

## ***Integrating Movement System Impairments and Manual Therapy in assessment and treatment of the shoulder***

Michael Wong, DPT OCS FAAOMPT  
Marshall LeMoine, DPT OCS FAAOMPT



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## **Shoulder pain prevalence**

- Affects 16-21% of the population
- Second only to low back pain
  - Picavet et al (2003)
  - Pope et al (1997)
  - Urwin et al (1998)



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## **ICF classifications for Shoulder disorders**

- Shoulder pain with mobility deficits (Adhesive capsulitis)
- Shoulder pain with muscle power deficits (Rotator cuff syndrome/ subacromial pain syndrome)
- Shoulder pain with movement coordination impairments (Instability/sprain)
- Shoulder pain with radiating pain (TOS)



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### Subacromial impingement syndrome/subacromial pain syndrome

- Shoulder pain with muscle power deficits
- 44% to 60% of all conditions that cause shoulder pain
- Picavet (2003)
- Pope (1997)
- Urwin (1998)

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### Evidence for impairments that drive shoulder pathology

- Poor posture
- Altered scapular kinematics
- Limited flexibility of the posterior shoulder structures
- Rotator cuff and scapular muscular weakness and imbalance

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### Movement Systems Impairment



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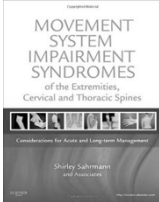

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### Movement Systems Impairments

• Developed by Dr. Shirley Sahrman



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### Diagnosis based on:

- Alignment
- Movement tests
- Secondary/ corrected tests



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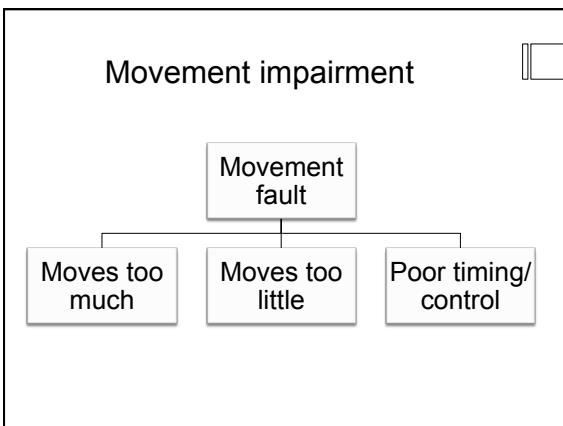
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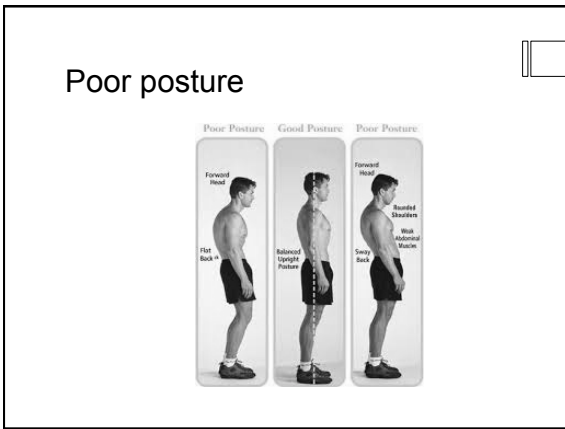
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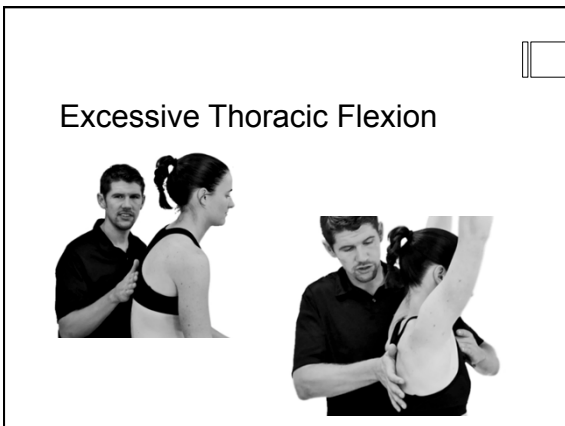
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NITIN KALRA, PT, MS<sup>1</sup> • AMEE L. SEITZ, PT, PhD, CCS<sup>2</sup> • N. DOUGLAS BOARDMAN III, MD<sup>3</sup> • LORI A. MICHENER, PT, PhD, ATC, SCS<sup>4</sup>  
**Effect of Posture on Acromiohumeral Distance With Arm Elevation in Subjects With and Without Rotator Cuff Disease Using Ultrasonography**  
*J Orthop Sports Phys Ther 2010;40(10):633-640*

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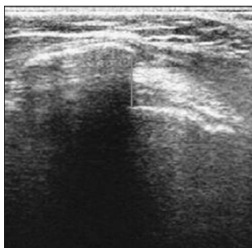
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**FIGURE 2.** Ultrasound probe positioning on the acromion.



**FIGURE 1.** The line represents the acromiohumeral distance (AHD).

- Acromiolumeral distance measured at 2 positions in 3 postures
- Increased space in upright posture at 45 deg abduction

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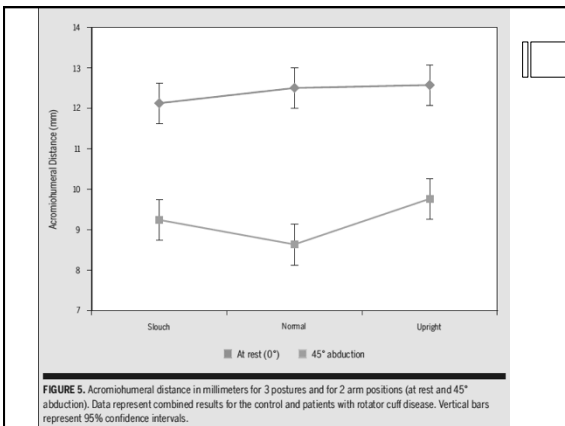
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**Thoracic Position Effect on Shoulder Range of Motion, Strength, and Three-Dimensional Scapular Kinematics**  
 Maikato Kibata, MS, PT, Philip McClure, PhD, PT, OCS, Neal A. Pratt, PhD, PT

Arch Phys Med Rehabil 1999;80:945-50

- Slouched posture:
  - Decreased shoulder abduction ROM
  - Scapula had decreased posterior tilting 90°-maximum abduction
  - 16.2% decrease in muscle force at 90° of abduction




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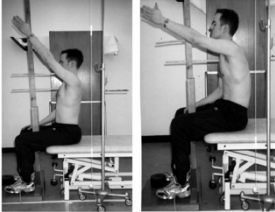

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Shoulder impingement: the effect of sitting posture on shoulder pain and range of motion

Michael P. Bullock<sup>a,\*</sup>, Nadine E. Foster<sup>b</sup>, Chris C. Wright<sup>c</sup>

Manual Therapy 10 (2005) 28–37


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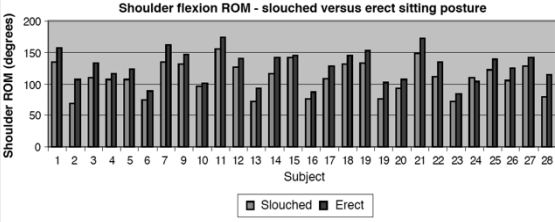
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**Shoulder flexion ROM - slouched versus erect sitting posture**



26 of 28 subjects had decreased ROM in slouched position (17.7° mean difference SD=9.2°)

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### Increased thoracic kyphosis

- Anteriorly tilted scapulae (Culham and Peat, 1994; Kaebetse et al., 1999)
- Excessive cervical flexion may increase tension in levator scapulae exaggerating the anterior tilt (Ludewig and Cook, 1996)
- Resultant scapular position may narrow subacromial space (Solem-Bertoft et al., 1993)

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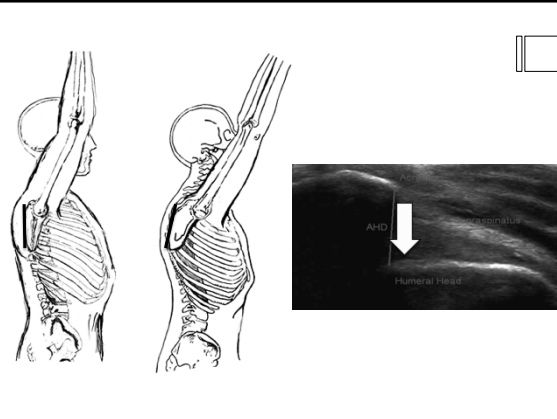
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### Manual therapy for shoulder pathology

STEPHANIE MUTH, PT, PhD<sup>1</sup> • MARY F. BARBE, PhD<sup>2</sup> • RICHARD LAUER, PhD<sup>3</sup> • PHILIP MCCLURE, PT, PhD, FAPTA<sup>4</sup>

### The Effects of Thoracic Spine Manipulation in Subjects With Signs of Rotator Cuff Tendinopathy

*J Orthop Sports Phys Ther* 2012;42(12): 1005-1016.

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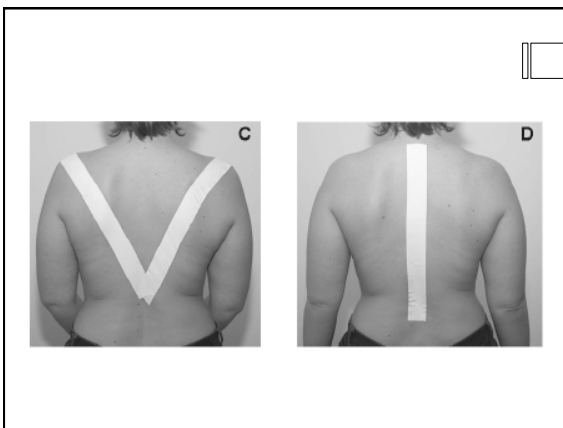
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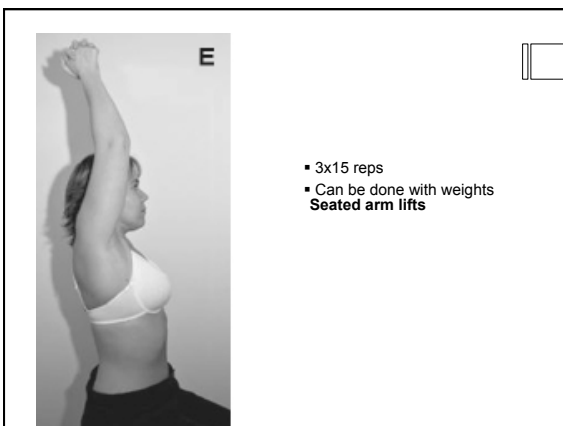
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**G**

Wall shoulder flexion

- Scroll arms up to maximum flexion
- 3-10 seconds end range holds
- Avoid compensation at hips and lumbar spine

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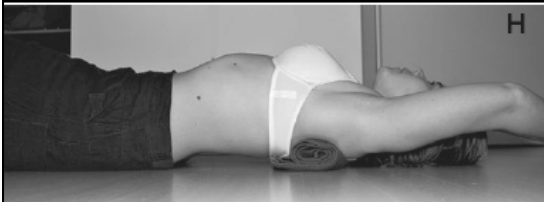
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**H**

Supine over towel roll

- Hooklying position
- Small towel roll under T5-T7
- Perpendicular set up
- 30-180 seconds
- Avoid compensations

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**Seated thoracic extension**



**F**

- Sitting
- Hands clasped behind neck
- Lift arms and extend thorax
- Avoid compensation at hips or lumbar

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### Seated or standing extension against wall



- Straighten back as much as possible
- 3x15 reps
- 10 second hold at end range

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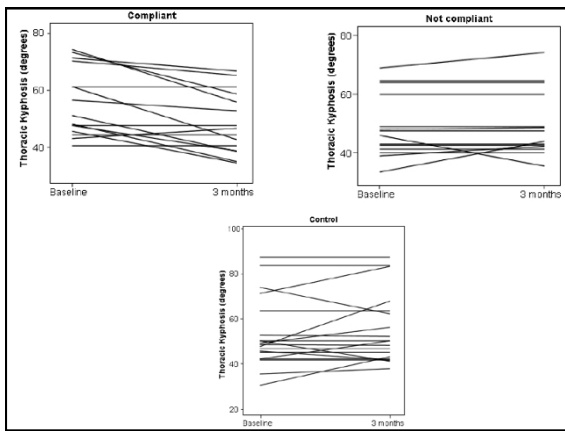
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### Significant improvement in kyphosis

Table II. Change in spine-related dysfunction and somatosensory measures in response to standard versus rehabilitation exercises.

	Rehabilitation		p	Control		p	F	p
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)			
Thoracic kyphosis (degrees)	52.5 ± 2.2	49.1 ± 2.0	0.017	52.8 ± 3.6	54.8 ± 3.6	0.272	0.017	
Quality of life (Qoaleffo-41)								
Pain (score/100)	37.4 ± 5.7	38.1 ± 4.9	0.836	30.0 ± 6.4	29.7 ± 5.7	0.936	0.891	
Activities of daily living (score/100)	22.2 ± 3.2	21.5 ± 2.9	0.751	15.8 ± 4.5	18.1 ± 4.0	0.407	0.606	
Jobs around the house (score/100)	35.1 ± 5.0	33.7 ± 5.4	0.612	41.3 ± 6.7	37.2 ± 6.2	0.300	0.364	
Mobility (score/100)	31.1 ± 4.8	29.6 ± 4.4	0.500	30.1 ± 5.0	32.2 ± 5.5	0.479	0.679	
Physical function (score/100)	30.3 ± 4.3	28.9 ± 4.3	0.417	30.0 ± 5.0	30.5 ± 5.1	0.859	0.976	
Social function (score/100)	51.0 ± 3.5	49.7 ± 5.0	0.686	53.7 ± 4.0	55.7 ± 4.7	0.311	0.520	
General health perception (score/100)	52.9 ± 4.4	52.3 ± 4.4	0.841	51.8 ± 3.3	50.0 ± 3.1	0.649	0.982	
Mental function (score/100)	37.9 ± 3.7	40.8 ± 3.8	0.029	36.6 ± 2.9	35.2 ± 3.8	0.725	0.345	
Total score (score/100)	37.8 ± 3.6	38.0 ± 3.7	0.860	34.4 ± 3.8	36.0 ± 3.5	0.475	0.560	

Intention-to-treat analysis: n=48 (rehabilitation n=29 and control n=19).

\*p-value of the difference in evolution between rehabilitation and control groups assessed with repeated measures ANOVA.

†p-value of the changes over time within rehabilitation and control groups assessed by paired t-tests.

VAS: visual analogue scale.

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### Clinical application

- Observe for preferred postures
- Determine contribution level of posture to painful movement
- Assess local tissue mobility
- Apply cognitive postural correction
- Apply manual therapy
- Apply tape as needed



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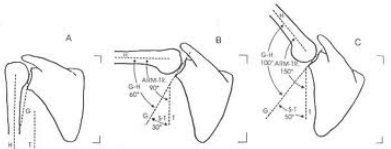
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### Scapular Movement Faults

- Depression
- Elevation
- Abduction
- Retraction
- Insufficient upward rotation
- Winging
- Anterior tipping



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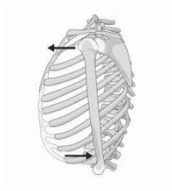
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### Humeral Movement Faults

- Anterior glide
- Internal rotation
- Superior glide
- Inferior glide
- Hypomobility



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### Current Concepts in the Scientific and Clinical Rationale Behind Exercises for Glenohumeral and Scapulothoracic Musculature

MICHAEL M. REINOLD, PT, DPT, ATC, CSCS<sup>1</sup> • RAFAEL ESCAMILLA, PT, PhD, CSCS, FACSMP<sup>2</sup> • KEVINE E. WILK, PT, DPT<sup>3</sup>

J Orthop Sports Phys Ther 2009; 39(2):105-117.

#### Direct 3-dimensional measurement of scapular kinematics during dynamic movements in vivo

Philip W. McClure, PhD, PT,<sup>a</sup> Lori A. Michener, MEd, PT, ATC,<sup>b</sup> Brian J. Sennett, MD,<sup>c</sup> and Andrew R. Karduna, PhD,<sup>d</sup> *Glenside and Philadelphia, Pa, and Richmond, Va*

J Shoulder Elbow Surg 2001;10:269-77

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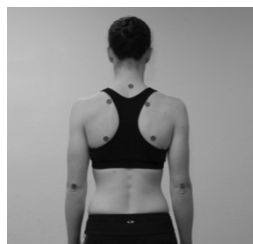
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### Scapular norms

McCulre, 01; Ludewig, 96, 09:

#### Resting

- 3" abduction
- T2-T7
- ER 10°
- Ant tilt°
- Neutral up/down rotation



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**Scapular norms** McCulre, 01; Ludewig, 96, 09:

**Elevation**

- Inferior angle to mid axillary line
- Acromion to C6-7
- ER 15-25°
- 50-60° up rotation
- Post tilt 20°



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**Insufficient Scapular Upward Rotation**



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**The Association of Scapular Kinematics and Glenohumeral Joint Pathologies**

PAULA M. LUDEWIG, PT, PhD<sup>1</sup> • JONATHAN F. REYNOLDS, PT, PhD<sup>2</sup>

J Orthop Sports Phys Ther 2009; 39(2):90-104

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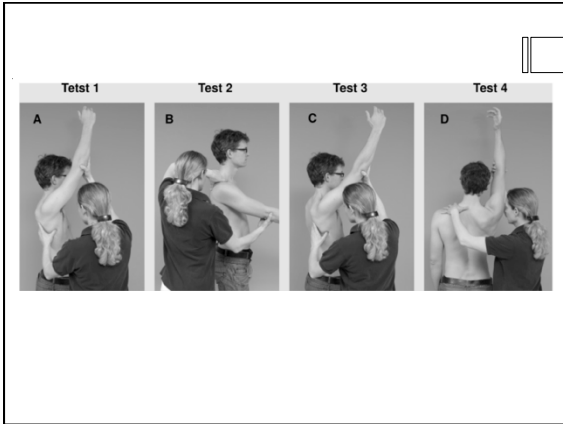
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### The Scapular Assistance Test Results in Changes in Scapular Position and Subacromial Space but Not Rotator Cuff Strength in Subacromial Impingement

AMEE L. SEITZ, PT, DPT, PhD, OCS<sup>1</sup> • PHILIP W. MCCLURE, PT, PhD<sup>2</sup> • SHERYL FINUCANE, PT, PhD<sup>3</sup> • JESSICA M. KETCHUM, PhD<sup>4</sup>  
MATTHEW K. WALSWORTH, MD, PT<sup>5</sup> • N. DOUGLAS BOARDMAN III, MD<sup>6</sup> • LORI A. MICHENER, PT, PhD, ATC, SCS<sup>7</sup>

*Orthop Sports Phys Ther* 2012;42(5):400-412,

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FIGURE 1. Scapular assistance test performed during shoulder kinematic data collection.

- Manual assist upward rotation
- Measured at 0, 45, and 90°
- Strength and mechanics

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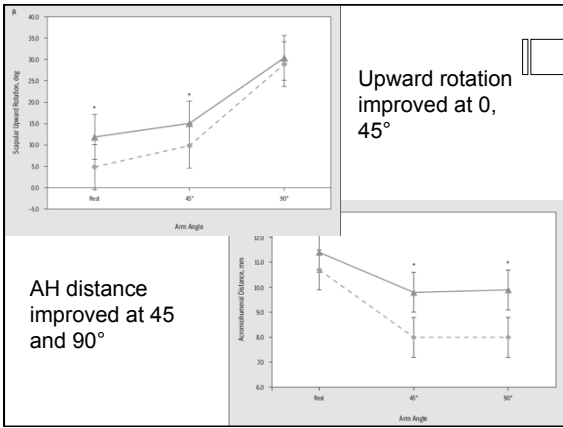
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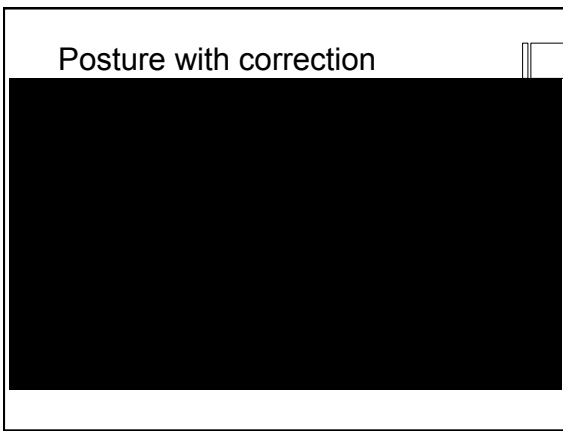
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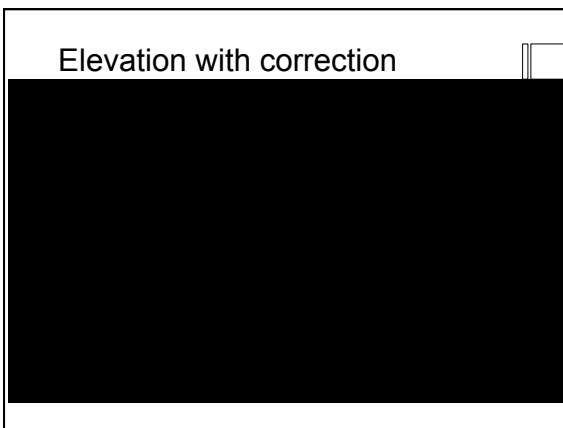
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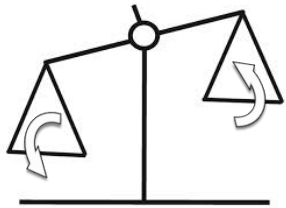
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**Insufficient Scapular Upward Rotation: associated Impairments**

- Muscle imbalance



Levator Scapule/  
Rhomboids

Serratus Anterior  
and Lower Trap

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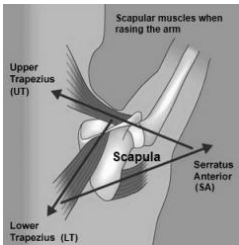
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**Insufficient Scapular Upward Rotation: associated Impairments**

- Upward rotators:
  - < 90 deg: UT and SA better
  - > 90 deg: LT better



Scapular muscles when raising the arm

Upper Trapezius (UT)

Scapula

Serratus Anterior (SA)

Lower Trapezius (LT)

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**Alterations in Shoulder Kinematics and Associated Muscle Activity in People With Symptoms of Shoulder Impingement**

Paula M Ludewig and Thomas M Cook

PHYS THER. 2000; 80:276-291.

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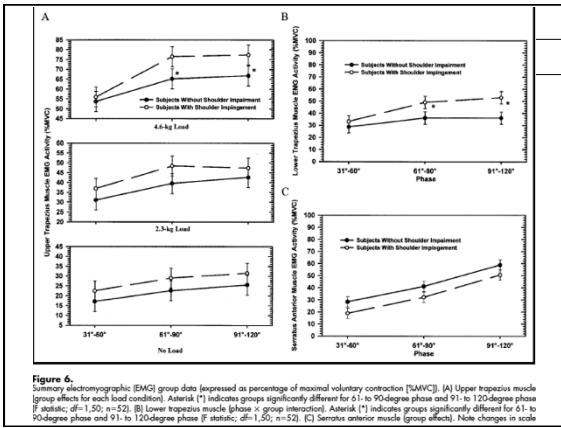
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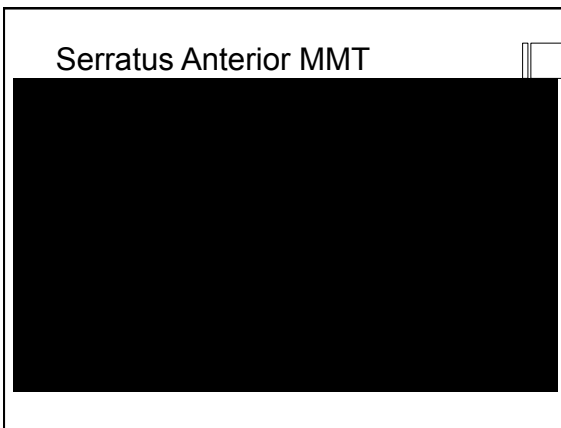
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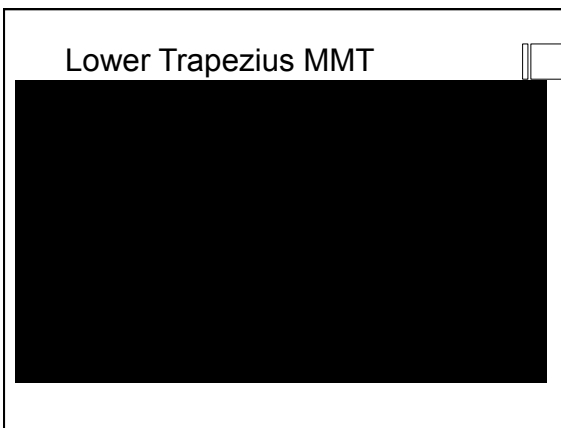
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### Insufficient Scapular Upward Rotation: Intervention

- Improve posture/alignment
  - Tape
- Improve strength/activation
  - Serratus anterior
  - Lower trapezius
- Improve flexibility, inhibition
  - Rhomboid
  - Levator Scapulae
- Retrain coordination with upward rotation:
  - Shoulder flexion: Wall, Quadruped, Sidelying Shoulder

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J Orthop Sports Phys Ther 2009; 39(2):105-117.

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### Serratus Anterior

1. Push-up with plus	1. Easy position to produce resistance against protraction	1. High EMG activity	1. Effective exercise to provide resistance against protraction, also good exercise for subscapularis
2. Dynamic hug	2. Performed below 90° abduction	2. High EMG activity	2. Easily perform in patients with difficulty elevating arms or performing push-up. Also good exercise for subscapularis
3. Serratus punch 120°	3. Combines protraction with upward rotation	3. High EMG activity	3. Good dynamic activity to combine upward rotation and protraction function

- Upward rotation, posterior tilt, External rotation
- Most activated with scapula protraction and upward rotation movement

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### Lower Trapezius

1. Prone full can	1. Can properly align exercise with muscle fibers	1. High EMG activity	1. Effective exercise, also good exercise for supraspinatus
2. Prone ER at 90° abduction	2. Prone exercise below 90° abduction	2. High EMG activity	2. Effective exercise, also good exercise for infraspinatus and teres minor
3. Prone horizontal abduction at 90° abduction with ER	3. Prone exercise below 90° abduction	3. Good ratio of lower to upper trapezius activity	3. Effective exercise, also good exercise for middle trapezius
4. Bilateral ER	4. Scapular control without arm elevation	4. Good ratio of lower to upper trapezius activity	4. Effective exercise, also good for infraspinatus and teres minor

- Upward rotation, posterior tilt, External rotation
- Best ratio of lower to upper trapezius with prone horizontal abduction at 90° with ER

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### Conscious Correction of Scapular Orientation in Overhead Athletes Performing Selected Shoulder Rehabilitation Exercises: The Effect on Trapezius Muscle Activation Measured by Surface Electromyography

KRISTOF DE MEY, PT<sup>1</sup> • LIEVEN DANNEELS, PT, PhD<sup>1</sup> • BARBARA CAGNIE, PT, PhD<sup>1</sup>  
LIES HUYGHE, PT<sup>1</sup> • ELIEN SEYNS, PT<sup>1</sup> • ANN M. COOLS, PT, PhD<sup>1</sup>

J Orthop Sports Phys Ther 2013;43(1):3-10.

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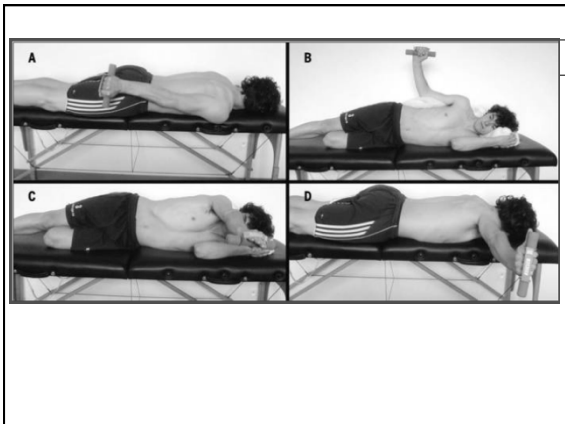
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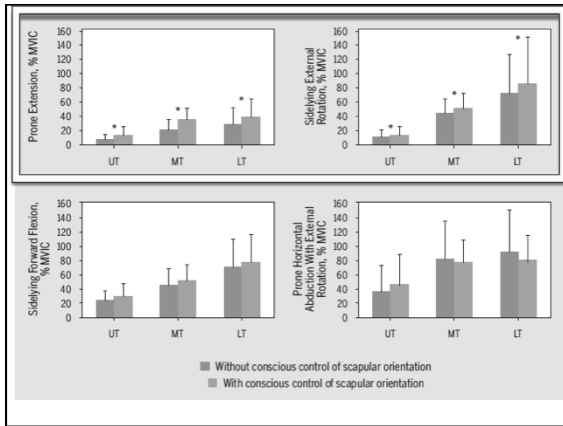
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### Insufficient Scapular Upward Rotation

- Serratus Anterior activation with flexion
- Quadruped rock back
- Wall slide

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### Excessive Scapular Abduction

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### Excessive Scapular Abduction

- Posture: > 3" from spine
- Elevation: > 1/2" past mid axillary line



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Effect of abducting and adducting muscle activity on glenohumeral translation, scapular kinematics and subacromial space width in vivo

H. Graichen<sup>a,\*</sup>, S. Hinterwimmer<sup>a,b</sup>, R. von Eisenhart-Rothe<sup>a</sup>, T. Vogl<sup>c</sup>, K.-H. Englmeier<sup>d</sup>, F. Eckstein<sup>e</sup>

Journal of Biomechanics 38 (2005) 755–760

- Isometric contraction measured at multiple angles
- Adducting muscle activity had significant increase of the subacromial space

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Effect of the Scapula Reposition Test on Shoulder Impingement Symptoms and Elevation Strength in Overhead Athletes

ANGELA R. TATE, PT, PhD<sup>1</sup> • PHILIP MCCLURE, PT, PhD<sup>2</sup>  
STEPHEN KAREHA, PT, DPT, ATC, CSCS<sup>3</sup> • DOMINIC IRWIN, PT, DPT<sup>4</sup>

J Orthop Sports Phys Ther 2008;38(1):4-11.

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- 98 subjects with + impingement signs
- Scapula passively posterior tilted and retracted
- 26% stronger in empty can position



Figure 4. Therapist using a handheld dynamometer to measure elevation force while performing the scapula reposition test.

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### Movement with correction

- Video shoulder flexion with excessive scap abduction and correction

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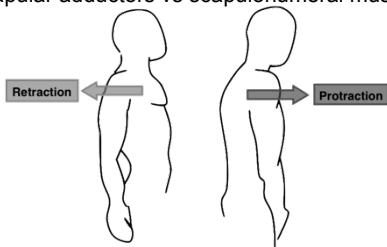
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### Excessive Scapular Abduction: associated Impairments

- Muscle Imbalance
- Scapular adductors vs scapulohumeral muscles



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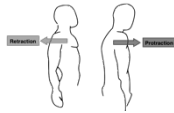
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### Excessive Scapular Abduction: associated Impairments

- Weak rhomboid, middle and lower trapezius
  - Cooks, 2006: decreased/latent activity in impingement group
- Abductors dominant/stiff:
  - Pectoralis major, Teres major/minor



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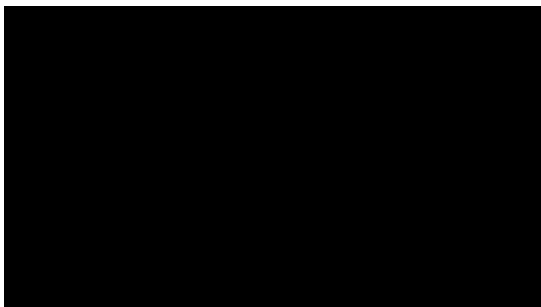
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### Middle Trapezius MMT



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### Excessive Scapular Abduction: Intervention

- Improve posture/alignment
  - Tape
  - Arm positioning
- Improve strength/activation
  - Middle/lower trapezius
  - Rhomboid
- Improve flexibility, inhibition
  - Pectoralis major
  - Teres major/minor
- Improve thoracic spine extension
- Improve GH posterior capsule mobility
  - Wilk, 2002

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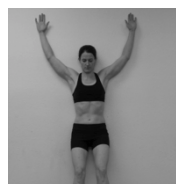
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### Excessive Scapular Abduction

- Taping
- Back to wall abduction/external rotation



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### Muscle Strength/Activation

- What we know
  - Timing alterations occur
  - Scapular weakness is common
  - Exercises need to be specific to strength scapular muscles

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Normalization procedures using maximum voluntary isometric contractions for the serratus anterior and trapezius muscles during surface EMG analysis ☆

Richard A. Ekstrom<sup>a</sup>, Gary L. Soderberg<sup>b</sup>, Robert A. Donatelli<sup>c</sup>

Journal of Electromyography and Kinesiology

Volume 15, Issue 4, August 2005, Pages 418-428

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- Highest EMG when trying to de-rotate scapula



Shoulder flexed to 125° as resistance is applied above the elbow and at the inferior angle of the scapula attempting to de-rotate the scapula with the subject sitting in an erect posture with no back support.

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## Surface Electromyographic Analysis of Exercises for the Trapezius and Serratus Anterior Muscles

*Richard A. Ekstrom, PT, DSc, MS, OCS<sup>1</sup>*  
*Robert A. Donatelli, PT, PhD, OCS<sup>2</sup>*  
*Gary L. Soderberg, PT, PhD, FAPTA<sup>3</sup>*

J Orthop Sports Phys Ther 2003;

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## Middle Trapezius

- Shoulder horizontal extension with external rotation



- Overhead arm raise at 140° in prone



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### Lower Trapezius

- Overhead arm raise at 140° in prone




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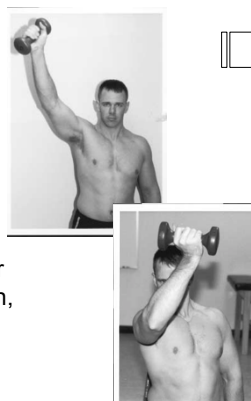
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### Serratus Anterior

- Exercises requiring upward rotation of the scapula
- Shoulder abduction in the plane of the scapula above 120°
- Combination of shoulder flexion, horizontal flexion, and external rotation




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North American Journal of Sports Physical Therapy :  
NAJSPT  
The Sports Physical Therapy Section of the American Physical Therapy Association

Surface Electromyographic Analysis of the Lower Trapezius Muscle During Exercises Performed Below Ninety Degrees of Shoulder Elevation in Healthy Subjects

Robert A. McCabe, MS, PT, OCS, Karl F. Orishimo, MS, [...], and Stephen J. Nicholas, MD

- Seated press-up
- Scapular retraction
- B/L external rotation at 0° abduction
  - Greatest lower-upper trapezius ratio

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## Rehabilitation of Scapular Muscle Balance

### Which Exercises to Prescribe?

Ann M. Cools,<sup>1</sup> PT, PhD, Vincent Dewitte,<sup>1</sup> PT, Frederick Lanszweert,<sup>1</sup> PT, Dries Notebaert,<sup>1</sup> PT, Arne Roets,<sup>2</sup> MPSS, Barbara Soetens,<sup>2</sup> PhD, Barbara Cagnie,<sup>1</sup> PT, PhD, and Erik E. Witvrouw,<sup>1</sup> PT, PhD

Am J Sports Med 2007 35: 1744

- Measured 3 parts trapezius and serratus with common scapular exercises looking for muscle ratios

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Exercise Movement	UT	MT	LT	Reference(s)
Abduction	x	x	x	22,35
Forward flexion		x	x	22,34,35,39
Dynamic hug	x			7,12,39
External rotation			x	2
Extension		x	x	7,22,35
Horizontal abduction (neutral or external rotation)	x	x	x	7,22,35
Military press	x			17,35
Rowing (low or high)	x	x	x	17,20,35
Scaption (neutral or external rotation)	x	x	x	2,12,22,35

- Side-lying external rotation
- Side-lying forward flexion
- Prone horizontal abduction with ER
- Prone extension

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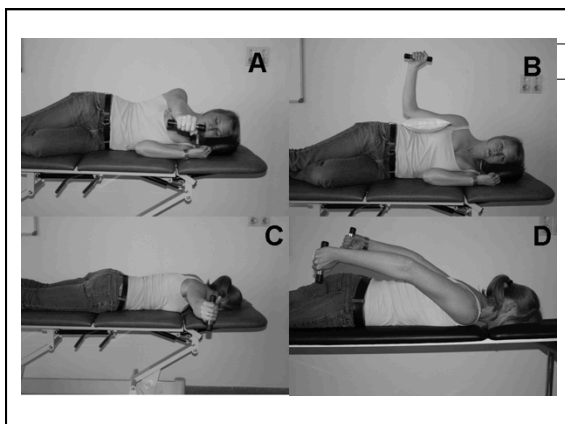
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**Posterior shoulder tightness**

- Osseous adaptation
- Posterior capsular tightness
- Musculotendinous tightness
- Postural (scapular) adaptations

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**Quantification of Posterior Capsule Tightness and Motion Loss in Patients with Shoulder Impingement**

Timothy F. Tyler,<sup>†</sup> MS, PT, ATC, Stephen J. Nicholas,<sup>‡§</sup> MD, Timothy Roy,<sup>||</sup> PT, and Gilbert W. Gleim,<sup>\*</sup> PhD

*Am J Sports Med* 2000 28: 668

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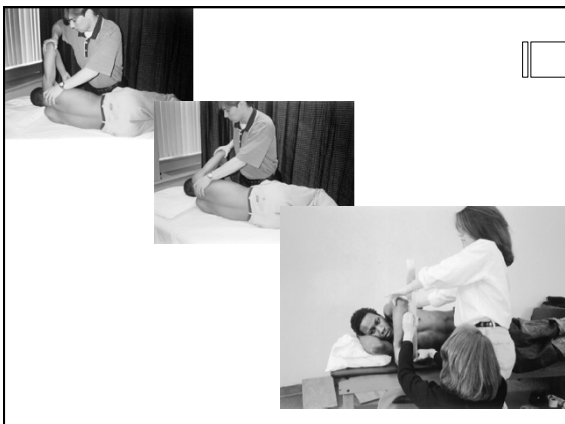
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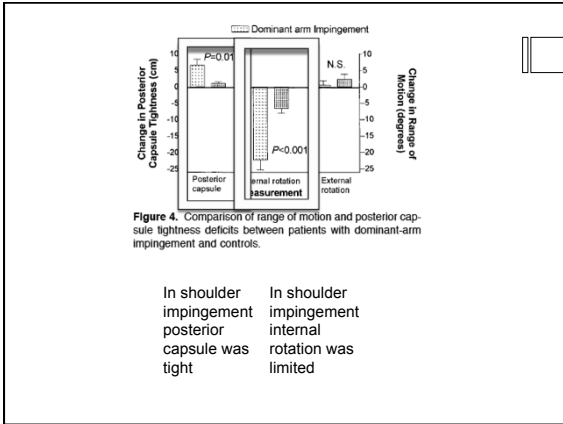
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### GIRD (Glenohumeral internal rotation deficit)

- GIRD is a loss of 18° or greater of IR in the throwing shoulder compared to non-throwing shoulder (Kibler 2012)
- GIRD of 18° correlated to 1.9-fold increase in injury (Wilk 2011)

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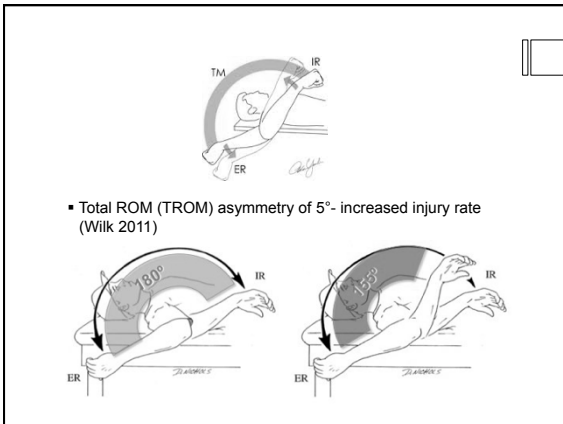
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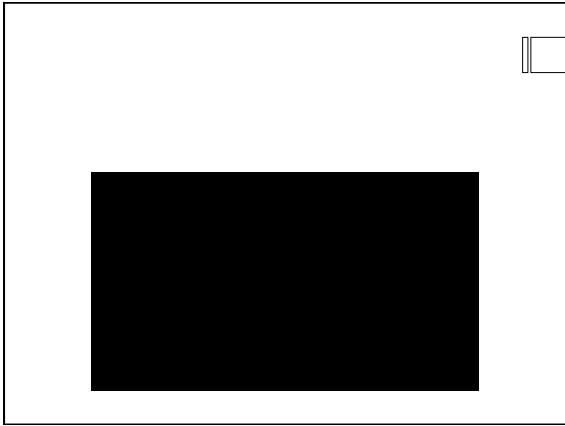
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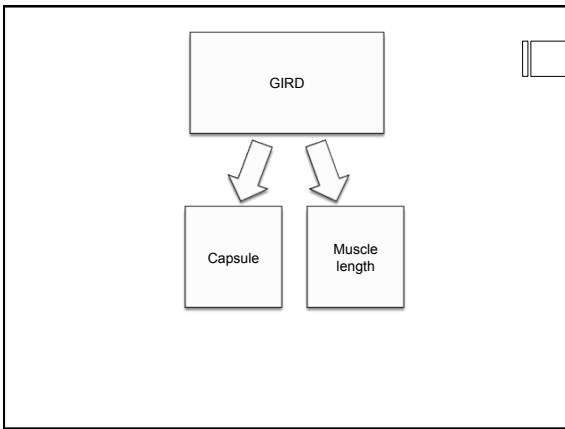
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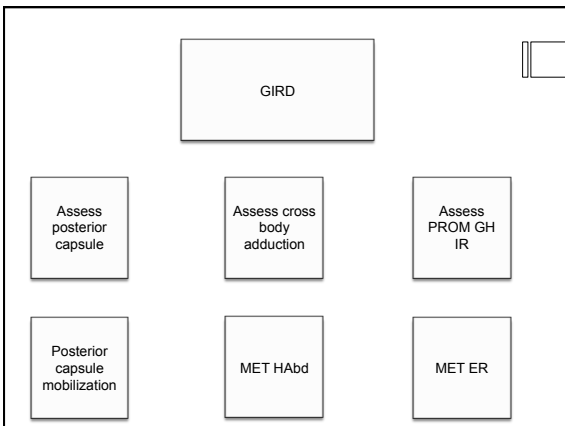
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Manual therapy for posterior capsule tightness

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The Effect of Cyclic Loading Simulating Oscillatory Joint Mobilization on the Posterior Capsule of the Glenohumeral Joint: A Cadaveric Study

TAKAYUKI MURAKI, PT, PhD<sup>1</sup> • NOBUYUKI YAMAMOTO, MD, PhD<sup>1</sup> • LAWRENCE J. BERGLUND, BS<sup>2</sup> • JOHN W. SPERLING, MD<sup>3</sup> • SCOTT P. STEINMANN, MD<sup>3</sup> • ROBERT H. COFIELD, MD<sup>3</sup> • KAI-NAN AN, PhD<sup>4</sup>

*J Orthop Sports Phys Ther* 2011;41(5):311-318

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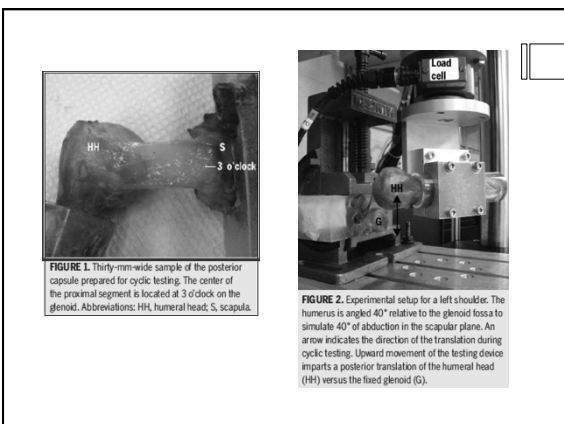
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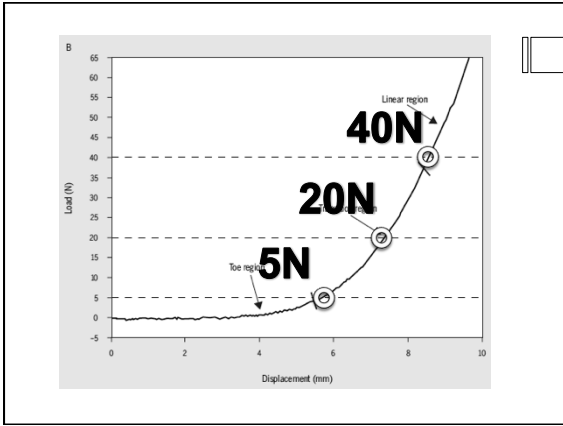
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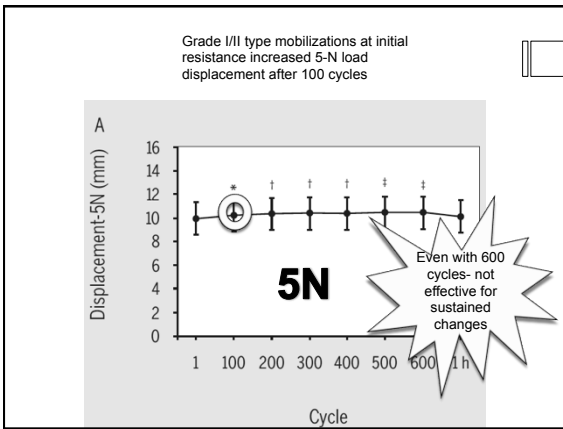
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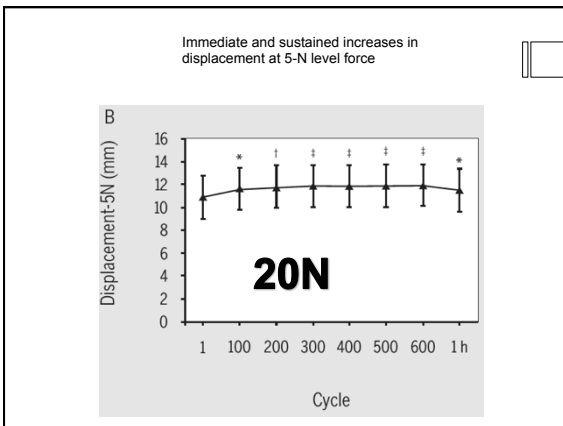
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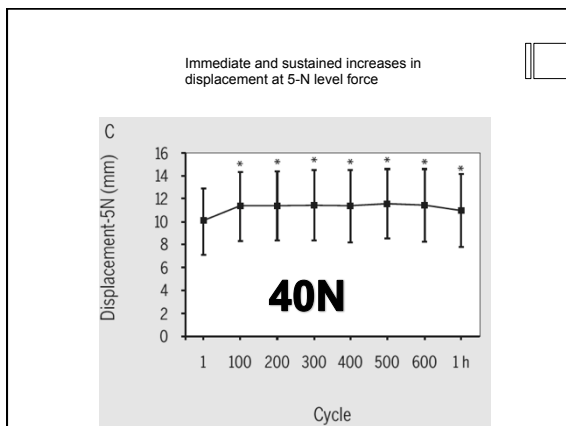
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Stiffness of tissue did not decrease even after 600 cycles at 40N

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**Clinical application:**

- You can expect non-sustained changes in capsular displacement even with 100 reps of Grade I/II type mobilizations (up to first resistance)
- You can expect immediate and sustained changes (up to 1 hour) with 20N and 40N forces (up to end resistance)
- Even at 600 oscillations at 40N, one is unlikely to incur any damage to supportive structure of the capsule

**9lbs of force**

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# The Modified Sleeper Stretch and Modified Cross-body Stretch to Increase Shoulder Internal Rotation Range of Motion in the Overhead Throwing Athlete

KEVIN E. WILK, PT, DPT, FAPTA<sup>1,3</sup> • TODD R. HOOKS, PT, OCS, SCS, ATC, MOMT, MTC, CSCS, FAAOMPT<sup>4</sup>  
LEONARD C. MACRINA, MSPT, SCS, CSCS<sup>1</sup>

*J Orthop Sports Phys Ther* 2013;43(12):891-894

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## Common stretches



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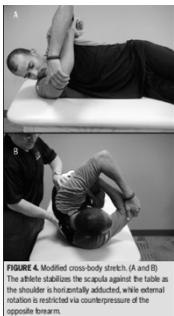
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## Modified stretches



**FIGURE 4.** Modified cross-body stretch (A and B). The pillow stabilizes the scapula against the table as the shoulder is horizontally adducted, while external rotation is restricted via counterpressure of the opposite forearm.



**FIGURE 1.** Modified sleeper stretch. (A) The athlete is slightly rotated posteriorly (20°-30° posterior to the coronal plane of the body) to place the shoulder in the scapular plane as passive internal rotation is performed. (B) This position stabilizes the scapula without causing subacromial impingement complaints.

**FIGURE 2.** A towel is placed under the elbow to increase the stretch of the posterior shoulder.

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**Clinical application: Asymptomatic**

- GIRD and TROM should be part of standard evaluation of throwing athlete examination
- 30 seconds stretches
- 4+ repetitions per stretch
- Performed before and after exercise program

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**Clinical application: Symptomatic**

- 30 second stretches
- Repeated at least 8-10 times per stretch

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**The Immediate Effects of Muscle Energy Technique on Posterior Shoulder Tightness: A Randomized Controlled Trial**

STEPHANIE D. MOORE, MS, ATC<sup>1</sup> • KEVIN G. LAUDNER, PhD, ATC<sup>2</sup> • TODD A. MCLODA, PhD, ATC<sup>3</sup> • MICHAEL A. SHAFFER, PT, ATC, OCS<sup>4</sup>

*J Orthop Sports Phys Ther 2011;41(6):400-407*

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**Humeral Anterior Glide**

- Humeral head anterior to acromion hood
  - Normal < 1/3<sup>rd</sup> (Bryde, 04)
- Anterior capsule laxity (Ludewig, 02)
- Stiffness (Ludewig, 02)
  - Posterior capsule
  - Humeral external rotators

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**Translations of the Humerus in Persons With Shoulder Impingement Symptoms**

*Paula M. Ludewig, PT, PhD<sup>1</sup>*  
*Thomas M. Cook, PT, PhD<sup>2</sup>*

J Orthop Sports Phys Ther 2002;32:248–259.

- Humeral translation measured during scaption
  - Compared with horizontal adduction and internal rotation ROM

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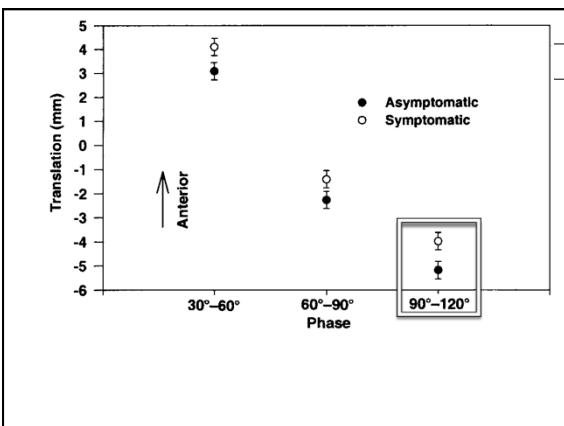
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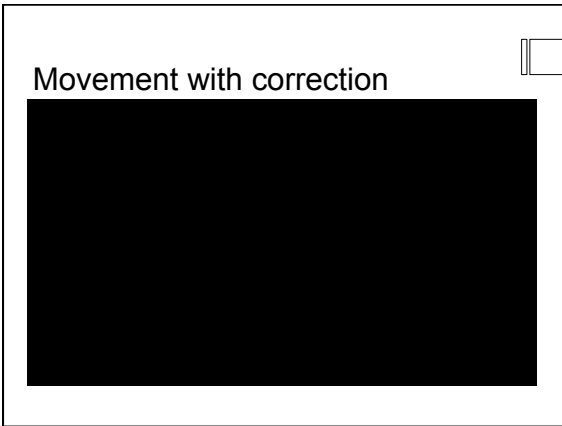
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- Humeral Anterior Glide:  
Interventions**
- Normalize scapula position if needed
  - Improve GH rotation precision/  
coordination (PICR)
  - Improve rotator cuff strength and  
control
  - Decrease Stiffness/activity
    - Posterior capsule
    - Biceps and pectoral muscles
    - Posterior deltoid

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Use of a Movement System Impairment  
Diagnosis for Physical Therapy in the Management  
of a Patient With Shoulder Pain

CHERYL CALDWELL, PT, DPT, CHT<sup>1</sup> • SHIRLEY SAHRMANN, PT, PhD, FAPTA<sup>2</sup> • LINDA VAN DILLEN, PT, PhD<sup>3</sup>

Orthop Sports Phys Ther 2007;37(9):551–563.

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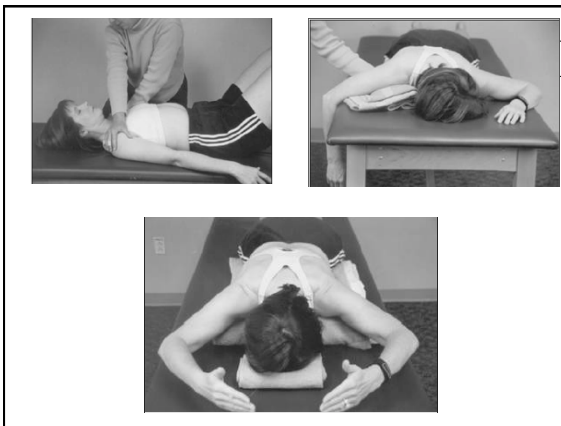
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Humeral Anterior  
Glide: Interventions

■ Biceps length test



■ Pectoralis major  
length test



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### Humeral Anterior Glide: Interventions

- Normalized rotation precision/coordination (PICR)
- Self Corrected humeral glide with IR
- Shoulder ER with resisted ER



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### Humeral Internal Rotation

- Excessive humeral internal rotation at rest
- Insufficient external rotation during shoulder elevation



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### Humeral Internal Rotation: Associated Impairments

- Tightness in internal rotators
  - Pectoralis major, Latissimus dorsi, subscapularis
- Weakness in external rotators
  - Infraspinatus, Teres minor

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The Association of Scapular Kinematics and Glenohumeral Joint Pathologies

PAULA M. LUDEWIG, PT, PhD<sup>1</sup> • JONATHAN F. REYNOLDS, PT, PhD<sup>2</sup>

J Orthop Sports Phys Ther 2009; 39(2):90-104

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- Short pectoralis muscle associated with impingement
- Humeral external rotation beneficial to increase Subacromial space
  - Clearance for greater tuberosity



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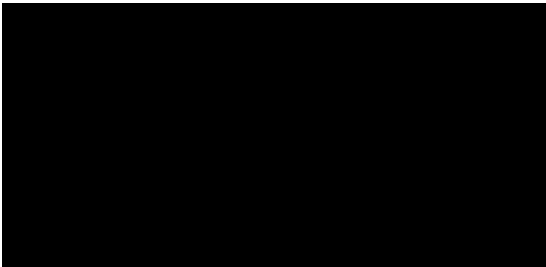
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Pectoralis length test



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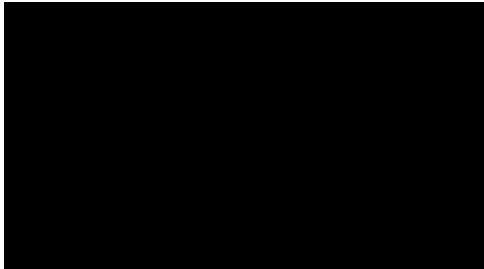
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### Pectoralis minor length test



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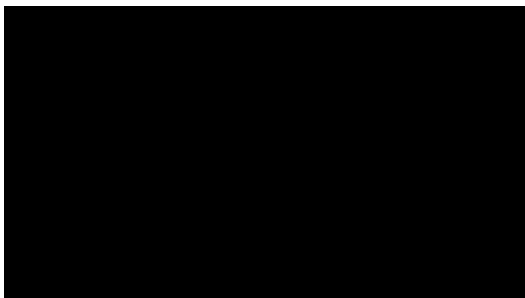
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### Latissimus dorsi length test



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### Humeral internal rotation: Interventions

- Improve coordination
  - Emphasize external rotation during shoulder movements
- Improve length/ stiffness
  - Pectoralis minor/major, Latissimus dorsi, Subscapularis
- Improve strength/endurance
  - Infraspinatus, Teres minor

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**The effects of manual treatment on rounded-shoulder posture, and associated muscle strength<sup>☆</sup>**

Christopher Kevin Wong, PT, PhD, OCS<sup>®</sup>, Denise Coleman, PT, DPT<sup>®</sup>, Vincent diPersia, PT, DPT<sup>®</sup>, Judi Song, PT, DPT<sup>®</sup>, Dennis Wright, PT, DPT, ATC/L<sup>®</sup>



“Rounded shoulders posture” remained significantly reduced 2 weeks after single treatment

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Supine or back to wall shoulder abduction or flexion with external rotation



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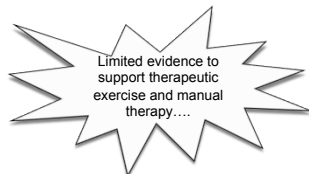
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Critical Review

**Therapeutic Exercise and Orthopedic Manual Therapy for Impingement Syndrome: A Systematic Review**

François Desmeules, BSc, PT, Claude H. Côté, PhD, and Pierre Frémont, MD, PhD

Clin J Sport Med 2003;13:176-182.



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The Effect of Therapeutic Exercise and Mobilization on Patients With Shoulder Dysfunction: A Systematic Review With Meta-analysis

TRACY J. BRUDVIG, PT, DPT, PhD, OCS<sup>1</sup> • HETAL KULKARNI, PT, MSPT<sup>2</sup> • SHALVI SHAH, PT, MSPT<sup>3</sup>

*J Orthop Sports Phys Ther* 2011;41(10):734-748



Current evidence is inconclusive...

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Lab Case 1- Humeral fault

- Posture/correction: anterior glide/ internal rotation
- Active range of motion/correction
- Total range of motion assessment/GIRD assessment
- Rotation precision with correction
- Posterior capsule mobility assessment
- Horizontal adduction assessment
- Muscle length assessment: Pectoralis major/Latissimus dorsi

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**Lab Case 1: Interventions**

- Improving mobility:
  - Posterior capsule mobilization
  - MET Horizontal abduction
  - MET Internal rotation
  - Pectoralis major and latissimus dorsi stretching
  - Modified sleeper stretch
  - Modified horizontal adduction stretch

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**Lab Case 1: Interventions**

- Improving coordination:
  - Humeral rotation precision (PICR)
  - Wall slide (flexion with external rotation)
  - Bilateral shoulder flexion with external rotation (supine or back against wall)
  - Bilateral shoulder abduction with external rotation (supine or back against wall)

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**Lab Case 2- Scapular fault**

- Posture/correction: insufficient upward rotation/excessive abduction
- Shoulder elevation/correction
- Pectoralis minor length
- Horizontal adduction assessment
- Serratus anterior strength
- Middle and lower trapezius strength
- Scapulothoracic mobility assessment

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### Lab Case 2: Interventions

- Improving mobility:
  - Scapulothoracic mobilization
  - MET Horizontal abduction
  - MET Internal rotation
  - Pectoralis minor stretch and soft tissue mobilization

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### Lab Case 2: Interventions

- Improving coordination:
  - Quadruped rock back with serratus anterior activation
  - Wall slide (flexion with serratus anterior activation)
  - Shoulder elevation with serratus anterior activation
  - Serratus anterior strengthening- serratus punch in scaption 120° with external rotation
  - Middle trapezius- Horizontal extension with ER "T"
  - Lower trapezius- Overhead arm raise at 140° in prone
  - Lower trapezius isolated- bilateral shoulder ER

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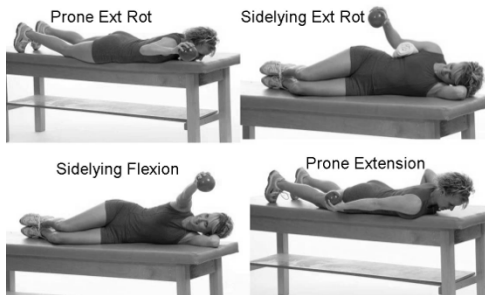
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**Lab Case 3- Thoracic fault**

- Posture/correction: thoracic kyphosis
- Shoulder elevation/correction
- Thoracic spine AROM with over pressures
- Passive intervertebral mobility assessment

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**Lab Case 3: Interventions**

- Improving mobility:
  - Thoracic extension mobilization with movement
  - Thoracic mobilization/manipulation
  - Thoracic extension mobilization with shoulder elevation
  - Foam roll with shoulder elevation
  - Taping

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**Lab Case 3: Interventions**

- Improving coordination:
  - Bilateral shoulder flexion without lumbar extension (supine or back to wall)
  - Quadruped rock back on forearms

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