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

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

Shoulder pain prevalence

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

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)
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)

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

Movement Systems Impairment

What is the underlying cause of musculoskeletal pain?
Movement Systems Impairments

- Developed by Dr. Shirley Sahrmann

Diagnosis based on:
- Alignment
- Movement tests
- Secondary/corrected tests

Movement impairment

- Movement fault
  - Moves too much
  - Moves too little
  - Poor timing/control
Poor posture

Excessive Thoracic Flexion
Effect of Posture on Acromiohumeral Distance With Arm Elevation in Subjects With and Without Rotator Cuff Disease Using Ultrasonography


- Acromiohumeral distance measured at 2 positions in 3 postures
- Increased space in upright posture at 45 degree abduction

**Figure 1.** The bar represents the acromiohumeral distance in mm.

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

**Figure 3.** Acromiohumeral distance in mm at 3 postures for 2 arm positions at rest and 45° abduction. Data represent combined results for the control and patients with rotator cuff disease. Vertical bars represent 95% confidence intervals.
Slouched posture:
- Decreased shoulder abduction ROM
- Scapula had decreased posterior tilting 90°-maximum abduction
- 16.2% decrease in muscle force at 90° of abduction

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

Manual therapy for shoulder pathology

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

Middle trapezius activity increased

Some Factors Predict Successful Short-Term Outcomes in Individuals With Shoulder Pain Receiving Cervicothoracic Manipulation: A Single-Arm Trial
Paul E. Mintken, Joshua A. Cleland, Kristin J. Carpenter, Melanie L. Blintek, Mike Keirns and Julie M. Whitman

**PHYS THER.**
Pain free shoulder flexion <127°
Shoulder internal rotation <53° at 90° of abduction
Negative Neer test
Not taking medications for their shoulder pain
Symptoms <90 days

### Table: Predictive Pain Criteria Identified in a Logistic Regression Analysis

<table>
<thead>
<tr>
<th>Number of Variables</th>
<th>Criterion</th>
<th>Probability of</th>
<th>Patients Who Satisfied</th>
<th>Positive Likelihood Ratio</th>
<th>Negative Likelihood Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain free flexion</td>
<td>&lt;127°</td>
<td>4.57</td>
<td>1.67</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Shoulder internal</td>
<td>&lt;53°</td>
<td>2.32</td>
<td>3.32</td>
<td>1.06</td>
<td>0.34</td>
</tr>
<tr>
<td>Negative Neer test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not taking med.</td>
<td></td>
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</tr>
<tr>
<td>Symptoms &lt;90 days</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*For probability of occurrence calculated using the positive likelihood ratio, and assume a prior probability of 40%.

### Rehabilitation Using Manual Mobilization for Thoracic Kyphosis in Elderly Postmenopausal Patients With Osteoporosis

Ivan Baumanns, PhD, Judith Van Arken, MSc, Mike Van Mackenbergh, MSc and Tony Mets, PhD


### Sample

- 48 post menopausal women with osteoporosis

![Diagram](image_url)

**Fig. 1.** Flow of participants. *Data were analyzed following the intention-to-treat principle and missing data were imputed using the last observation carried forward (LOCF) technique.
Intervention
Taping
Exercises

- Seated arm lifts
  - 3x15 reps
  - Can be done with weights
  - Seated arm lifts
Wall shoulder flexion
- Scroll arms up to maximum flexion
- 3-10 seconds end range holds
- Avoid compensation at hips and lumbar spine

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

Seated thoracic extension
- Sitting
- Hands clasped behind neck
- Lift arms and extend thorax
- Avoid compensation at hips or lumbar spine
Seated or standing extension against wall

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

Significant improvement in kyphosis

<table>
<thead>
<tr>
<th>Table 2: Change in kyphosis after rehabilitation and exercise program in randomized groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Seated</td>
</tr>
<tr>
<td>Standing</td>
</tr>
</tbody>
</table>

Note: p-values indicate statistical significance. 95% confidence intervals are provided.
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

Scapular Movement Faults

- Depression
- Elevation
- Abduction
- Retraction
- Insufficient upward rotation
- Winging
- Anterior tipping
Humeral Movement Faults

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

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

MICHAEL M. HERIOLS, PT, DPT, ATC, CSPO, RAY H. ESQUERA, PT, MSc, DIPSC, ATC

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

Philip W. McCullar, PhD, PT 1; Lori A. Michener, MEd, PT, ATC, Brian J. Sennett, MD 1 and Andrew R. Karzis, PhD 2,3 Glenville and Philadelphia, Pa, and Richmond, Va
J Shoulder Elbow Surg 2001;10:269-77

Scapular norms

McCulare, O1; Ludewig, 96, 09:

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

Insufficient Scapular Upward Rotation

The Association of Scapular Kinematics and Glenohumeral Joint Pathologies

Paula M. Ludewig, PT, PhD1  •  Jonathan F. Reynolds, PT, PhD

Significant decrease in scapular upward rotation in scaption and abduction plane

Interrater reliability of clinical tests to evaluate scapulothoracic motion

Evelyn Baarszochi1,*, Jaap Swinnenburg1, Florian Brunner2 and Jan Kool3

Baarszochi et al. BMC Musculoskeletal Disorders 2018, 19:315
http://www.biomedcentral.com/1471-2474/19/315
The Scapular Assistance Test Results in Changes in Scapular Position and Subacromial Space but Not Rotator Cuff Strength in Subacromial Impingement

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

Upward rotation improved at 0, 45°

AH distance improved at 45 and 90°

Posture with correction

Elevation with correction
Insufficient Scapular Upward Rotation: associated Impairments

- Muscle imbalance

[Diagram showing muscle imbalances]

- Insufficient Scapular Upward Rotation: associated Impairments
  - Upward rotators:
    - < 90 deg: UT and SA better
    - > 90 deg: LT better

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

Paula M Ludewig and Thomas M Cook

Decreased Serratus Anterior activity

Serratus Anterior MMT

Lower Trapezius MMT
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

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

Michael M. Herkalo, PT, DPT, ATC, CSCS • Rafael Escorbeila, PT, MBA, CSCS, DACSM • Kevin Wilk, PT, DPT*

Serratus Anterior

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Instructions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push-up with plyo</td>
<td>Start in prone position, hold, resist with arms at 90°</td>
<td>Effective exercise to provide resistance against posterior movement and upward rotation</td>
</tr>
<tr>
<td>Dynamic lag</td>
<td>Perform with scapula retraction and upward rotation</td>
<td>Can be performed with or without resistance</td>
</tr>
<tr>
<td>Serratus push (LDT)</td>
<td>Combination of retraction with upward rotation</td>
<td>Most activated with scapula protraction and upward rotation movement</td>
</tr>
</tbody>
</table>

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

- Recruit car
- Enhance ER at 90° abduction
- Enhance horizontal abduction at 90° abduction
- Maintain ER

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

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; LIEVEN DANNEELS, PT, PhD; BARBARA CAGNE, PT, PhD
LIEZE DE LIGNE, PT; ELEEN KEYSN, PT; ANN M. COOLS, PT, PhD

Insufficient Scapular Upward Rotation
- Serratus Anterior activation with flexion
  - Quadruped rock back
  - Wall slide

Excessive Scapular Abduction
Excessive Scapular Abduction

- Posture: > 3” from spine
- Elevation: > ½” past mid axillary line

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


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

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

ANGELA R. TATE, PT, PhD* • PHILIP McCLURE, PT, PhD*
STEPHEN KAREWA, PT, DPT, ATC, CSCS® • DOMINIC IRWIN, PT, DPT*

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

Movement with correction

- Video shoulder flexion with excessive scap abduction and correction

Excessive Scapular Abduction: associated Impairments

- Muscle Imbalance
- Scapular adductors vs scapulohumeral muscles
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

Middle Trapezius MMT

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
Excessive Scapular Abduction

- Taping
- Back to wall abduction/external rotation

Muscle Strength/Activation

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

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

Richard A. Exstrom, Gary L. Soderberg, Robert A. Donatelli

Journal of Electromyography and Kinesiology

Volume 15, Issue 4, August 2005, Pages 418-428
Highest EMG when trying to de-rotate scapula

Middle Trapezius
- Shoulder horizontal extension with external rotation
- Overhead arm raise at 140° in prone

Surface Electromyographic Analysis of Exercises for the Trapezius and Serratus Anterior Muscles
Richard A. Estrom, PT, DSc, MS, OCS
Robert A. Donatelli, PT, PhD, OCS
Gary L. Saltzberg, PT, PhD, FAPTA
J Orthop Sports Phys Ther 2003;
Overhead arm raise at 140° in prone

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

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

Which Exercises to Prescribe?


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

<table>
<thead>
<tr>
<th>Exercise Movement</th>
<th>UT</th>
<th>MT</th>
<th>LT</th>
<th>Reference(s)</th>
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<tbody>
<tr>
<td>Abduction</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>22,35</td>
</tr>
<tr>
<td>Forward flexion</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>22,34,35,39</td>
</tr>
<tr>
<td>Dynamic hug</td>
<td>x</td>
<td></td>
<td></td>
<td>7,12,39</td>
</tr>
<tr>
<td>External rotation</td>
<td>x</td>
<td>x</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Extension</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>7,22,35</td>
</tr>
<tr>
<td>Horizontal abduction</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>7,22,35</td>
</tr>
<tr>
<td>Military press</td>
<td></td>
<td>x</td>
<td></td>
<td>17,35</td>
</tr>
<tr>
<td>Rowing (low or high)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>17,20,35</td>
</tr>
<tr>
<td>Scaption (neutral or</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>2,12,22,35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
- Side-lying external rotation
- Side-lying forward flexion
- Prone horizontal abduction with ER
- Prone extension
Posterior shoulder tightness

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

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

Timothy F. Tyler,*‡ BS, PT, ATC, Stephen J. Nicholas,*§ MD, Timothy Fogel,‡‡ PT, and Gilbert W. Giles,*‡ PhD

In shoulder impingement posterior capsule was tight
In shoulder impingement internal rotation was limited

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)

Total ROM (TROM) asymmetry of 5° increased injury rate (Wilk 2011)
GIRD

Capsule

Muscle length

Assess posterior capsule

Assess cross body adduction

Assess PROM GH IR

Assess posterior capsule mobilization

MET HAbd

MET ER
Manual therapy for posterior capsule tightness

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

Takafumi Miura, PT, PhD • Nobutaka Yamauchi, MD, PhD • Lawrence J. Berglund, MD • John N. Sperling, MD • Scott R. Sterrman, MD • Robert A. Coffield, MD • Hai-Nan An, PhD

Grade I/II type mobilizations at initial resistance increased 5-N load displacement after 100 cycles. Even with 600 cycles, not effective for sustained changes.

Immediate and sustained increases in displacement at 5-N level force.
Immediate and sustained increases in displacement at 5-N level force

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

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
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® + TODD R. HOOKS, PT, DCS, SCS, ATC, MMT, MTC, CSCS, FAAOMPT®
LEONARD G. MACRINA, MSPT, SCS, CSCS®


Common stretches

Modified stretches
Clinical application: Asymptomatic
- GIRD and TROM should be part of standard evaluation of throwing athlete examination
- 30 second stretches
- 4+ repetitions per stretch
- Performed before and after exercise program

Clinical application: Symptomatic
- 30 second stretches
- Repeated at least 8-10 times per stretch

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

Stephanie S. Winkle, NE, ATC • Kevin G. LaLonde, PhD, ATC • Todd A. Meister, NC, ATC • Michael A. Sargent, PT, ATC, OCS

Table 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET</td>
<td>Horizontal</td>
<td>122 ± 15</td>
<td>12.5 ± 10</td>
<td>115.5 to 128.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control</td>
<td>106 ± 18</td>
<td>11.2 ± 9</td>
<td>98.8 to 123.4</td>
<td>0.05</td>
<td></td>
</tr>
</tbody>
</table>

Table 3

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MET</td>
<td>Horizontal</td>
<td>102 ± 17</td>
<td>12.3 ± 10</td>
<td>95.7 to 108.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control</td>
<td>96 ± 19</td>
<td>11.1 ± 9</td>
<td>87.9 to 104.3</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>

MET Horizontal HAbd significantly better than control.
Humeral Anterior Glide

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

Translations of the Humerus in Persons With Shoulder Impingement Symptoms

Paula M. Ludewig, PT, PhD
Thomas M. Cook, PT, PhD


- Humeral translation measured during scaption
- Compared with horizontal adduction and internal rotation ROM
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
Use of a Movement System Impairment Diagnosis for Physical Therapy in the Management of a Patient With Shoulder Pain

CHERYL CALDWELL, PT, CPT OMT • SHIRLEY SAHRMANN, PT, PhD, FAAPTA • LINDA VAN DULEN, PT, PhD

Humeral Anterior Glide: Interventions

- Biceps length test
- Pectoralis major length test
Humeral Anterior Glide: Interventions

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

Humeral Internal Rotation

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

Humeral Internal Rotation: Associated Impairments

- Tightness in internal rotators
  - Pectoralis major, Latissamus dorsi, subscapularis
- Weakness in external rotators
  - Infraspinatus, Teres minor
The Association of Scapular Kinematics and Glenohumeral Joint Pathologies

PAULA M. LUDEWIG, PT, PhD* • JONATHAN F. REYNOLDS, PT, PhD*


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

Pectoralis length test
Pectoralis minor length test

Latissimus dorsi length test

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

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

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

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


Limited evidence to support therapeutic exercise and manual therapy...
The Effect of Therapeutic Exercise and Mobilization on Patients With Shoulder Dysfunction: A Systematic Review With Meta-analysis

TRACY J. BUDWEISI, PT, DPT, PhD, OCS* • HETAL KULKARNI, PT, MSPT* • SHALVE SHAR, PT, MSPT*


Current evidence is inconclusive...

LAB

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
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

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)

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
Lab Case 2: Interventions
- Improving mobility:
  - Scapulothoracic mobilization
  - MET Horizontal abduction
  - MET Internal rotation
  - Pectoralis minor stretch and soft tissue mobilization

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
Lab Case 3- Thoracic fault

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

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

Lab Case 3: Interventions

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