Understanding Joint Mechanics and Movement Patterens

In the context of manual therapy, weights and measures of muscle imbalance or movement sciences refer to the objective and subjective methods used to assess how uneven muscle strength, length, tone, or coordination can impact movement patterns and overall function**.** These assessments may include manual muscle testing, goniometry (for joint range), dynamometry (for force output), EMG (for muscle activation), and movement analysis to detect compensations or asymmetries. Understanding these imbalances through measurable parameters allows clinicians to tailor manual therapy interventions—such as soft tissue mobilization, joint manipulation, or neuromuscular facilitation—to restore symmetry, enhance stability, and improve biomechanical efficiency. Essentially, these "weights and measures" serve as a diagnostic lens into how the body moves and how manual therapy can optimize that movement.

Module 2- 1st point

Traditional manual muscle testing (MMT) evaluates muscle strength by applying resistance against the primary action of a specific muscle, typically along its anatomical line from origin to insertion. However, functional movement is rarely isolated—it relies on the coordinated interaction of multiple muscles, including prime movers, synergists, and stabilizers. Moreover, functional strength does not necessarily involve maximal force production; instead, factors like timely muscle activation and sequencing are more critical. As a result, classical MMT may not fully capture the dynamic recruitment patterns of muscles involved in complex functional tasks. Although MMT is a valuable tool, it primarily quantifies weakness and may not reveal the true neuromuscular status during coordinated movements. For instance, a muscle may appear strong in isolated testing but still be inhibited within a movement pattern, or vice versa. Dr. Vladimir

Janda referred to this phenomenon as *pseudoparesis*, characterized by muscle hypotonia, an MMT score of 4/5, and delayed or absent activation on EMG. Janda emphasized that analyzing movement patterns provides a more reliable indication of functional pathology than pain-based assessments, which are inherently subjective. Movement assessments should follow postural evaluations and precede any tactile facilitation to ensure authentic motor responses. In evaluating these patterns, clinicians should prioritize the quality, timing, and sequencing of muscle activation—particularly the initiation phase—over sheer strength or task completion. Such analysis reveals underlying dysfunctions that may contribute to abnormal load distribution or stress across joints and tissues. While motor patterns vary between individuals, both normative and dysfunctional patterns are identifiable. This approach underpins Janda's six foundational movement tests, which offer insight into a patient's preferred neuromotor strategies. Complementary MMT and additional movement evaluations further enrich clinical interpretation and intervention planning.

Janda's Basic Movement Patterns

Janda identified six fundamental movement patterns that serve as a diagnostic framework for evaluating a patient's overall movement quality and neuromuscular control. These include tests for hip extension, hip abduction, curl-up, cervical flexion, push-up, and shoulder abduction. Each test is designed to assess coordination, sequencing, and stability within a functional context. To ensure accurate observation of the patient's preferred movement strategy, Janda recommended several key guidelines: the patient should wear minimal clothing to allow full visualization of the body; the clinician should avoid providing verbal instructions beyond basic directions; and physical contact should be avoided, as tactile input may alter motor responses. Each movement should be performed slowly and repeated three times to allow consistent observation. While

Janda emphasized the importance of muscle firing order during these tests, he placed greater diagnostic value on compensatory movement patterns, which often reveal underlying dysfunctions. The initial phase of each movement is particularly informative, offering insights into motor control strategies. Clinicians should observe both sides of the body to detect asymmetries, and signs such as muscle trembling or limb instability may indicate weakness or fatigue. Not all six tests are necessary for every patient; the selection of appropriate tests should be guided by the individual's posture, movement history, and clinical presentation. Reference tools, such as Table given below, can assist in identifying key indicators during assessment.

Movement test	Key indicators
Hip extension	Decreased gluteus maximus bulk Increased hamstring bulk Observation of spinal horizontal grooves or creases Anterior pelvic tilt Increased or asymmetrical paraspinal bulk Decreased trailing limb posture at terminal stance during gait
Hip abduction	Lateral shift or rotation of pelvis Asymmetrical height of iliac crest Observation of adductor notch Adducted hips or varus position Increased lateral IT groove Positive result on single-leg stance test Trendelenburg sign or increased lateral pelvic shift during loading response during gait
Trunk curl-up	Decreased abdominal tone Lateral grooves in abdominal wall Impaired respiration Pseudohernia
Cervical flexion	Prominence of sternocleidomastoid at mid- to distal insertion Forward head posture Increased angle (>90°) between chin and neck Impaired respiration
Push-up	Forward head with protracted shoulders Increased internal rotation of arms Nipples that face out superiorly and laterally (in males) Scapula winging, tipping
Shoulder abduction	Forward head with protracted shoulders Gothic shoulder Levator notch Scapular winging, tipping

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Hip Extension Test – Janda's Movement Pattern

The hip extension test evaluates the neuromuscular control and recruitment sequence of muscles involved in posterior chain activation, particularly during tasks that simulate functional gait

mechanics. In a typical gait cycle, the terminal stance phase requires approximately 10° of apparent hip hyperextension, partially achieved through 5° of posterior pelvic rotation. This trailing limb posture is critical for allowing the trunk to advance over the stable leg, thereby facilitating forward propulsion (Perry, 1992; Rancho Los Amigos, 1989). When hip flexors are short or stiff, the range of motion in the hip is restricted, shifting the axis of rotation proximally to the lumbar spine. This compensation increases mechanical stress and can contribute to lumbar dysfunction.

Clinically, the hip extension test is performed with the patient in a prone position, arms at the sides, and feet hanging off the table to ensure neutral leg rotation. The patient is instructed to slowly lift one leg toward the ceiling, keeping the movement smooth and controlled. The test primarily observes the sequencing and activation of the hamstrings, gluteus maximus, contralateral and ipsilateral erector spinae, and occasionally the shoulder girdle musculature.

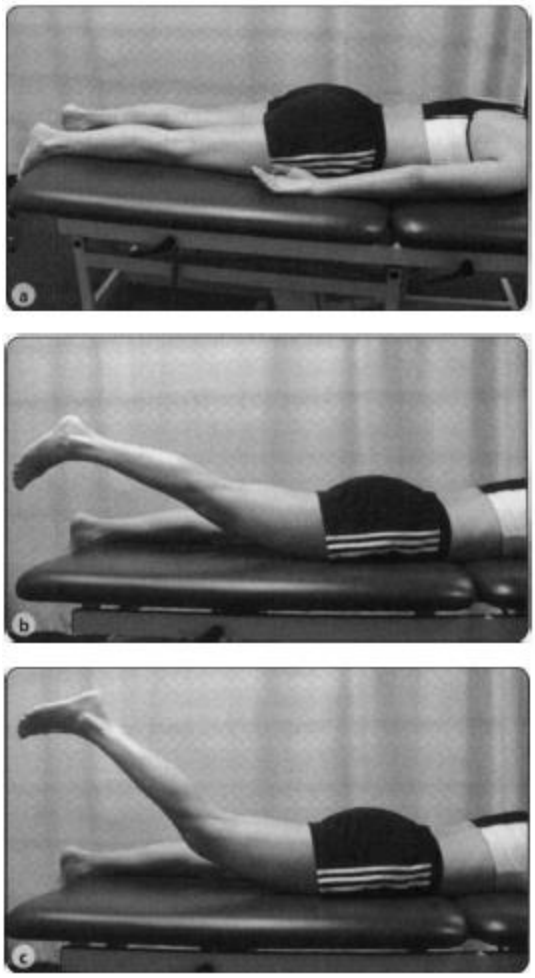
According to Janda, the normal activation sequence begins with the hamstrings, followed by the gluteus maximus, then the contralateral erector spinae, and finally the ipsilateral erector spinae. Deviations from this pattern—particularly delayed or absent gluteus maximus activation—are considered dysfunctional. A common faulty pattern involves dominant activation of the hamstrings and lumbar extensors, often observed as an anterior pelvic tilt and exaggerated lumbar lordosis during leg lift. In more dysfunctional cases, thoracolumbar extensors or shoulder muscles may initiate the movement, indicating a complete bypass of the gluteal contribution.

Additional clinical signs include inability to maintain knee extension, suggesting hamstring dominance, and hypertrophy of the hamstrings and lumbar extensors with concurrent gluteus maximus atrophy in postural assessment. Some patients also exhibit compensatory upper quadrant activity, such as activation of the contralateral latissimus dorsi or increased upper

trapezius involvement, reflecting compromised spinal stabilization and over-reliance on the thoracolumbar fascia.

Research supports these observations, noting significant variation in recruitment patterns even among healthy individuals (Bullock-Saxton et al., 1994; Vogt & Banzer, 1997; Pierce & Lee, 1990). Importantly, delayed gluteus maximus activation has been associated with anterior hip pain and increased lumbar load (Lewis & Sahrmann, 2005). Furthermore, studies emphasize the importance of feed-forward mechanisms—specifically the anticipatory activation of the abdominals and lumbar erector spinae—to stabilize the pelvis and trunk during the preparatory phase of hip extension (Hodges & Richardson, 1996, 1998; McGill, 2002; Hungerford et al., 2003).

The image sequence depicts the Prone Hip Extension Test, a classic assessment used in Janda's Movement Pattern Analysis to evaluate muscle activation sequencing, joint mechanics, and potential compensatory patterns during hip extension.



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Explanation of three frames with emphasis on joint mechanics and neuromuscular control:

Figure a – Starting Position

- The subject lies prone, with the pelvis and spine in neutral alignment.
- **Joints involved**:
    - Hip: Neutral extension
    - Knee: Neutral (extended)

    - Lumbar spine: Neutral lordosis
- This position sets the baseline to observe deviations from normal during the active movement phase.

Figure b – Faulty Movement Pattern

- As the subject attempts hip extension:
    - There is lumbar hyperextension and anterior pelvic tilt, indicating early activation of the lumbar erector spinae rather than the gluteus maximus.
    - The pelvis tilts anteriorly, which decreases the posterior pelvic stability.
- **Joint mechanics**:
    - **Hip**: Extension begins, but not initiated by the gluteus maximus.
    - **Lumbar spine**: Moves into excessive extension, suggesting overuse of lumbar extensors (e.g., erector spinae).
    - **Pelvis**: Anteriorly tilts due to inhibited gluteals and tight/overactive hip flexors.
- **Janda's interpretation**:
    - This faulty pattern is consistent with Lower Crossed Syndrome (LCS).
    - It shows gluteus maximus inhibition with compensation by hamstrings and lumbar erector spinae.

Figure c – Additional Compensatory Pattern

- As hip extension continues, there is excessive knee flexion, indicating dominant hamstring activity.
- **Joint mechanics**:
    - **Hip**: Extension continues, but with altered neuromuscular control.
    - **Knee**: Flexes due to hamstring dominance, further proving gluteal inhibition.

    - **Lumbar spine**: Still in an extended position.

- **Implications**:
    - The hamstrings are taking over hip extension because the gluteus maximus is weak or inhibited.
    - The movement lacks proper lumbopelvic stability and gluteal control.

Clinical Summary (Janda's Perspective):

- This test illustrates a dysfunctional hip extension pattern where:
    1. Gluteus maximus is delayed or underactive.
    2. Hamstrings and lumbar extensors compensate for hip extension.
    3. Pelvic and lumbar instability occur due to improper muscular coordination.
- These findings are key signs of Lower Crossed Syndrome, where tight hip flexors and lumbar extensors coexist with weak gluteals and abdominals.

Hip Abduction Movement Pattern Test

The hip abduction test evaluates the functional integrity of the lateral hip stabilizers and their role in maintaining pelvic alignment during gait. During the loading response phase of the gait cycle, the lower fibers of the gluteus maximus, hamstrings, and adductor magnus eccentrically control hip flexion torque, stabilizing the hip joint and minimizing trunk flexion. Simultaneously, the tensor fasciae latae (TFL), posterior gluteus medius and minimus, and upper fibers of the gluteus maximus act eccentrically to stabilize the pelvis in the frontal plane. As the body transitions into midstance, this coordinated action of the hip abductors counters the significant varus torque, preventing lateral pelvic shift or contralateral hip drop.

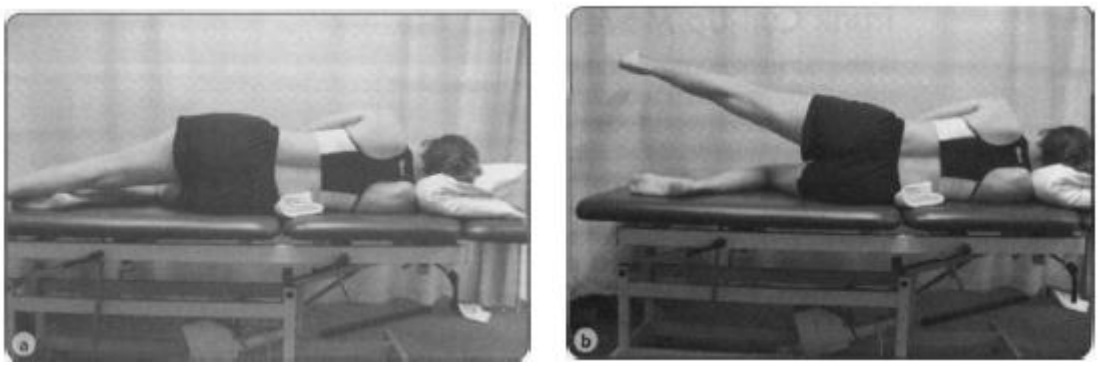
Clinically, the test is performed with the patient lying on their side, the bottom leg flexed for support, and the top leg extended in line with the trunk. The gluteus medius, minimus, and TFL

serve as the primary movers for abduction, while the quadratus lumborum and abdominal muscles assist in stabilizing the pelvis. The patient is asked to lift the top leg vertically toward the ceiling, ideally achieving approximately 20° of pure abduction without compensatory hip flexion, rotation, or trunk movement. A stable trunk and pelvis during this motion is a hallmark of a normal recruitment pattern.

Dysfunctional patterns are commonly observed and provide key diagnostic insight. The most frequent compensatory pattern is dominance of the TFL, resulting in combined hip flexion and abduction due to the muscle's dual action. A more severe dysfunction occurs when the quadratus lumborum initiates the movement, producing a hip hike before 20° of abduction. In this case, the quadratus lumborum acts as a prime mover rather than a stabilizer, leading to a lateral pelvic tilt. Such faulty mechanics shift stress to the lumbosacral region and hip joint, compromising gait efficiency and stability.

Positive findings during this test include tightness of the iliotibial band, atrophy of the gluteal muscles, and failure in the single-leg stance test, often reflecting poor lateral stability and increased compensatory load on the spine and pelvis during locomotion.

The Hip Abduction Test, as depicted in the images (Figures a–d), is used in Janda's movement pattern assessment to evaluate the function and motor control of the hip abductors, primarily the gluteus medius, and to detect compensatory strategies or imbalances in the lumbopelvic-hip complex. Here's an explanation of each phase and associated compensatory patterns in terms of joint mechanics and muscle imbalances:



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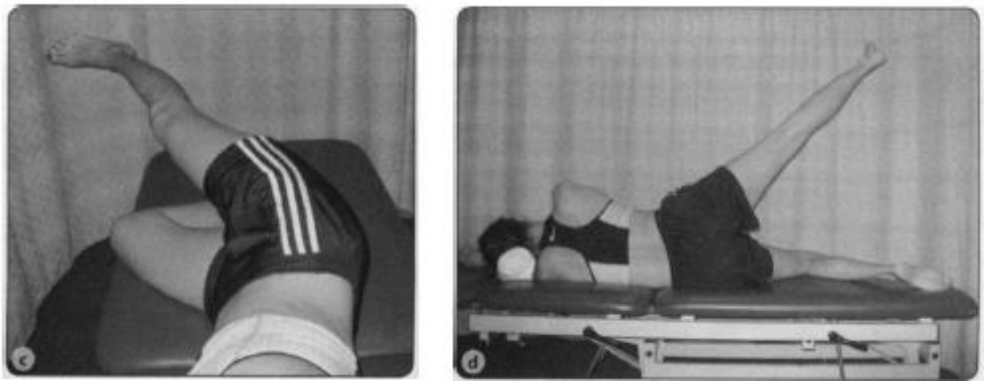
☑ Normal Movement Pattern (Figure a– Start & Figure b – End):

- Position: Patient lies on the side with hips neutral and knees extended (Figure 6.2a).
- Movement: The top leg is abducted directly in the coronal plane without any pelvic movement or hip flexion/rotation (Figure b).
- Mechanics:
    - Primary mover: Gluteus medius initiates and controls abduction.
    - Stabilizers: Obliques and contralateral quadratus lumborum stabilize the trunk and pelvis.
- Outcome: Pure hip abduction without pelvic hiking, anterior pelvic tilt, or femoral rotation.



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❌ Compensatory Patterns (Faulty Movement Patterns):

1. Tensor Fasciae Latae (TFL) Dominance – Figure c (Tensor Mechanism):

- Compensation: Hip abduction is combined with hip flexion and internal rotation.
- Mechanics:
    - TFL substitutes for a weak or inhibited gluteus medius.
    - Femur rotates internally, and pelvis may tilt forward slightly.
- Clinical Significance: Common in patients with postural abnormalities and contributes to valgus knee or patellofemoral dysfunctions.

2. Hip Hike (Quadratus Lumborum Dominance) – Figure 6.2d:

- Compensation: Elevation of the ipsilateral pelvis ("hip hike") instead of true hip abduction.
- Mechanics:
    - The quadratus lumborum laterally flexes the spine to raise the pelvis.

    - Hip abduction appears excessive, but it's primarily a trunk movement.
- Clinical Significance: Indicates gluteus medius weakness with compensation from lateral trunk muscles. May result in lumbar spine stress or side-shift posture.

🧠 Janda's Interpretation:

This test reflects phasic muscle weakness (gluteus medius) and tonic muscle overactivity (TFL, QL), consistent with Lower Crossed Syndrome. Abnormal patterns here are predictors of pelvic instability, lumbopelvic pain, and hip/knee dysfunctions due to faulty load transfer.

Trunk Curl-Up Movement Pattern Test

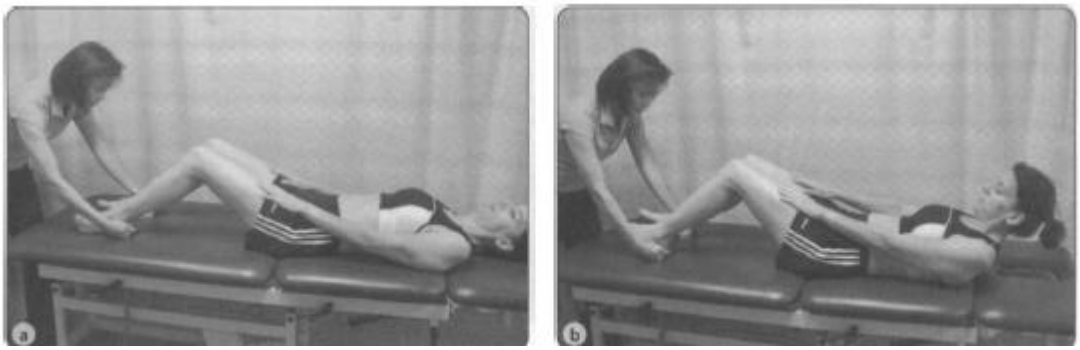
The trunk curl-up movement pattern test evaluates the dynamic interaction between the abdominal musculature and the hip flexors, particularly during the early phase of spinal flexion. In a proper curl-up, the abdominal muscles—notably the rectus abdominis and internal obliques—contract concentrically to produce spinal flexion. This results in a rounded upper trunk, flattening of the lumbar spine, and a posterior pelvic tilt. The upward phase concludes once the scapulae lift off the table, with the heels maintaining full contact on the surface. Further spinal flexion into a full sit-up involves increasing contribution from the hip flexors, especially the iliopsoas (Kendall, McCreary, and Provance, 1993).

Clinically, the test is performed with the patient in a supine position, and the clinician observes the sequencing of muscle recruitment during the curl-up. When abdominal activation is adequate, the movement presents as smooth upper trunk flexion with minimal pelvic compensation. Conversely, hip flexor dominance is indicated by limited upper trunk flexion and an anterior pelvic tilt, signaling inefficient abdominal contribution.

To refine assessment, the clinician may place their hands under the patient's heels to detect early heel lift, a sign that hip flexors are overpowering the abdominals (Jull & Janda, 1987). If heel

elevation occurs before scapular clearance, the test is considered positive, revealing a dysfunctional movement pattern. It is important to clarify that the so-called "Janda crunch" or "Janda sit-up"—often misrepresented in popular fitness literature—is not an exercise endorsed by Janda. Rather, his intent was to monitor heel lift, not to prescribe resistance-based hamstring contraction.

Debate persists over the functional distinction between upper and lower abdominal muscles. While Kendall et al. proposed separate tests—curl-ups for the upper abdominals and double-leg lowering for the lower—others, such as Lehman and McGill (2001), argue that such differentiation lacks anatomical and functional precision. They emphasize the interconnectedness of the abdominal fascia and muscle layers, suggesting that although regional activation differences exist, the abdominals function as a coordinated system to stabilize the spine (McGill, 2002). This supports the use of **multiple movement challenges** to assess comprehensive abdominal function.



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The Curl-Up Test shown in Figures a–b is used in Janda's movement pattern assessment to evaluate abdominal muscle function, specifically the activation and coordination of the rectus abdominis and deep stabilizers like the transversus abdominis and obliques. This test helps identify substitution patterns, muscle imbalances, and deficits in core stabilization.

☑ Normal Movement Pattern:

Figure a – Start Position:

- Patient lies supine with knees bent, feet flat on the table.
- Arms are positioned alongside the body.
- Neutral pelvis and lumbar spine are maintained.

Figure b – Finish Position:

- Patient actively curls the trunk forward toward the knees without excessive pelvic or lumbar movement.
- Movement is smooth and controlled, with no jerky or hip-flexor-dominant motion.

Key Joint Mechanics and Muscle Activation:

- Primary movers: Rectus abdominis and obliques flex the thoracic spine.
- Stabilizers: Transversus abdominis and deep lumbar stabilizers (e.g., multifidus) maintain pelvic position.
- Neutral pelvis: Maintained through abdominal bracing; no anterior pelvic tilt should occur.

❌ Abnormal/Substitution Patterns (Not shown in images but clinically relevant):

1. Hip Flexor Dominance:
    - Excessive activation of iliopsoas and rectus femoris.

    - Anterior pelvic tilt during trunk lift indicates that abdominal muscles are not providing adequate stabilization.
2. Poor Segmental Control:
    - Rapid movement with jerking suggests poor eccentric control or compensation by superficial muscles like the external obliques.
3. Abdominal Wall Protrusion:
    - Doming or bulging of the abdominal wall indicates ineffective transversus abdominis activation.
4. Scapular Winging or Head Thrusting:
    - Suggests poor integration of thoracic spine and cervical stabilizers with core control.

🧠 Janda's Interpretation:

- A positive test (poor abdominal control, pelvic motion, or hip flexor dominance) indicates core instability and an imbalance between phasic and tonic muscles, commonly seen in Lower Crossed Syndrome.
- Weak abdominal function here contributes to postural dysfunction, impaired load transfer, and lower back pain.

Cervical Flexion Movement Pattern Test

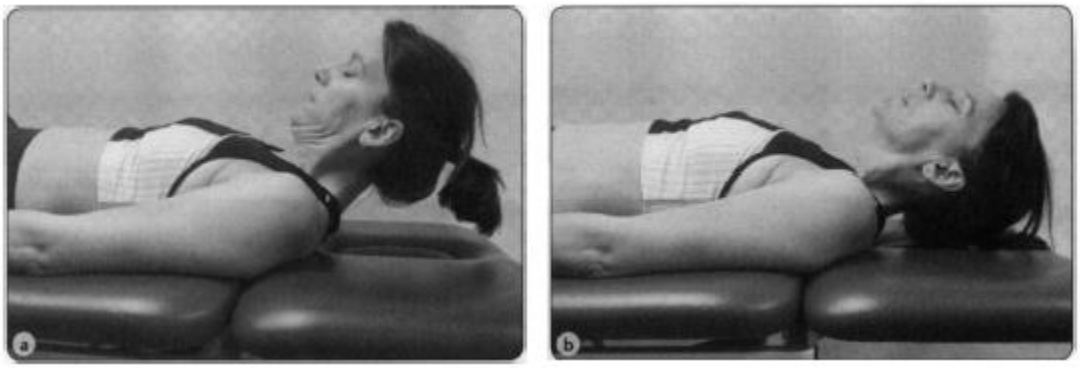
The cervical flexion movement pattern test is designed to assess the functional coordination between the deep cervical flexors—including the longus capitis, longus colli, and rectus capitis anterior—and the more superficial synergists, namely the sternocleidomastoid (SCM) and anterior scalene muscles (Kendall, McCreary, and Provance, 1993). In an optimal movement pattern, cervical flexion should occur with a smooth, segmental craniocervical (upper cervical) flexion, led by the deep cervical flexors and characterized by minimal compensatory activity from the superficial muscles.

This test is particularly useful for identifying motor control dysfunction in individuals with neck pain, including those with idiopathic cervical discomfort or whiplash-associated disorders. Surface electromyographic (EMG) studies have consistently demonstrated increased activity in the SCM and anterior scalene in such populations, along with delayed or reduced activation of the deep neck flexors (Jull, 2000; Falla et al., 2003). The loss of segmental stability and endurance in these deep muscles contributes to compromised cervical motor control, a common factor in chronic neck pain and recurrent headaches (Falla et al., 2003a, 2003b, 2004, 2006; Jull et al., 1999; Cibulka, 2006).

The test is performed with the patient in a supine position, instructed to slowly flex the head toward the chest. A positive finding is indicated by a forward jutting of the chin or jaw during the initiation of the movement, signifying excessive reliance on the SCM and scalenes and poor recruitment of the deep flexors (see Figure b). Additionally, visible hypertrophy or resting bulk in the mid-belly of the SCM may reflect long-standing dominance of superficial musculature. To further clarify the movement pattern, the clinician may apply light resistance to the patient’s forehead using one or two fingers. This maneuver enhances detection of anterior translation of

the cervical segments, confirming the inadequate stabilization by the deep flexors if such translation is observed.

The presence of forward head posture, observable during postural assessment, also supports the diagnosis of weak or inhibited deep cervical flexors and is commonly correlated with the findings of this test.



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The Cervical Flexion Test, shown in Figures a–b, is used in Janda’s movement pattern assessment to evaluate the coordination and strength of deep neck flexors (especially the longus colli and longus capitis) and to identify compensatory overuse of superficial cervical flexors like the sternocleidomastoid (SCM) and anterior scalene.

☑ Figure a – Normal Pattern:

- Patient lies supine and performs a gentle chin tuck followed by cranio-cervical flexion (like nodding "yes").
- The chin moves toward the sternum with minimal to no elevation of the head.
- Deep cervical flexors initiate and control the motion.

- The head and neck segments stay aligned, and the SCM and superficial muscles remain relatively relaxed.

❌ Figure b – Abnormal Pattern (Positive Test):

- The chin juts forward and cervical spine hyperextends during attempted flexion.
- Indicates dominance of the sternocleidomastoid and scalene muscles, and inhibition or weakness of the deep neck flexors.
- Often seen in individuals with Upper Crossed Syndrome, where postural imbalances (e.g., forward head posture) cause altered recruitment patterns.

🧠 Clinical Significance (Janda's Interpretation):

- A positive test signifies neuromuscular imbalance between phasic (deep flexors) and tonic (SCM, upper trapezius) muscles.
- This dysfunctional pattern may contribute to:
    - Chronic neck pain
    - Cervicogenic headaches
    - Forward head posture
    - Poor cervical stability

🔍 Joint Mechanics Summary:

Motion Component	Normal	Abnormal
Initial movement	Chin tucks inward	Chin juts forward
Primary muscles used	Longus colli, longus capitis	Sternocleidomastoid, scalene
Head position	Neutral spine maintained	Cervical hyperextension present

Push-Up Movement Pattern Test

The push-up movement pattern test is a valuable clinical assessment for evaluating the quality of dynamic scapular stabilization, particularly the interplay between the serratus anterior, trapezius, and other scapular stabilizers. In a properly executed push-up, the scapulae should abduct and upwardly rotate as the trunk ascends, without any signs of scapular elevation or winging. This coordinated motion reflects an effective force-couple between the serratus anterior and trapezius muscles, supported by contributions from additional scapular synergists (Cools et al., 2003).

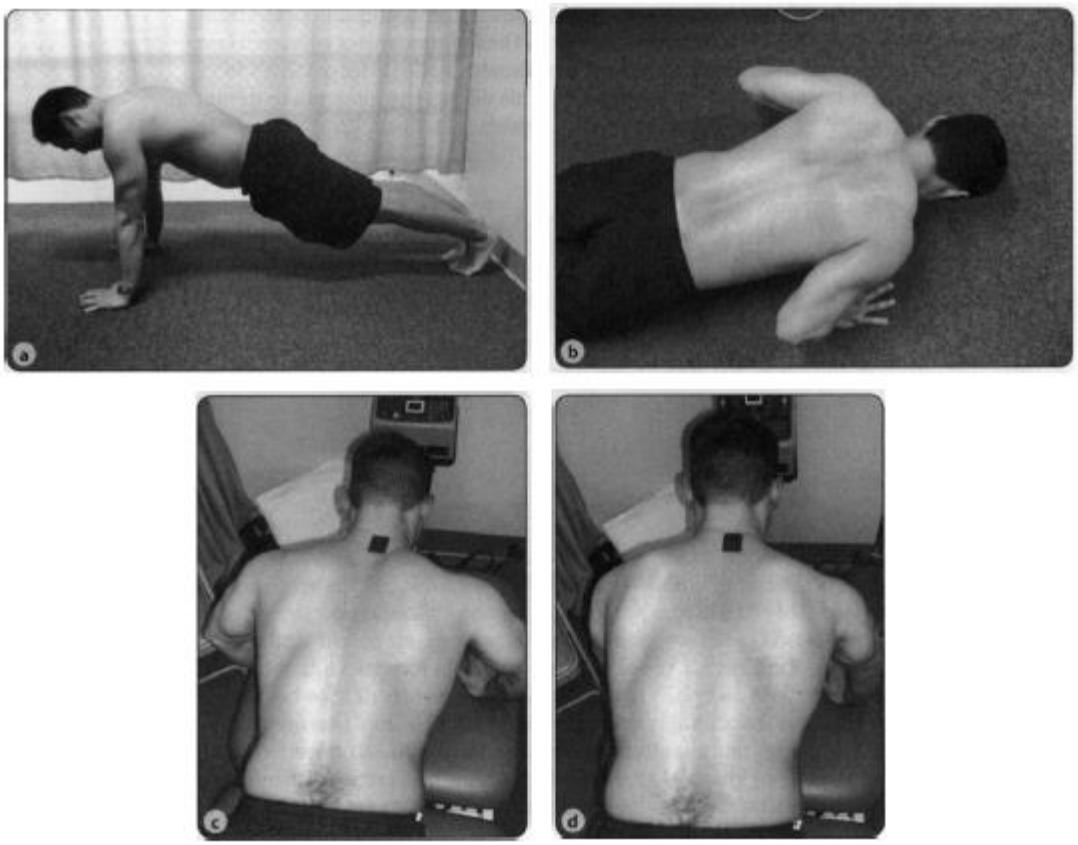
Weakness or dysfunction of the serratus anterior becomes evident when the patient exhibits scapular winging, excessive adduction, or an inability to complete full scapular abduction throughout the movement. Conversely, dominance of the upper trapezius and levator scapulae is often demonstrated through excessive scapular elevation or shrugging. These compensations indicate altered recruitment patterns within the scapular stabilizing system.

Importantly, the eccentric phase—as the patient lowers from the push-up position—is more sensitive for identifying dysfunctional movement patterns, including scapular elevation, tipping, winging, adduction, or abduction. The nature of the scapular deviation observed often reflects the overactivity or dominance of specific muscular synergists involved in the movement.

The test is performed with the patient in a prone position, legs extended, and instructed to execute a standard push-up from the feet (see Figure a–b). The clinician closely observes the scapular kinematics and torso alignment, noting any deviations such as winging, excessive elevation, or asymmetry (Figure c–d). Due to its physical demands, the test requires sufficient torso and upper extremity strength and endurance to maintain a stable posture throughout.

If the patient is unable to perform a standard push-up, a modified push-up from the knees is permitted (Figure e). Observations of scapular winging, “gothic shoulder” posture, levator notch,

or excessive pectoral bulk during postural analysis should prompt clinicians to include this test as part of a broader assessment for upper crossed syndrome (UCS) as described by Janda.



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The Push-Up Test, as illustrated in Figure (a–d), is part of Janda’s movement pattern assessment and is used to evaluate scapular stability, upper kinetic chain coordination, and potential muscle imbalances involving the shoulder girdle, especially the scapulothoracic and glenohumeral joints.

🏁 Figure a – Starting Position (Push-Up Ready):

- Ideal alignment shows the body in a straight line, shoulders over wrists, core engaged.

- Scapulae should lie flat against the rib cage (no winging or excessive protraction).
- Requires coordination of core stabilizers, serratus anterior, lower trapezius, and pectoralis major.

🏁 Figure b – Ending Position (Push-Up Bottom):

- Elbows are flexed close to the body.
- The scapulae should retract symmetrically with controlled thoracic extension.
- This requires balanced activation of rhomboids, middle/lower trapezius, and scapular stabilizers.

❌ Figures c and d – Deviations (Observed from Posterior View):

These images highlight asymmetries and dysfunctions that are commonly observed:

▸ *Figure c – Right Scapular Winging or Protraction:*

- Right scapula appears elevated or abducted more than the left.
- Suggests weakness or inhibition of the serratus anterior or lower trapezius on the right side.
- Overactivation of the upper trapezius or levator scapulae may also be involved.

▸ *Figure d – Left Scapular Elevation or Asymmetry:*

- Uneven elevation may indicate dominance of the upper trapezius or imbalance between scapular stabilizers.
- Possible underlying postural issues (e.g., Upper Crossed Syndrome) or muscle length-tension imbalances.

🧠 Janda's Interpretation:

The Push-Up Test identifies:

- Scapular dyskinesis

- Poor neuromuscular control of scapular stabilizers
- Upper crossed syndrome (tight pectorals and upper traps; weak lower traps and deep neck flexors)
- Dysfunction in phasic muscles like lower trapezius, serratus anterior
- Dominance of tonic muscles (upper trapezius, SCM)

🔍 Key Muscles Involved:

Functional Role	Muscle Involved
Scapular protraction	Serratus anterior (weak if winging)
Scapular depression	Lower trapezius, latissimus dorsi
Scapular elevation	Upper trapezius (dominant in faulty patterns)
Glenohumeral stability	Rotator cuff group
Core stabilization	Rectus abdominis, obliques, TA

☑ Clinical Use:

This test is helpful in:

- Identifying shoulder girdle dysfunction in athletes
- Screening for scapular instability
- Informing rehabilitation plans (targeting serratus anterior, lower trapezius)

Shoulder Abduction Movement Pattern Test

The shoulder abduction movement pattern test evaluates the functional coordination among the deltoid, rotator cuff, upper trapezius, and levator scapulae, which together contribute to smooth and efficient movement of the shoulder complex. Proper abduction of the arm in the frontal plane involves a coordinated sequence of glenohumeral abduction, scapular upward rotation, and scapular elevation, maintained through precise muscular force coupling.

The test is conducted with the patient seated, arms resting at the sides, and elbows flexed to minimize unwanted rotational components (Figure a). As the patient abducts the arm, the clinician observes three key motion components:

1. Abduction at the glenohumeral joint,
2. Upward rotation of the scapula, and
3. Elevation of the scapula.

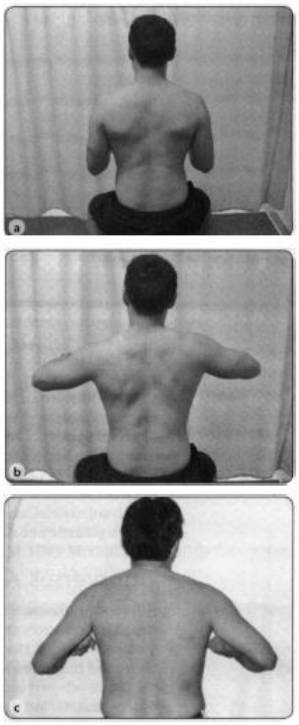
Activation of the contralateral upper trapezius for postural stabilization is considered normal. However, the critical point in the assessment is at approximately 60° of shoulder abduction. At this angle, scapular elevation begins to accompany upward rotation. Premature or exaggerated elevation of the shoulder girdle before 60° indicates incoordination or dysfunction in the muscular force couples, particularly involving the deltoid, rotator cuff, upper trapezius, and levator scapulae (Figures b-c).

Common compensatory strategies observed include:

- Early scapular elevation, suggestive of overactivity of the upper trapezius or levator scapulae.
- Initiation of abduction via shoulder girdle elevation, frequently seen in individuals with frozen shoulder, indicating a pathological movement pattern.

- Contralateral trunk side bending to initiate arm elevation, representing a severe imbalance, often due to rotator cuff or deltoid weakness combined with shortened or overactive contralateral quadratus lumborum.

Additional findings such as upper trapezius hypertrophy, deltoid and posterior rotator cuff atrophy, and presence of a “gothic shoulder” or levator notch during postural observation further reinforce a positive test outcome and indicate underlying upper crossed syndrome or chronic compensatory strategies. Moreover, repetitive or sustained abnormal shoulder abduction patterns may place undue mechanical stress on the cervical and thoracic spine.



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The test shown in the image sequence (a–c) is the Scapular Assistance or Scapular Dyskinesis Test, part of postural and movement pattern assessments as advocated by Janda and Kibler. This test is designed to observe scapular movement control, symmetry, and muscle activation patterns during shoulder motion, particularly shoulder abduction and external rotation.

🖼️ Figure Descriptions:

Figure (a): Starting Position

- The subject is seated with hands raised and elbows flexed.
- This neutral starting position is used to prepare for active scapular motion testing.
- Scapulae should be symmetrical, lying flat against the ribcage.

Figure (b): Mid-Movement – Active Abduction/ER

- The subject raises elbows and shoulders into abduction and external rotation, mimicking a "chicken wing" posture.
- A symmetrical upward rotation and posterior tilt of both scapulae should occur.
- Observation at this point may reveal:
    - Winging (scapula lifting off the thoracic wall)
    - Elevation or asymmetry
    - Reduced upward rotation on one side

Figure (c): Final Movement – Max Elevation

- Full abduction with retraction and elevation is visible.
- Clear deviation is seen in the form of:
    - One scapula elevated more than the other
    - Scapular winging
    - Asymmetrical muscle activation

🧠 Clinical Interpretation

Observation	Possible Dysfunction
Scapular winging	Weak serratus anterior or long thoracic nerve palsy
Early/elevated scapula	Overactive upper trapezius or levator scapulae
Limited upward rotation	Dysfunctional lower trapezius or serratus anterior
Scapular asymmetry	Muscle imbalance or faulty movement pattern

🔍 Muscles Involved

Muscle Group	Role in Movement
Serratus Anterior	Scapular protraction and upward rotation
Trapezius (mid/lower)	Scapular retraction, depression
Rhomboids	Retraction and scapular stability
Levator Scapulae	Scapular elevation
Rotator Cuff Group	Glenohumeral stabilization

☑ Purpose of the Test:

- Detects scapular dyskinesis
- Identifies neuromuscular control issues
- Helps direct rehabilitation towards:
    - Improving scapular control
    - Strengthening serratus anterior and lower trapezius

- Inhibiting overactive upper trapezius

☑ **Comprehensive Summary Table of Functional Tests**

Test Name	Start / End Position	Key Observations	Clinical Implications
Hip Abduction Test	Sidelying; leg straight → Active abduction	Substitution by tensor fasciae latae or hip hike	Weak gluteus medius; poor lumbopelvic stability
Curl-Up Test	Supine; knees bent → Active abdominal curl	Quality of trunk flexion; muscle trembling or hip flexor dominance	Weak abdominal core; poor neuromuscular control
Cervical Flexion Test	Supine; chin tucked and lifted → chin protrusion	Chin jutting indicates loss of deep neck flexor control	Positive for weak deep cervical flexors (longus colli/capitis)
Push-Up Test	Prone plank → Elbow flexion + scapular motion	Trunk or scapular deviation; asymmetry	Weak scapular stabilizers (serratus anterior, lower traps); core instability
Scapular Dyskinesis Test	Seated; arm elevation in ER → Observe scapulae	Winging, asymmetry, early scapular elevation	Dyskinesis; weak serratus anterior, overactive upper trapezius

📌 Legend for Common Observations:

- Winging = Scapula lifting off thorax
- Hip Hike = Pelvic compensation due to gluteal weakness

- Chin Jut = Dominant superficial neck flexors (e.g., SCM)
- Deviation = Lateral trunk or scapular shift during motion
- Substitution = Use of secondary muscles (TFL, hip flexors)

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