

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE
PROGRAM IN PHYSICAL THERAPY

STANDING TESTS

Appearance

Make a general observation of the Pt.'s posture. Is there good muscle definition? How does their weight affect shoulder posture?

Alignment

Posterior View

- Observe slope of shoulders: normal is a slight downward slope
- Scapulothoracic alignment:
 - abd/add (normal = vertebral spinous process 3" from root of spine of scapula)
 - upward/downward rotation [normal vertebral border vertical or very slight upward rotation (5°)] (Ludewig PM 2009)
 - palpate middle 1/3 of vertebral border of scapula using opposite hand
 - internal/external rotation (normal 30 - 40° anterior to frontal plane)
 - place hands on scapula with fingers parallel to spine of scapula
 - winging (abnormal)
 - anterior tilt (normal 10-15°)
 - one indicator of anterior tilt is prominence of inferior angle
 - place hands on scapula with fingers perpendicular to spine of scapula
 - depression/elevation:
 - Normal: root of spine of scapula aligned with T3
 - Three indicators of scapulothoracic depression:
 - root of spine of scapula aligned lower than T3
 - clavicle horizontal or sloped downward
 - slope of shoulders increased
- Spine
 - Cervical
 - Thoracic
 - Lumbar
- Humerus
 - Medial versus lateral rotation (Confirm that impairment is at the GHJ by correcting scapular alignment)
 - Normal humeral rotation: antecubital crease should be facing medially slightly and olecranon should face laterally slightly. In other words: with scapula 40° anterior to frontal plane the axis between medial and lateral epicondyles aligned 30° anterior to the frontal plane (Ludwig PM 2009).
 - If scapula is in increased internal rotation, and antecubital crease is aligned with the frontal plane, then humerus is in lateral rotation.
 - If scapula is in increased external rotation, and antecubital crease is aligned with frontal plane, then humerus is in medial rotation.
 - Abd/adduction (normal = arm at side with normal scapular alignment)

Lateral View

- Scapula:
 - Confirm tilt and internal/external rotation as observed in backview
- Humerus:
 - Extension/flexion (normal = shaft of humerus vertical)
 - Confirm by correcting impairments in scapular alignment
 - Humeral head relative to acromion (normal = no > 1/3 humeral head anterior to anterolateral corner of acromion)
- Spine:
 - Cervical
 - Thoracic
 - Lumbar

Anterior View

- Clavicle
 - Normal:
 - 6-29° elevation (Ludewig PM 2009; Telford S 1948; Todd TW 1912) Assess by placing index fingers on the superior aspect of clavicle, one finger just medial to the AC joint and the other lateral to SC joint.
 - 19° retraction (Ludewig PM 2009)
- Humerus:
 - Normal humeral rotation: antecubital crease should be facing medially slightly and olecranon should face laterally slightly. In other words: with scapula 40° anterior to frontal plane the axis between medial and lateral epicondyles aligned 30° anterior to the frontal plane (Ludwig PM 2009).

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Bilateral shoulder flexion and return from flexion

- Watch for the following during arm elevation from a backview:
 - Acromion
 - Acromion should elevate slightly during shoulder flexion, beginning after the 1st 40° of arm elevation
 - Acromion should be aligned with C6-7 at end ROM arm elevation
 - Acromion should not depress during first 90° of arm elevation
 - Scapula should upwardly rotate, posteriorly tilt and by the end range externally rotate slightly. These movements should occur without excessive scapular abduction or adduction.
 - The vertebral border of the scapula should reach 55-60° (+ or - 5°) . This is the angle of the vertebral border of the scapula relative to the vertical and is a result of the combination of scapular movements.
 - Normal scapular abduction at the end range is 3" from the vertebral spine to the root of the spine of the scapula.
 - Excessive scapular adduction (increased clavicular retraction)
 - root of spine of scapula <2.5 inches from vertebral spine at end range shoulder flexion
 - Excessive scapular abduction (decreased clavicular retraction)
 - root of spine of scapula > or = 3.5 inches from vertebral spine at end range shoulder flexion and/or
 - greater than ½" of abduction of scapula in first 90° of shoulder flexion and/or
 - scapula rests in abduction and remains abducted during shoulder flexion
 - Scapula should posteriorly tilt 10° by ~140° the end range of arm elevation (Ludewig PM 2009)
 - Scapula should externally rotate so it is 10-20° anterior to the frontal plane @ the end range of arm elevation. (Ludewig PM 2009)
 - Scapula should elevate slightly throughout the range of arm elevation.
 - SH rhythm (should be 2:1)
 - Monitor SH rhythm with one hand on the upper arm or wrist and other hand palpating inferior angle of scapula
 - Inferior angle should reach midaxillary line by end of arm elevation
 - GH creases (look for asymmetry)
 - GH rotation (should not be excessive MR)
 - Humerus should LR 60° degrees during arm elevation so olecranon is directed more anterior than lateral direction at end range (Ludewig PM 2009). The olecranon facing laterally is 0° of humeral LR and the olecranon facing anteriorly with the arm overhead is 90° of GH lateral rotation.
 - Shoulder ROM should be about 170° maintaining a fairly stable spine. (Normally the thoracic spine does extend *slightly* at end range arm elevation.)
- Shoulder flexion from a front and sideview
 - Clavicle should retract 16° and elevate at least 6-10° (Ludewig PM 2009)
- During the return from flexion (backview):
 - the scapula should not internally rotate (IR) and anteriorly tilt excessively
 - Not significant if the IR/tilting occurs in the last 30-40° of the return motion especially if the scapula is resuming its starting alignment.
 - There should be less scapular anterior tilt during arm lowering than during arm raising. Ludewig PM 2009
 - There should be less scapular movement during arm lowering than during arm raising. Braman 2009

Single shoulder flexion

- May see exaggerated scapular movement impairments relative to bilateral shoulder flexion
- Palpate cervical spinous processes (SP). Compare the movement of the SP during bilateral compared to unilateral shoulder flexion. Normally the SP should stay stable during both.
+ if SP rotate during unilateral shoulder flexion. This indicates that the segment of the cervical spine that is moving is relatively too flexible.
Secondary test: manually assist scapular movement to correct any scapular impairments during the shoulder flexion and cue the patient to contract the intrinsic cervical flexors.

Shoulder abduction

Expectations for movement of the scapula and humerus are very similar as for shoulder flexion with the exceptions:

- Greater scapular external rotation will occur during the range of motion (Ludewig PM 2009)
- Impairments of humeral anterior and superior glide are more readily identified at midrange abduction.

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Standing Shoulder lateral rotation with arm at side and elbow flexed 90°

Begin by palpating the inferior border of the scapula
Ask subject to perform bilateral **active external rotation of the shoulders** Monitoring inferior border of the scapula for motion visually and by palpation. Observe for symmetry of movement.

Compensatory Motion: Scapula moves into Adduction before reaching end range; glenohumeral joint moves into extension or abduction, excessive anterior translation of humeral head

Examiner passively assesses available ROM of external rotation

- If GH LR is limited, it could be due to a scapular alignment impairment of excessive scapular internal rotation. If this is the case, correct the scapular impairment and see if GH LR increases.

Cervical Range of Motion

- Can be performed in standing or sitting.
- Stand behind the subject and assess active cervical ROM noting any imprecise motion, ROM, and symptom production.
 - Note compensatory cervical extension, flexion, or sidebending during cervical rotation
 - Note excessive translation: anteriorly during flexion, posteriorly during extension, and laterally during sidebending
 - During all motions note whether or not motion seems to occur smoothly across all segments of cervical spine vs. being isolated to one or two segments.
- Passively elevate the shoulder girdle and repeat cervical ROM. Usually examiner hand placement in axilla while standing behind patient works best to elevate the shoulder girdle. Use caution not to anteriorly tilt scapula during passive elevation. Assess the load of the shoulder girdle while lifting.
 - Positive test is > 10 degrees increase in ROM and decreased symptoms with shoulder girdle elevated compared to unsupported and/or improved quality of motion.

SUPINE TESTS

Pectoralis Minor Length Test

- Positioning: Supine with towel roll under distal humerus and forearms resting on abdomen
- Observe shoulders from superior view looking for asymmetry. Normal should be posterior acromion 1" off table
- Next examiner stands next to patient and places heel of hand on coracoid area and stretches pectoralis minor observing for relative flexibility.
- Watch for rotation of trunk/rib cage or elevation of rib cage. Abdominals are less stiff/flexible than pec minor if trunk rotation is noted.
- If trunk or rib cage movement is noted, cue patient to contract abdominals and/or manually stabilize trunk/rib cage to determine actual length
- Short if unable to push posterolateral corner of acromion almost to table.

Latissimus Dorsi Length Test

1st Part of Test is active and done bilaterally and is done to determine relative flexibility/stiffness:

Position: Hooklying

Motion: Active Bilateral Flexion of Arms over Head

Compensatory Movements: Lumbar extension, ribcage elevation, shoulder MR, and/or anterior humeral glide

Secondary Test: Contract lower abdominals, keeping back flat against the Table if compensatory movement is Lumbar extension or rib cage elevation. Cue patient to LR shoulder if movement is MR.

*Example of conclusions: if lumbar spine extends then structures of trunk (abdominals and joints) are relatively more flexible than latissimus.

2nd Part of Test done passively and unilaterally

Position: Hooklying

Motion: Passive Unilateral Flexion of Arms over Head with shoulder LR

Support humerus at elbow maintaining about 60° of shoulder lateral rotation

Compensatory Movement: Same as above

Normal Range In Passive Test: 170° of shoulder flexion normal range

Secondary Tests:

If superior shoulder pain at end ROM shoulder flexion, and scapula is anteriorly tilted, apply manual pressure to posteriorly tilt scapula. If note humeral anterior glide, apply posteriorly directed pressure over head of humerus during shoulder flexion. If note shoulder MR, stop shoulder flexion at point where no longer able to control MR.

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Scapulohumeral (SH) Length Test

1st Part of Test:

Begin the SH length test at the end of the latissimus dorsi length test. Determining the length of the Latissimus Dorsi, this provides the 'standard' regarding how much shoulder flexion should be expected during the SH muscle length test.

2nd Part of Test:

Position: Hooklying

Motion: **Passive** Unilateral Flexion of the Arm over Head with shoulder LR

Compensatory Movement: Scapular movement such that lateral border of scapula protrudes greater than $\frac{1}{2}$ inch from the posterolateral border of the thorax. This is noted with the shoulder flexed to end ROM and the shoulder in LR.

May also observe posterior tilting of the scapula, humeral anterior glide, or scapular abduction.

Stabilization: Decrease shoulder flexion to 90 degrees so that scapula does not protrude from posterolateral border of thorax more than $\frac{1}{2}$ inch. Slowly flex the shoulder passively while applying manual pressure to the lateral border of the scapula to prevent compensatory movement yet allowing full normal scapular movement.

Conclusions:

*If shoulder flexion range is less than that achieved during Latissimus test there is **Shortness** of the Scapulohumeral Muscles

*Scapulohumeral Muscles are stiffer than the muscles that should stabilize the scapula

*To determine if the **Teres Major** is the main contributor to this shortness- medially rotate the shoulder at the end range of shoulder flexion. If significant gains are made in the range of shoulder flexion, one can conclude that the shortness of the Scapulohumeral Muscles is mostly due to the shortness of the Teres Major. If there is no increase in range with medial rotation, teres major is not the primary contributor, and all scapulohumeral muscles are short.

Pectoralis Major Length Test

Sternal Fibers

Position: Supine

Motion: Passive Unilateral shoulder flexion ending with arm about 45° away from head and shoulder in external rotation

Compensatory Motion: Anterior/inferior glide of the humeral head noted in the axilla, trunk rotation, rib elevation.

Stabilization: Apply gentle posterior pressure on the humeral head and rib cage as needed to stabilize

Normal range: humerus to the table with the shoulder abducted about 145° without any compensatory movements

Clavicular Fibers

Position: Supine

Motion: Horizontal Abduction with Lateral Rotation

Compensatory Motion: Anterior glide of the humeral head or trunk rotation

Stabilization: Apply gentle posteriorly directed force on the humeral head and/or trunk to stabilize as needed.

Normal Range: Humerus should reach the table without compensatory motions.

Passive Shoulder Abduction

1st Part of Test:

Position: Supine

Humerus at side - adducted and in slight external rotation; humerus in scapular plane

Motion: Examiner passively abducts the glenohumeral joint to 90 degrees of abduction while watching the head of the humerus to identify any visible humeral superior translation.

Normal: The glenohumeral joint should abduct without visible humeral superior translation.

Compensatory Movements: Excessive humeral superior or anterior translation.

Secondary Test:

Passively move the arm into abduction while manually applying an inferior or posterior glide to the head of the humerus as indicated.

Shoulder External or Lateral Rotator and Posterior Capsule Length

1st Part of Test:

Position: Supine

Humerus in 90 degrees of **Abduction**

Elbow flexed to 90 degrees

Place towel rolls under elbow to place the humerus and scapula in same plane (towel rolls should be as distal as possible)

Motion: **Active Medial Rotation** (To look at relative flexibility)

Compensatory Movements: Anterior tilting of the scapula or humeral anterior glide. Examiner should palpate spine of scapula and humeral head during test as well as observe visually for compensatory movements.

Stabilization: See if the patient can correct the movement impairment by asking them to stabilize scapula

2nd Part of Test:

Motion: **Passively** move the arm into medial rotation assessing range

Compensatory Movements: Anterior tipping of the scapula or humeral anterior glide

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PROGRAM IN PHYSICAL THERAPY

Stabilization: Apply gentle posterosuperior directed pressure to coracoids area to stabilize scapula and to anterior humeral head to stabilize humeral head

Normal Range: 70 degrees

*If the MR ROM is limited, repeat the motion several times in order to get the lateral rotators to let go.

*Lateral rotators are stiff relative to the glenohumeral joint or scapulothoracic muscles, depending on the compensatory mechanism used

Shoulder Internal or Medial Rotator and Anterior Capsule Length

1st Part of Test:

Position: Supine

Humerus in 90 degrees of **Abduction**

Elbow flexed to 90 degrees

Place towel rolls under elbow to place the humerus and scapula in same plane (towel rolls should be as distal as possible)

Motion: **Active Lateral Rotation** (To look at the relative flexibility)

Compensatory Movements: Anterior glide of humerus, scapular posterior tilt or scapular adduction/external rotation

Stabilization: Stabilize clavicle and Spine of scapula for scapular movement and head of humerus for anterior glide.

Anterior Glide of the Humerus- Apply posteriorly directed pressure on the head of the humerus to prevent anterior glide from occurring

2nd Part of Test:

Motion: **Passively** move arm into lateral rotation assessing range

Normal Range: 90 degrees

Shoulder Lateral Rotation with arm at side (adducted)

Position: Supine

Humerus adducted to side of body

Elbow flexed to 90 degrees

Place towel rolls under elbow to place the humerus and scapula in same plane (towel rolls should be as distal as possible)

Motion: **Passive Lateral Rotation** (To look at the length of the medial rotators and anterosuperior capsule)

Compensatory Movements: Anterior glide of humerus or shoulder abduction

Stabilization: Anterior Glide of the Humerus- Apply posteriorly directed pressure on the head of the humerus to prevent anterior Glide from occurring. Stabilize distal humerus to prevent shoulder abduction.

Normal Range: 70 degrees

Posterior Deltoid Length Test

Position: Supine

Arm in 90 degrees of Abduction

Elbow Flexed to 90 degrees

Head in midline (use nose as reference point)

Motion: Horizontal Adduction of the shoulder. Can be done with the shoulder in internal or external rotation. Should be done actively first to identify relative flexibility. If scapula abducts prior to the olecranon crossing midline the scapulothoracic muscles are less stiff than the posterior structures of the shoulder.

Compensatory Motion: Scapular Abduction/internal rotation

Stabilization: During the passive test, stabilize the scapula so the lateral border of the scapula does not protrude more than ½ inch beyond the posterolateral border of the thorax. Use no more than moderate pressure.

Normal Range: Olecranon crosses midline with shoulder in internal rotation without compensatory movement of scapula.

Biceps Brachii Length Test

Position: Supine

Towel Roll under Distal Humerus to allow glenohumeral joint to be aligned well and allow full elbow extension

Motion: 1st **Active** elbow extension with forearm pronation. If the scapula anteriorly tilts before the end range of elbow extension, the biceps is relatively more stiff than the axioscapular muscles. If the humeral head translates anteriorly the anterior glenohumeral joint capsule is more flexible than the biceps.

2nd **Passive** elbow extension with forearm pronation compared to elbow extension with forearm supinated.

Compensatory Motion: anterior tilt of the scapula or humeral anterior glide

Stabilization: Apply posteriorly directed force to anterior shoulder in coracoid area to prevent scapular anterior tilt and to anterior aspect of humeral head to prevent humeral anterior glide.

Normal: the elbow extends fully with the forearm pronated without compensatory movements.

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Prone Tests		
1	Shoulder External (Lateral) Rotation	Sh
	<p>Position: Prone Arm abducted to 90 degrees with upper arm supported on table; forearm hanging off table; towel rolls under the proximal shoulder to put the scapula and humerus in the same plane and to align the scapula well on the thorax. Examiner's hand should be palpating the anterior humeral head during the test.</p> <p>Motion: Passively externally rotate the shoulder while visually and manually monitoring the scapula for movement. This is to confirm the length of the shoulder internal rotators which was already tested in supine.</p> <p>Next ask the patient to perform active external rotation while visually and manually monitoring the scapula and the humeral head for compensatory movement.</p> <p>Compensatory motion: humeral anterior glide, scapular anterior tilt, scapular internal rotation, scapular depression, scapular upward or downward rotation, and glenohumeral horizontal abduction</p> <p>Stabilization: Cues include: "lead with fingertips", spin humerus on axis, use less effort, hold scapula still (after examiner manually places scapula in the correct alignment), avoid pushing into examiner's hand that is palpating humeral head.</p>	
2	Shoulder Internal (Medial) Rotation	Sh
	<p>Position: Prone Arm abducted to 90 degrees with upper arm supported on table; forearm hanging off table; towel rolls under the proximal shoulder to put the scapula and humerus in the same plane and to align the scapula well on the thorax. Examiner's hand should be palpating the anterior humeral head during the test.</p> <p>Motion: Passively internally rotate the shoulder while visually and manually monitoring the scapula for movement. This is to confirm the length of the shoulder external rotators which was already tested in supine.</p> <p>Next ask the patient to perform active internal rotation while visually and manually monitoring the scapula and the humeral head for compensatory movement.</p> <p>Compensatory motion: humeral anterior glide, scapular anterior tilt, scapular internal rotation, scapular elevation, glenohumeral horizontal abduction, and elbow extension</p> <p>Stabilization: Cues include: spin humerus on axis, use less effort, hold scapula still (after examiner manually places scapula in the correct alignment), avoid pushing into examiner's hand that is palpating humeral head.</p>	
3	Cervical Extension	CS
	<p>Position: Prone with arms overhead, one hand on top of the other and forehead resting on hands</p> <p>Motion: Active cervical extension</p> <p>Compensatory Motion: posterior cervical translation or excessive use of levator scapulae vs. intrinsic cervical extensors</p> <p>Corrections for compensatory motion: Pretend you have a rod through your ears and rotate your head around that rod. Drag nose along your hands as you extend your neck</p>	
Quadruped Tests		
1	Alignment (preferred vs. corrected)	UQ
	<p>Position: Quadruped</p> <p>Correct alignment: 90 degrees hip flexion; back flat; hands under shoulders without excessive scapular winging, internal rotation, or depression. Elbows should not be locked in hyperextension. May need to horizontally abduct shoulders (spread hands apart) to correct scapular internal rotation. Cervical spine and head should be aligned in neutral alignment. Note cervical extensor muscle activity.</p>	
2	Rocking Backward	UQ
	<p><i>Position:</i> See above</p> <p><i>Motion:</i> Rock Back</p> <p>Scapula should upwardly rotate and elevate slightly without excessive internal rotation. Humerus should not glide anteriorly or inferiorly excessively.</p> <p><i>Compensatory Motion:</i> Extension of the neck with rocking backwards; humeral inferior or anterior translation, and lack of scapular movement.</p> <p><i>Corrections for Compensatory Motion:</i> Cue to maintain chin towards Adam's Apple and posterior neck "long". If the patient is able to rock back with the cervical spine in correct alignment after the cue, then the levator scapulae is stiff but not short.</p> <p>Cue to allow scapula to move and to push self backwards using arms to facilitate use of serratus anterior. If scapula is internally rotating too much it might help to cue to keep back flat. If scapula is not moving, another cue to correct can be to slide the hands forward slightly as they rock back.</p>	

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3	Cervical Flexion/Extension	CS
	<p><i>Position:</i> See above</p> <p><i>Motion:</i> Active cervical flexion/extension. Cervical rotation can also be assessed in this position.</p> <p>Compensatory Motion: During extension: posterior cervical translation or excessive use of levator scapulae vs. intrinsic cervical extensors during extension. During flexion: anterior cervical translation. May also note limited range of motion into flexion.</p> <p>Corrections for compensatory motion: Pretend you have a rod through your ears and rotate you head around that rod</p>	
4	Shoulder Flexion	CS,TH
	<p>Have Pt. lift one arm up while monitoring for thoracic spine extension/rotation. Also note quality of scapular movement.</p> <p>Correct thoracic rotation by cueing to press opposite hand into surface toward knee or cue for low abs</p>	

	Additional Tests	
1	Standing Shoulder Abduction/External Rotation with Back to Wall	
	<p>Position: Have Pt. place back flush against wall with feet 4-5" apart and knees slightly flexed; feet about 6" away from wall</p> <p>Have Pt. use low abs to flatten back toward wall (avoid too much lumbar flexion, just reversal of curve)</p> <p>Flex shoulders to 90 degrees to raise arms and then horizontally abduct shoulders so shoulders end up in 90 degrees abduction with external rotation and elbows are flexed 90 degrees (like goal posts).</p> <p>Head and neck should be in good alignment, chin slightly tucked.</p> <p>Examiner should monitor visually and manually the low back, scapular movement, and glenohumeral joint alignment. If the glenohumeral joint is not aligned well cue the patient to move the elbows anteriorly away from wall so humerus is aligned better relative to scapula. May cue to only place fingertips on wall or not have arms in contact with wall at all. The priority is to obtain good alignment and movement.</p> <p><i>Motion:</i> Slide arms up the wall (abduction with external rotation).</p> <p>Maintain Correct alignment of LB with back flat, cervical spine.</p>	
2	Shoulder Flexion Facing Wall	LB
	<p><i>Position:</i> Feet a comfortable distance from wall so patient can place ulnar side of hands on wall while maintaining good alignment and movement of scapula.</p> <p><i>Motion:</i> Perform shoulder flexion sliding the hands up the wall while maintaining correct trunk, head, neck alignment, and correct scapular and humeral movement. The patient can be instructed to walk in towards the wall as needed to maintain correct alignment as they raise their arms overhead.</p> <p>Any of the same compensatory movements may be seen with this as with standing shoulder flexion.</p> <p>For correcting scapular depression, cue to elevate the scapula especially in the last ½ of the range of motion of arm elevation.</p> <p>For correcting insufficient scapular upward rotation and increase activation of serratus, cue to imagine a string attached from the inferior angle of the scapula to the elbow so that as the person raises the arm overhead the scapula "comes out and around". Also cueing to push into the wall slightly with the hands will help activate the serratus.</p> <p>To focus on lower trapezius, cue to lift the hands off the wall at the end range arm elevation by bringing adducting the scapulae.</p> <p>For correcting scapular internal rotation and abduction, cue to avoid letting the scapulae abduct excessively as the arms are raised overhead.</p>	