspect of spine control, specifically the timing of muscle activation.

- There is strong evidence that the CNS monitors spine stability, although it remains unclear which signals/information are used to derive the complex phenomenon.
- Modeling and experimental results both demonstrate that trunk muscles change activation levels to meet stability demands such as:
  - Holding a mass higher
  - Adding weight to the trunk
  - Lifting an unstable load
  - Stability is threatened from impaired trunk control following a fatiguing exertion
  - Intrinsic spine stiffness is reduced following prolonged periods of trunk flexion
- There are some anatomical features that suggest that humans may have evolved to protect the spine against instability.
  - For example → early anatomical observations have shown neural coupling of motor units in the spinal cord via long spinal interneurons that function to coordinate muscle activity.
  - This neural coupling has composite mechanical properties that are involved in maintaining erect posture while allowing movements of the head, neck, and trunk.
- Although neural and mechanical coupling mechanisms appear to be available to protect a healthy spine, they may negatively impact control in an injured spine.
  - For example→ disc degeneration and spondylolisthesis (these laxities may be isolated to a single level thus creating segmental hypermobility.
  - Deeper segmental muscles, like multifidus, are often atrophied in those with back pain and those with degenerative lumbar spine pathology.
    - This muscle wasting is believed to be related to reflex inhibition following injury, at least in the early period after injury.
    - Neural inhibition could also delay muscle activation at the affected level. Both multifidus atrophy and neural inhibition can be problematic from a stability perspective.
  - Large superficial muscles (erector spinae and latissimus dorsi) spanning the lumbar spine add a compressive load that acts to destabilize the spine, much like gravity.
  - Therefore it is very important that the deeper muscles that have attachments to specific spine levels are recruited sufficiently to provide the needed stiffness to prevent the spine from buckling.
  - The **ratio of deep to superficial muscle activation** must be carefully controlled, as well as the timing of the activation with the deeper segmental muscles activating before the more superficial muscles.
- In conclusion—> joint hypermobility, muscle wasting, and reflex inhibition in deeper segmental muscles may act together to create disequilibrium in both the

spine's mechanical structure and its control, which could have a destabilizing influence on the spine.

- **Coactivation to assist with spinal instability**
  - **Coactivation:** simultaneous contraction of both agonist and antagonist muscles around a joint. This phenomenon is crucial for spinal stability, load bearing, and fine motor control, influencing how the back muscles interact to maintain posture and movement.
  - **Agonist and Antagonist muscles:** agonist muscles are the primary movers during a specific action, while antagonist muscles oppose that movement, working to control and stabilize the joint.
  - **Joint stability:** coactivation helps to stabilize the spine by increasing stiffness and reducing the likelihood of excessive movement or injury during various activities.
  - **Load bearing:** when the spine is subjected to external loads coactivation helps distribute forces and protect the spinal structures from excessive stress.
  - **Motor control:** coactivations plays a role in fine-tuning movements and ensuring accuracy, especially in tasks requiring precision and control.

- Examples of Coactivation