ACTIVFORCE | webinar

Investigating Injuries

Scapular Dyskinesis

What's That All About, Then?

Introductions

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PT, DPT

Introductions

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Agenda

- Introduction
- Understanding Scapular Dyskinesis
- Clinical Presentations and Classifications (Types I–III)
- Mechanisms and Contributing Factors
- Anatomical Overview
- Clinical Assessment
  - ROM: Shoulder Flexion, Abduction, Internal and External Rotation
  - MMT: Serratus Anterior, Lower and Middle Trapezius, Rhomboids, Upper Trapezius and Levator Scapulae
- Case Study
  - Data Review and Analysis
- Treatment and Rehabilitation Strategies
- Q&A

Learning Objectives

By the end of this session, participants will:

- Understand the anatomy and biomechanics of the scapula
- Recognize patterns and causes of scapular dyskinesis
- Learn evidence-based assessment techniques
- Apply clinical reasoning for rehabilitation
- Explore ActivBody tools in assessing and retraining scapular control

Scapular Dyskinesis

What is Skapular Dyskinesis?

Greek origin: The word is a combination of two Greek words.

- **Dys-**: Meaning “abnormal”, “difficult”, and “faculty”
- **Kinesis**: Meaning “movement” and “motion”.

Consensus statement

Editor's choice
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Clinical implications of scapular dyskinesis in shoulder injury: the 2013 consensus statement from the 'scapular summit'

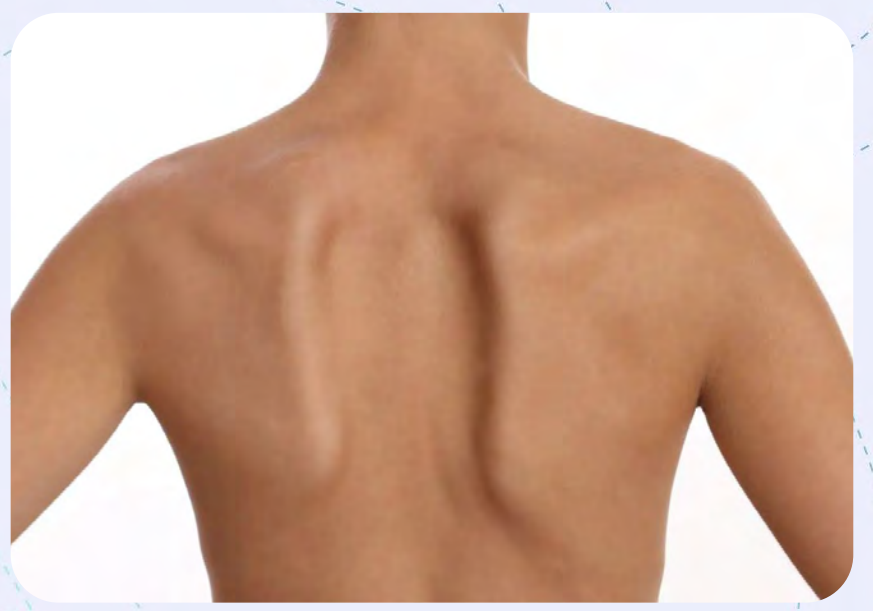
W Ben Kibler,[1] Paula M Ludewig,[2] Phil W McClure,[3] Lori A Michener,[4] Klaus Bak,[5] Aaron D Sciascia[1]

BJSM 2013

- SD is present in a high percentage of most shoulder injuries
- The exact role of SD in creating/exacerbating shoulder dysfunction is not clearly defined
- Shoulder impingement symptoms are particularly affected by SD evaluation of SD
- SD is most aptly viewed as a potential impairment to shoulder function
- Treatment for shoulder injury can be more effectively implemented by
- A reliable observational clinical evaluation method for SD is available
- Rehabilitation programmes to restore scapular position and motion can be effective within a more comprehensive shoulder rehabilitation programme.

Clinical Presentation

- Asymmetrical scapular motion
- Prominence of medial border or inferior angle
- Early or excessive elevation during arm movement
- Pain or fatigue with overhead activities



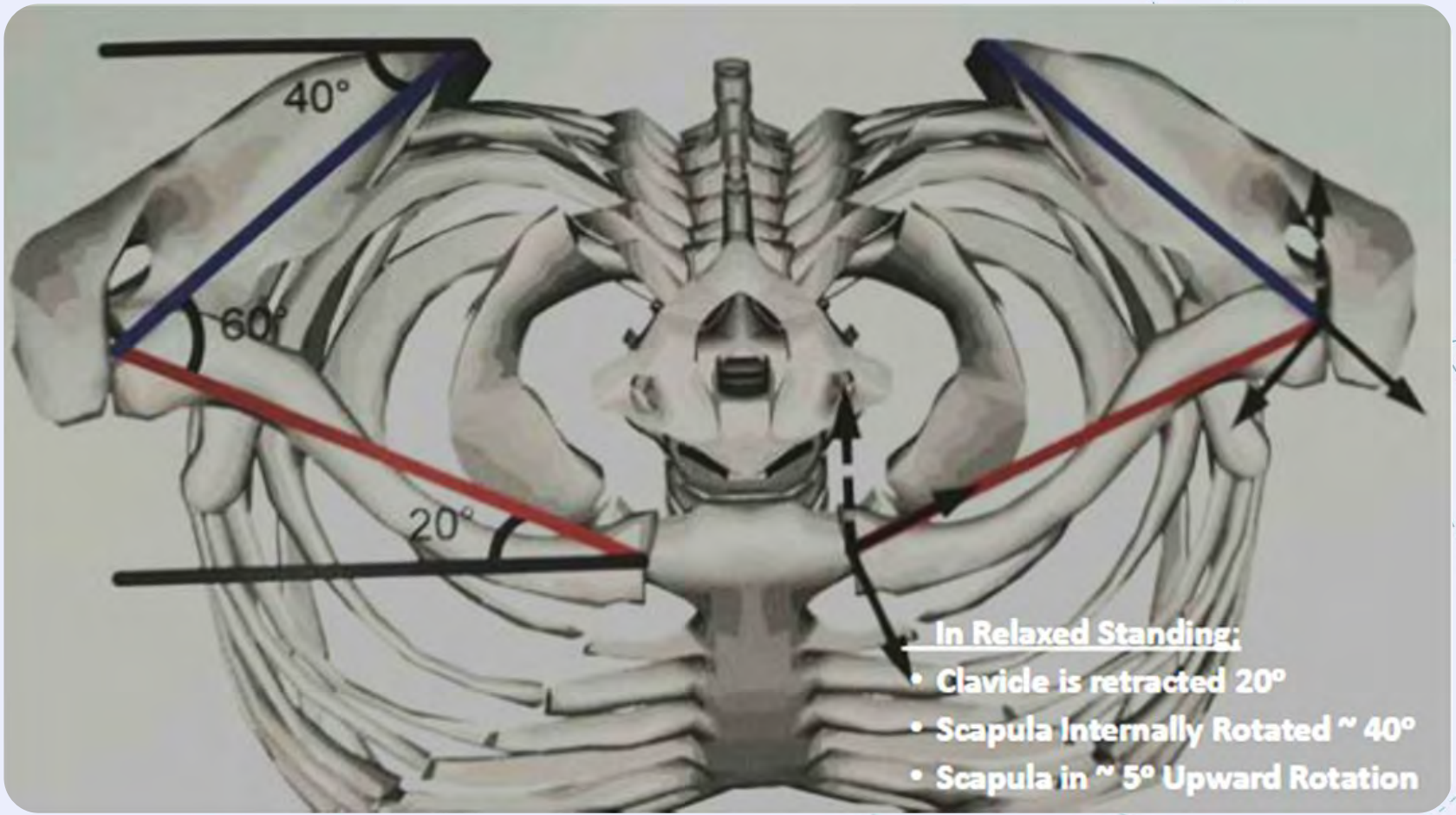
Causes To Consider

- ACJ Dysfunction
- Sub Acromial Impingement
- Glenoid labrumTears
- Claviclefractures/Non-Union
- Lack of Soft Tissue Extensibility
- Cervical Spine Issues
- Sub-Optimal Thoracic Spine Mobility
- Kinetic Chain Deficits

Prevalence of Scapular Dyskinesis

Systematic Review (Salamh et al., 2023)				
	SYMPTOMATIC		ASYMPTOMATIC	
	With SD	**Without SD**	**With SD**	Without SD
Athletic/Musicians	81%	19%	42%	58%
General Orthopedic Population	57%	43%	48%	52%
Athletic Population	79%	21%		
General Population			42%	58%

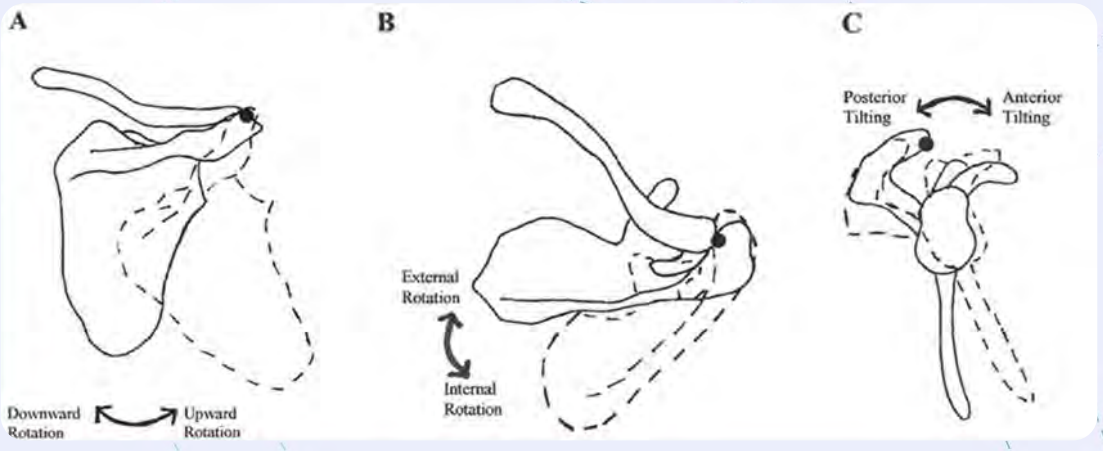
SD may be a normal finding


40°
60°
20°
In Relaxed Standing:
• Clavicle is retracted 20°
• Scapula Internally Rotated ~ 40°
• Scapula in ~ 5° Upward Rotation

Resting Scapula Position (Arms By Side, Neutral Posture)			
Scapular Orientation	Mean Angle (°)	Typical Range (°)	Description
Upward Rotation	Approx 5-10	0-10	Glenoid fossa faces slightly upward relative to thorax
Internal Rotation	Approx 30-45	30-40	Scapular plane lies approx. 35° anterior to frontal plane. Aligns to thoracic curve
Anterior Tilt	Approx 10-15	8-20	Superior border tilts anteriorly; glenoid faces slightly upward and anterolaterally

Scapular Force Couple

Amit G. Alon


A
Downward Rotation
Upward Rotation
B
External Rotation
Internal Rotation
C
Posterior Tilting
Anterior Tilting

Normal Scapular Motion

Scapula upwardly rotates and posteriorly tilts during arm elevation (Ludewig PM et. al., JOSPT 1996; Lukasiewicz AC et. al.,1999 ;McClure PW et. al., 2001) Scapula externally rotates during arm elevation especially at the end ranges. (Ludewig PM 2009) Scapula internally rotates until after ~125°and then starts to externally rotate (Braman,2009)

Arm Lowering

Scapula had greater posterior tilting (2°) during arm lowering compared to arm raising (Ludewig PM 2009)
So…you shouldn't see increased anterior tilting during arm lowering

Normal Scapular Motion

Scapula should elevate but only slightly (6-10°) (Ludewig PM 2009) Vertebral border of scapula should remain in contact with thorax

Normal Scapular Motion

By the end range of arm elevation: –Acromion should be aligned with C6-7 The vertebral border of the scapula should reach 55-60o(+ or –5o) upward rotation Scapula should posteriorly tilt 10o(Ludewig PM 2009) Scapula should externally rotate so it is 10-20oanterior to the frontal plane (Ludewig PM 2009)

Elevation

Joint & Motion	Range	Prime Movers	Secondary Movers	Synergists	Antagonists
Glenohumeral Abduction	0-120 deg	Deltoid Supraspinatus	Biceps Brachii (if humeral ER)	Anterior Deltoid Posterior Deltoid	Latissimus Dorsi Pectoralis Major Triceps Brachii
External Rotation	0-70 deg	Supraspinatus Infraspinatus Teres Minor	Posterior Deltoid		Anterior Deltoid Subscapularis Latissimus Dorsi Pectoralis Major
Scapular Upward Rotation	0-30 deg	Upper Trapezius Upper Fibres Serratus Anterior		Upper Trapezius Upper Fibres Serratus Anterior	Rhomboids Levator Scapula Coracoid Muscles
	30-60 deg	Upper Trapezius Lower Trapezius All Serratus Anterior		Upper Trapezius Upper Fibres Serratus Anterior Upper & Lower Trapezius	Rhomboids Levator Scapula Coracoid Muscles

What happens with shoulder elevation?

Shortening

- Supraspinatus
- Infraspinatus
- Teres minor
- Deltoid
- Upper Trapezius
- Serratus Anterior

Lengthening

- Subscapularis
- Levator scapulae
- Rhomboid major
- Rhomboid minor
- Lower Trapezius
- Latissmus dorsi
- Teres major
- Coracobrachialis
- Biceps Brachii-Short head

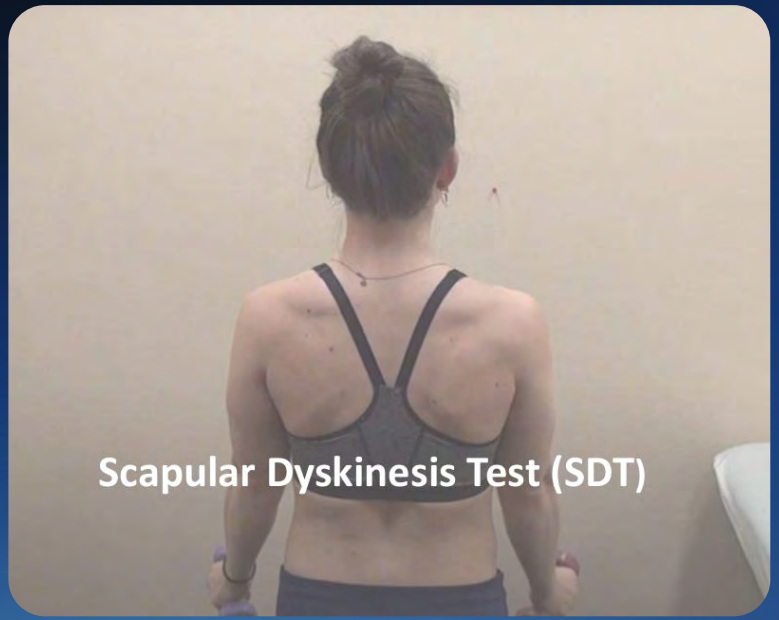
Scapular Kinematics Overview

- Normal upward rotation: ~60° during full shoulder elevation
- 2:1 ratio of glenohumeral to scapulothoracic movement
- Proper timing and coordination crucial for joint health

Clinical Assessment & Treatment Strategies

Clinical Assessment of Scapular Dyskinesis

Test	Focus	Key Finding	Reliability	Clinical Use
Scapular Dyskinesis Test (SDT)	Dynamic visual observation	Asymmetry / winging	κ = 0.61–0.84	Screening & classification
Scapular Assistance Test (SAT)	Dynamic manual facilitation	↓ pain / ↑ motion	Moderate	Confirms functional involvement
Scapular Retraction Test (SRT)	Stabilisation effect	↑ strength / ↓ pain	Moderate	Functional confirmation
Lateral Scapular Slide Test (LSST)	Static measure	>1.5 cm asymmetry	Variable	Postural & static asymmetry
Uhl Classification	Pattern type	Type I–III dyskinesis	κ = 0.5–0.7	Motion pattern differentiation
Video/Digital analysis	Quantitative observation	Kinematic trace	High (if used correctly)	Documentation, rehab tracking



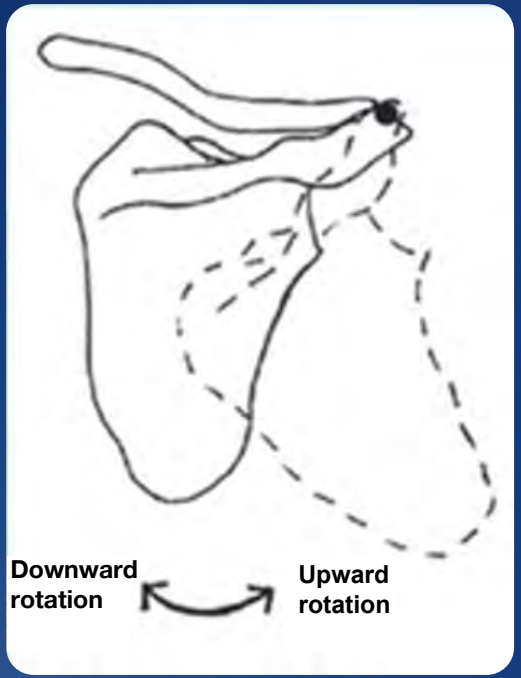
1.4kg if patient weighs <68.1kg
2.3kg if patient weighs ≥68.1kg & 3 reps

Metronome of 60 BPM & 5 reps

YES/NO

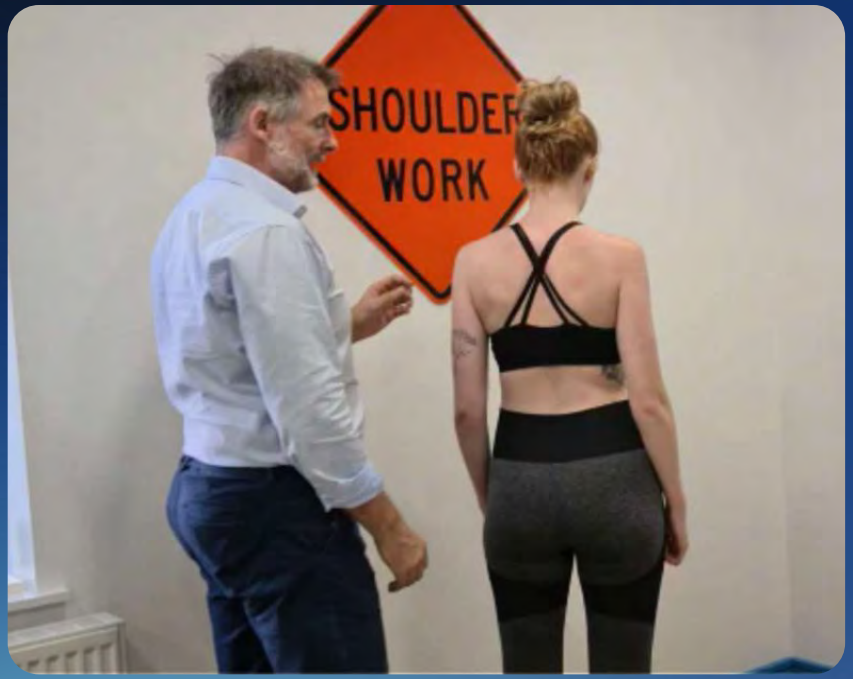
McClure et al., 2009

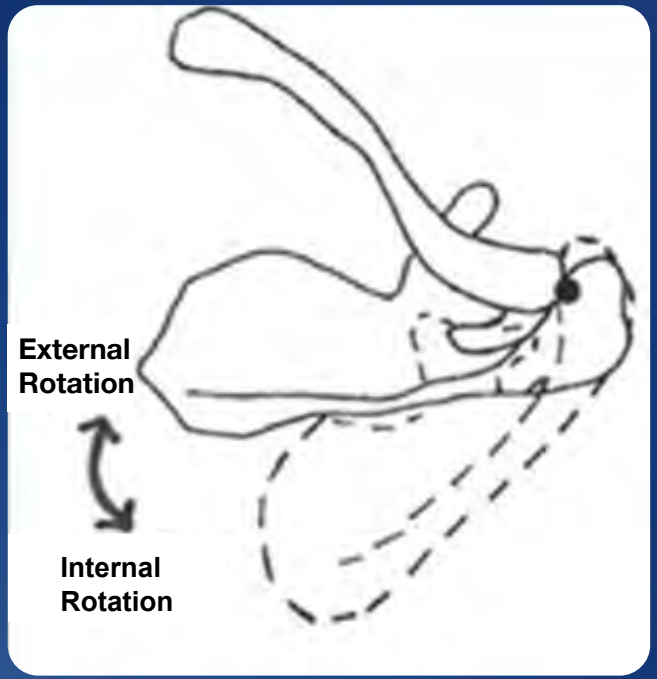

SHOULDER


Downward rotation
Upward rotation

Scapular Posterior Tilt Test

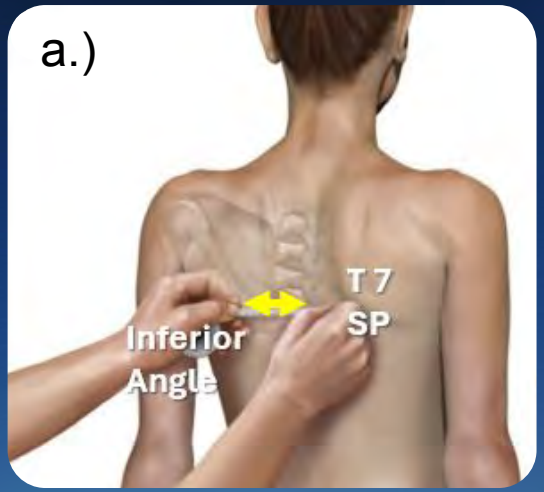
Scapular External Rotation Test



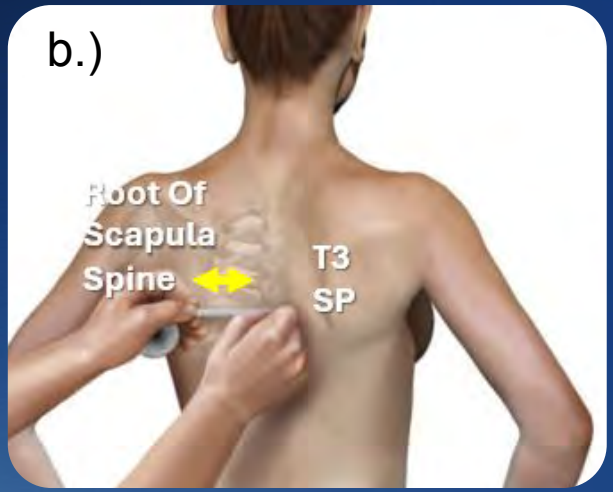


Lateral Scapula Slide Test

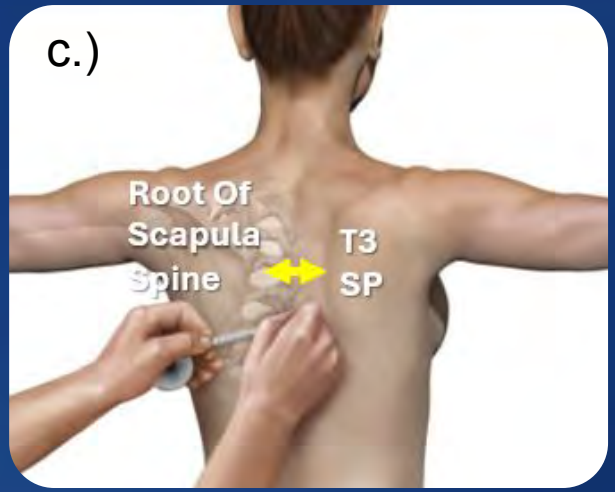
The threshold of abnormality is 1.5 cm



Arms by Side



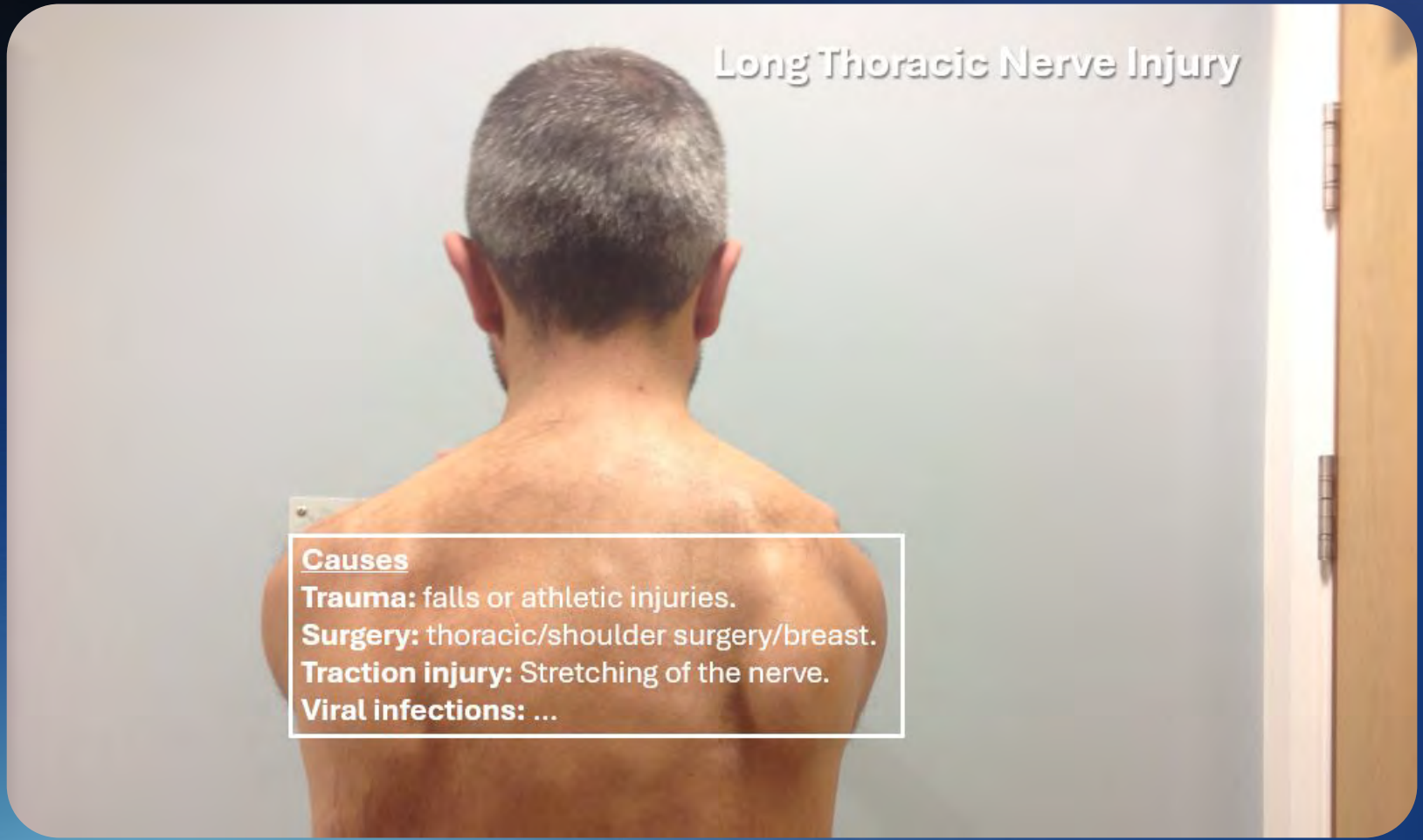
Hands on Hips



Arms @ 90 deg & Internal Rotation

Roche et al., 2015

Sometimes things are not what they appear to be.


Long Thoracic Nerve Injury
Causes
Trauma: falls or athletic injuries.
Surgery: thoracic/shoulder surgery/breast.
Traction injury: Stretching of the nerve.
Viral infections: ...

Parsonage-Turner Syndrome (PTS)

Luis Arthur Brasil Gadelha Farias

Facioscapulohumeral Muscular Dystrophy (FSHD)

en.wikipedia.org

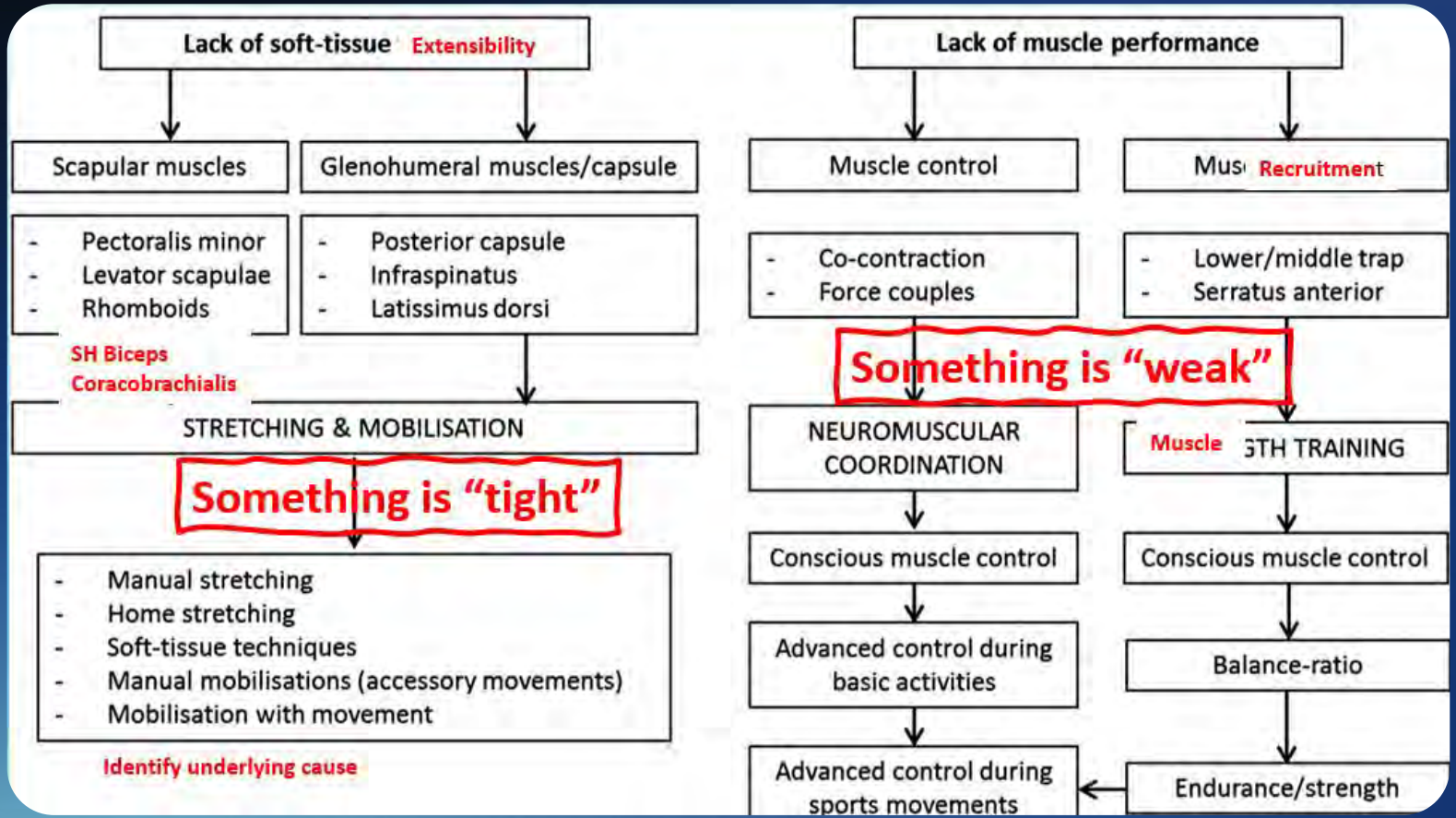
Type	Description	Primary Visual Feature	Common Associations
Type I – Inferomedial border prominence	The **inferior medial angle of the scapula protrudes posteriorly** due to excessive anterior tilt.	Inferior angle visible; scapula appears to "tilt forward" during motion.	Often linked with **rotator cuff pathology**, **labral injury**, or **posterior capsule tightness**. May indicate weakness or delayed activation of **lower trapezius** and **serratus anterior**.
Type II – Medial border prominence	The **entire medial border lifts away from the thoracic wall**, reflecting excessive internal rotation of the scapula.	Medial border more visible along its length.	Commonly seen with **GH instability** or **scapular muscle imbalance**, especially involving the **rhomboids** and **serratus anterior**.
Type III – Superior border elevation	The **superior border of the scapula elevates excessively** during arm motion (especially during early elevation).	"Shrugging" pattern; early scapular elevation instead of smooth upward rotation.	Often seen with **impingement syndromes** or **rotator cuff tears**—compensatory upper trapezius overactivity and lower trapezius/serratus weakness.
Type IV – Symmetric scapular motion (Normal) **	The scapulae move symmetrically and smoothly during arm motion, maintaining normal resting posture.	No prominence or asymmetry observed.	Represents **normal scapular kinematics**. Used as comparison for affected side.

Scapula Dyskinesis - What is Wrong?

Regional Contributors

- Thoracic Kyphosis/Mobility
- Posterior Shoulder Tightness
- Kinetic-chain Deficits
- Cervical contribution in neck-pain populations

(Cools et al., 2013)



Range of Motion:

Shoulder Flexion

- Can be done in supine and seated position

Shoulder Abduction

- Can be done in supine and seated position

Range of Motion:
Shoulder Internal/External Rotation

- Can be tested in supine and seated position
- Device can be strapped on wrist

Muscle Testing:
Serratus Anterior- Protraction / Upward Rotation

- Sitting or supine with shoulder flexed to 90° (arm pointing forward).
- “Punch your arm forward — reach toward the ceiling (or forward)
- Common Substitution: Overactivation of pectoralis major or trunk rotation.as far as you can.”

Muscle Testing:

Upper Trapezius — Elevation

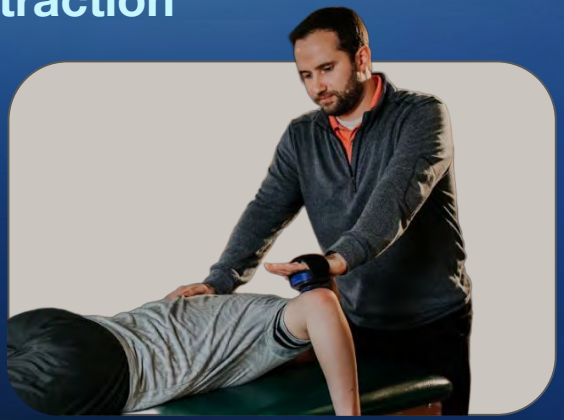
- Seated.
- “Shrug your shoulders up toward your ears — hold it.”
- Common Substitution: Leaning or rotating neck.

Lower Trapezius — Depression / Upward Rotation

- Prone, with arm abducted ~145° (in line with lower trap fibers), thumb up.
- “Lift your arm off the table as high as you can, keeping your elbow straight.”
- Common Substitution: Lumbar extension, overuse of middle trap or rhomboids.

Muscle Testing:

Middle Trapezius — Retraction



- Prone, arm abducted to 90°, elbow extended, thumb up.
- “Lift your arm toward the ceiling — bring your shoulder blade toward your spine.”
- Common Substitution: Shoulder elevation by upper trapezius.

Rhomboids — Retraction / Downward Rotation

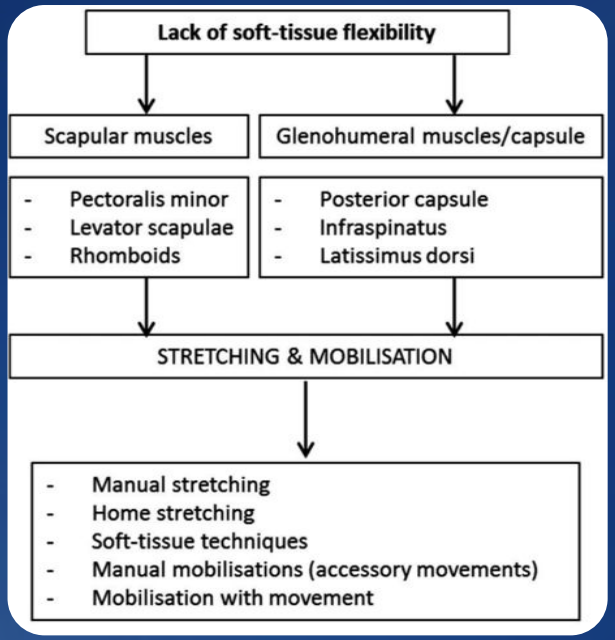
- Prone, hand placed on lower back (shoulder internally rotated, elbow flexed).
- “Lift your hand away from your back.”
- Common Substitution: Upper trap or latissimus dorsi activation.

Pectoralis Minor Length

- Coracoid process
- Lateral sternal junction of the fourth rib

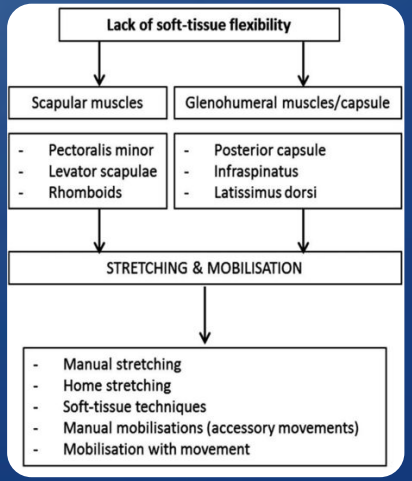
Joo & Kim, 2025

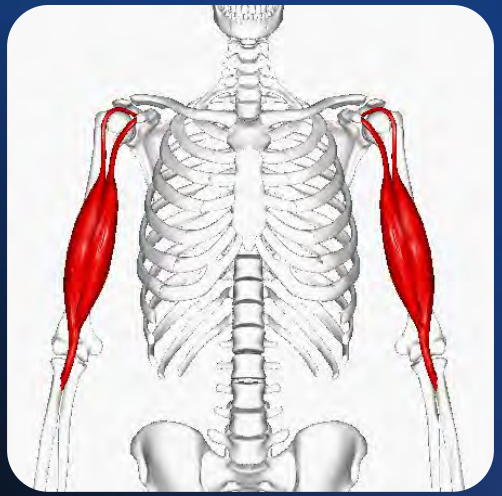
Pectoralis Minor

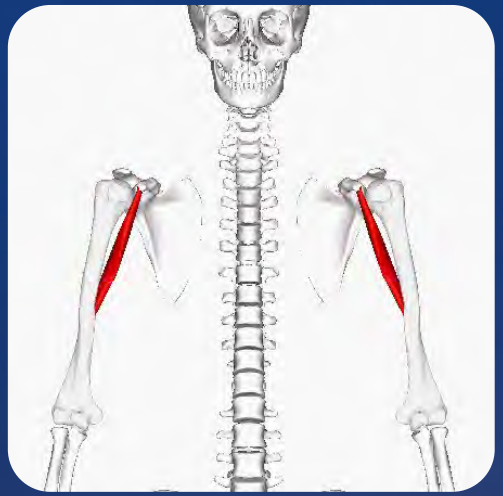


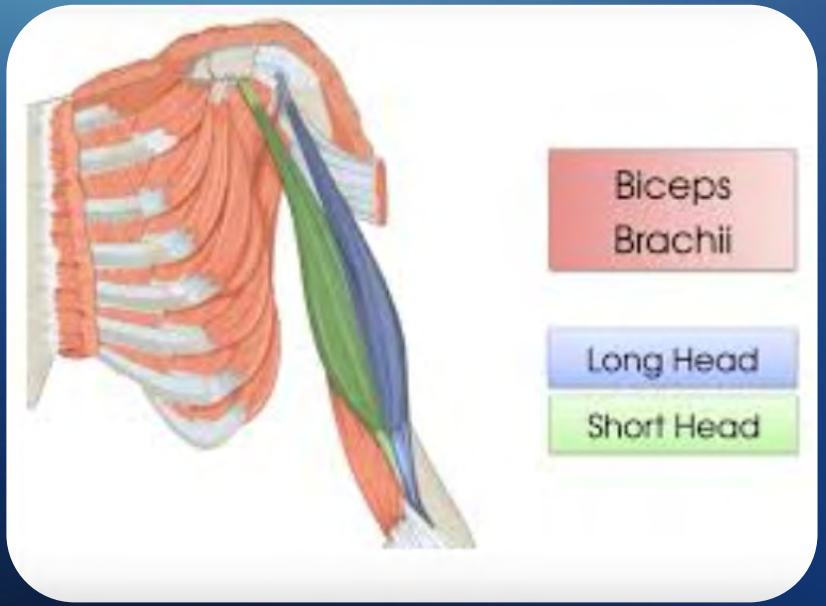
Differential Assessment of Coracoid Muscle Extensibility

Scapular Muscles



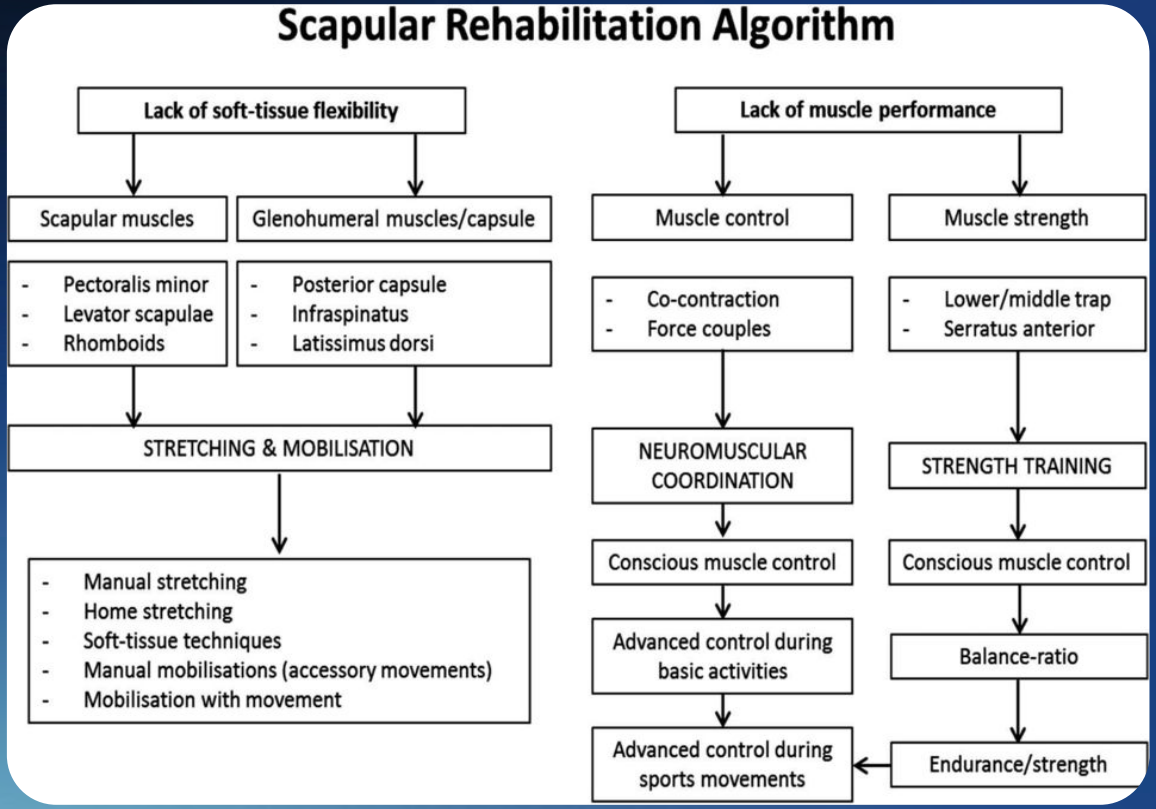





Biceps Brachii
Long Head
Short Head

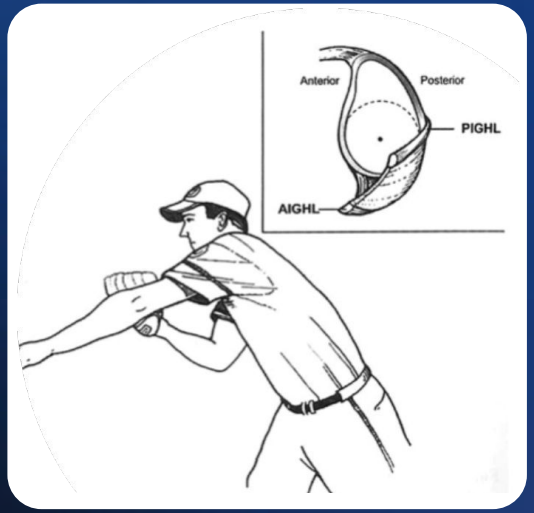

Coracobrachialis
Bodyworks Prime

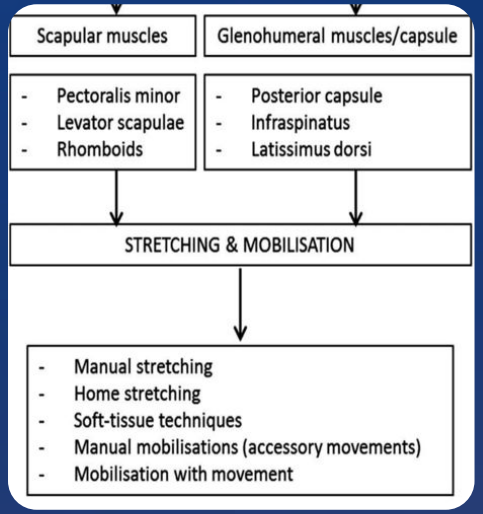
Levator Scapula



Posterior Capsular Inflexibility

- Subjects with posterior shoulder tightness (evaluated by measuring glenohumeral internal rotation ROM) demonstrated greater scapular anterior tilt
- Decrease in shoulder internal rotation has been associated with shoulder impingement in overhead athletes (Harryman et al., 1990; Tyler et al., 2000; Borich et al., 2006)





ECKENRODE 2012

Definition

a loss of >20° of IR compared to the contralateral shoulder

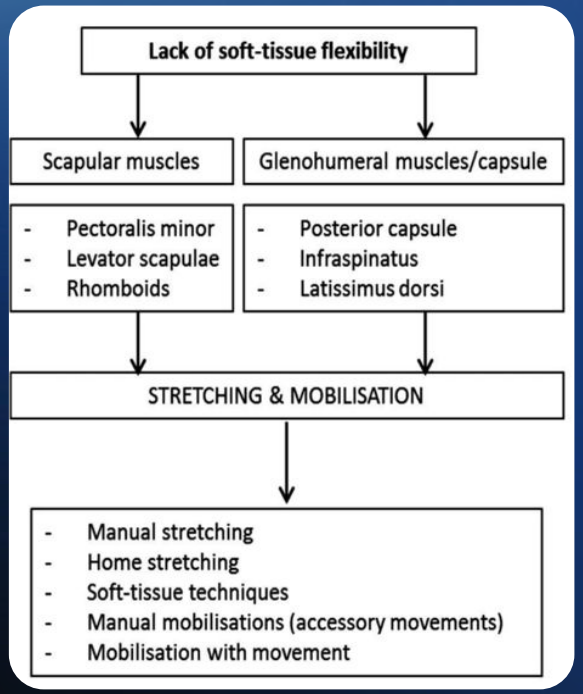
Causes

- Capsular Tightness
- Humeral Retrotorsion
- Scapular Dyskinesia
- Rotator Cuff Tightness

Laudner et al., 2008

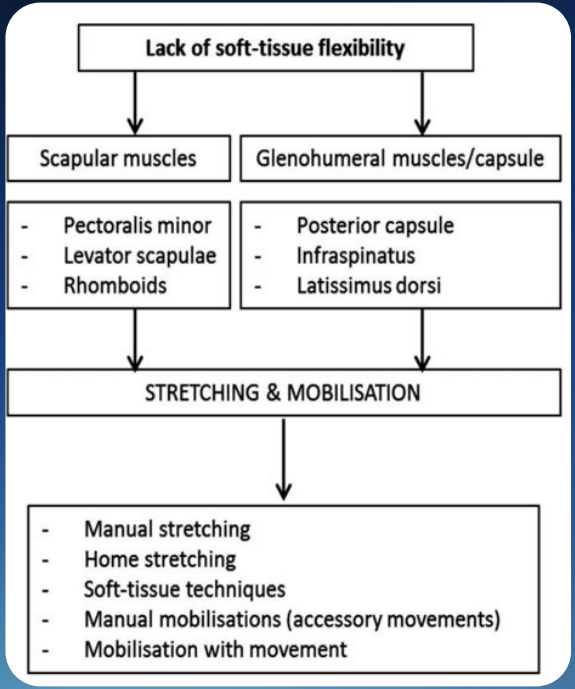
Managing GIRD

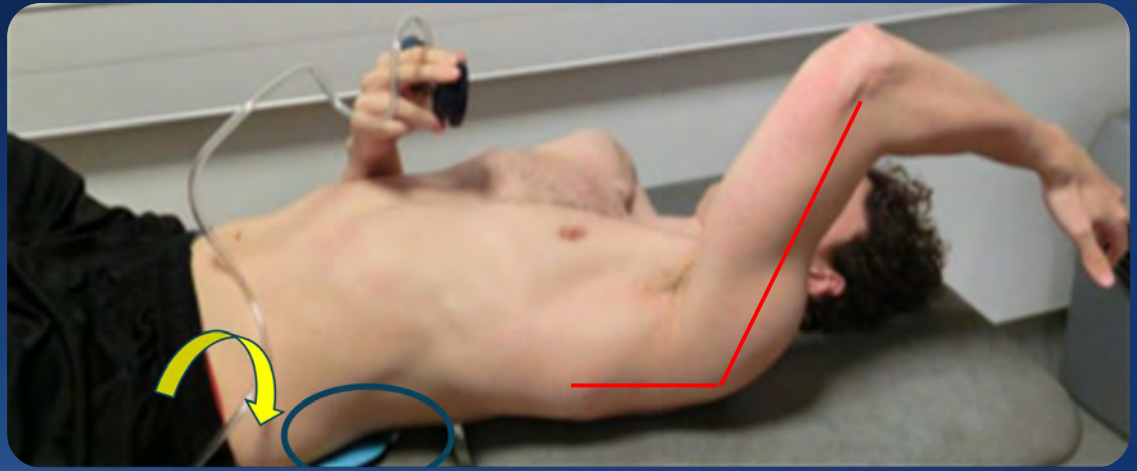
Interventions For Posterior Capsule Tightness



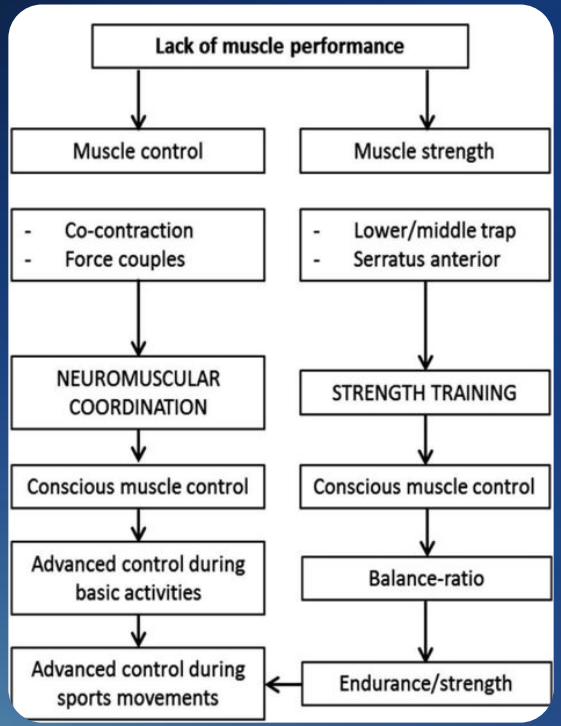
Laudner et al.,2008

Latissimus Dorsi Length Assessment

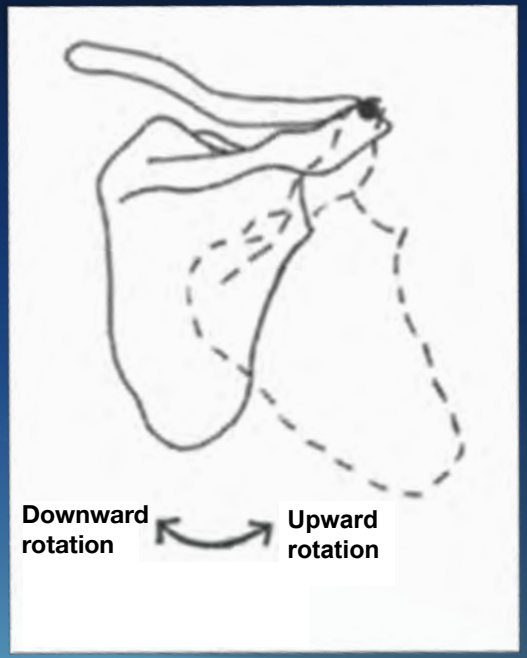




Posterior Cuff Force Production Assessment

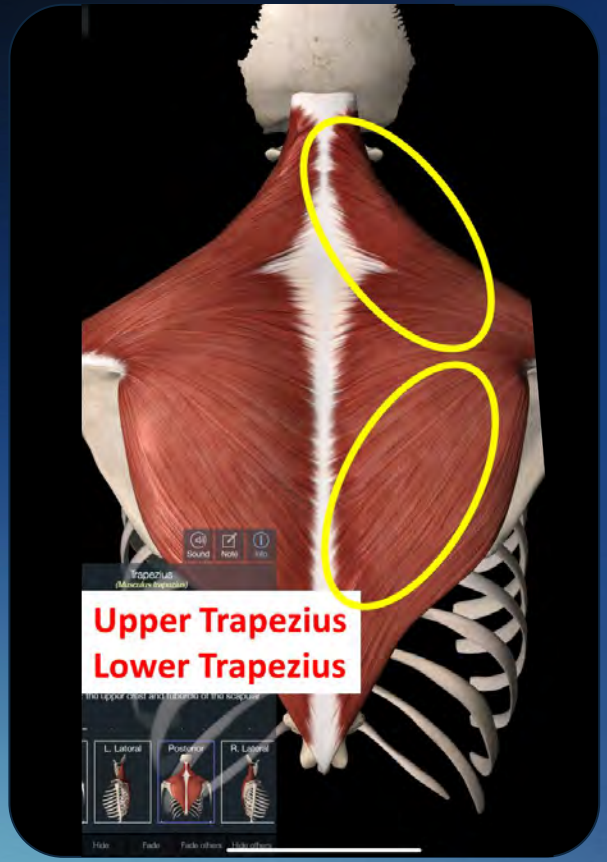


Scapular Upward Rotation



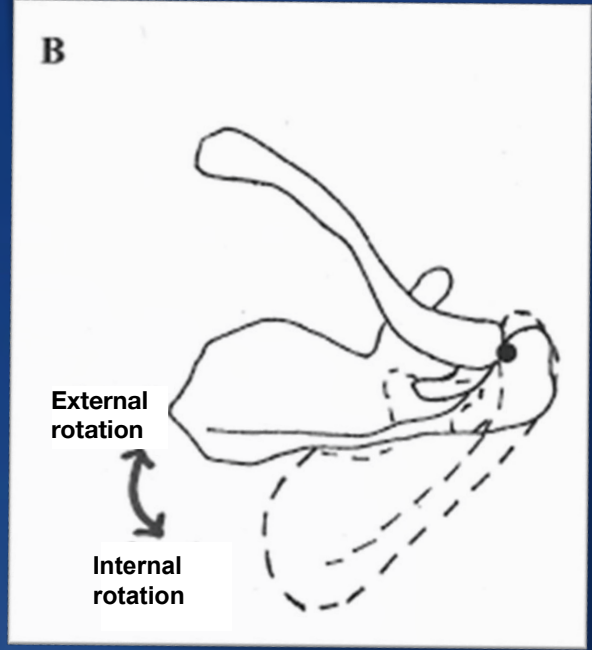
Result of sternoclavicular posterior rotation and elevation, and acromioclavicular upward rotation (Fernandez-Matías et al., 2025)

Scapular Upward Rotators

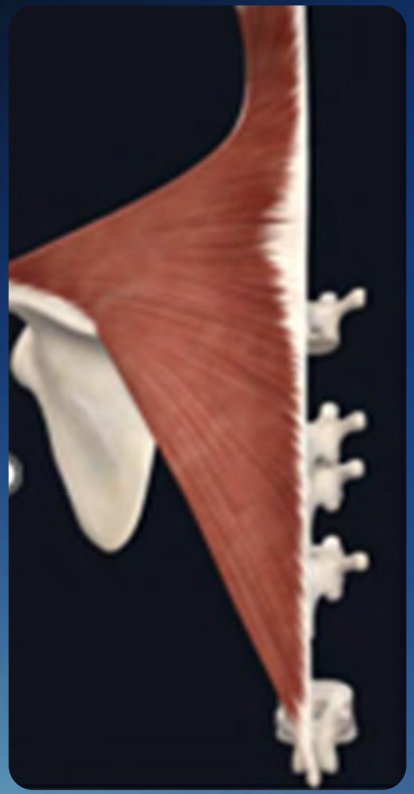


Scapular External Rotation

Results from sternoclavicular retraction and acromioclavicular external rotation



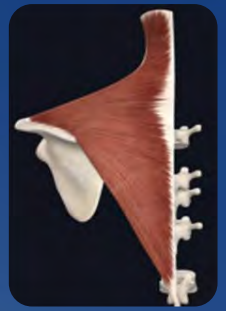
Scapular External Rotators



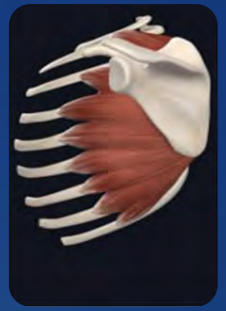
Trapezius (Middle)

Rhomboid Major

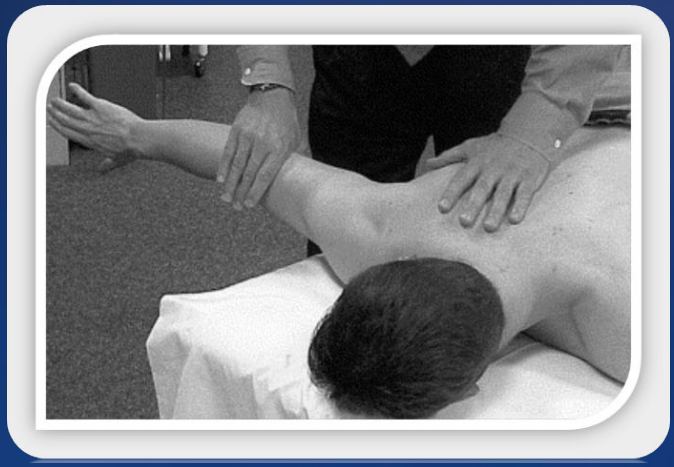
Rhomboid Minor



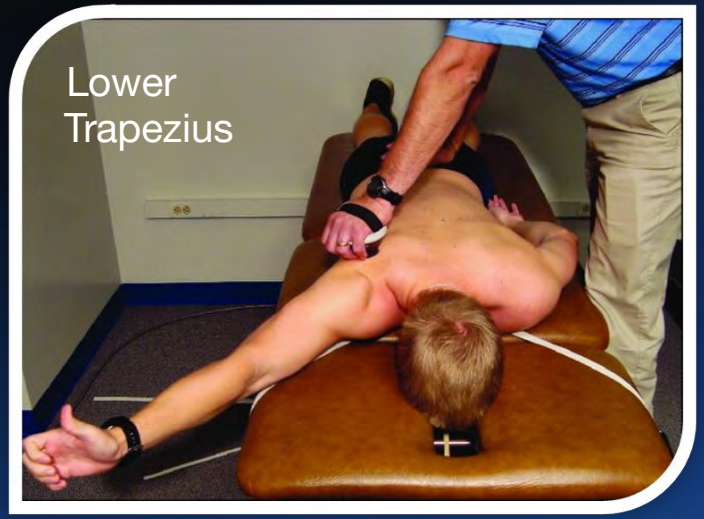
Trapezius (Lower)



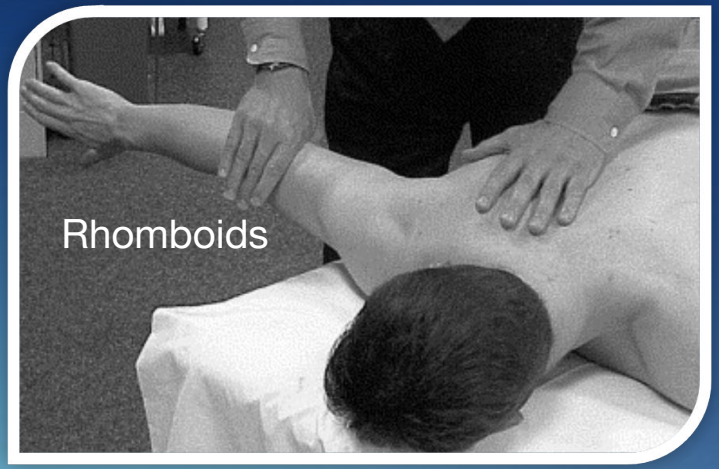
Serratus Anterior

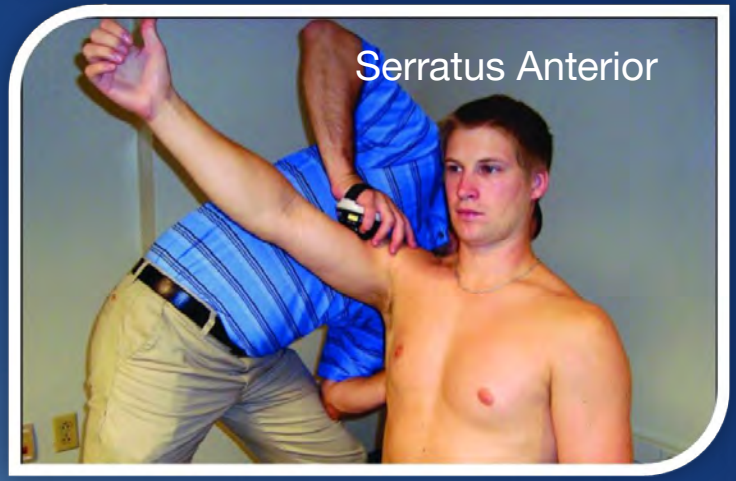



WORK


Lower
Trapezius

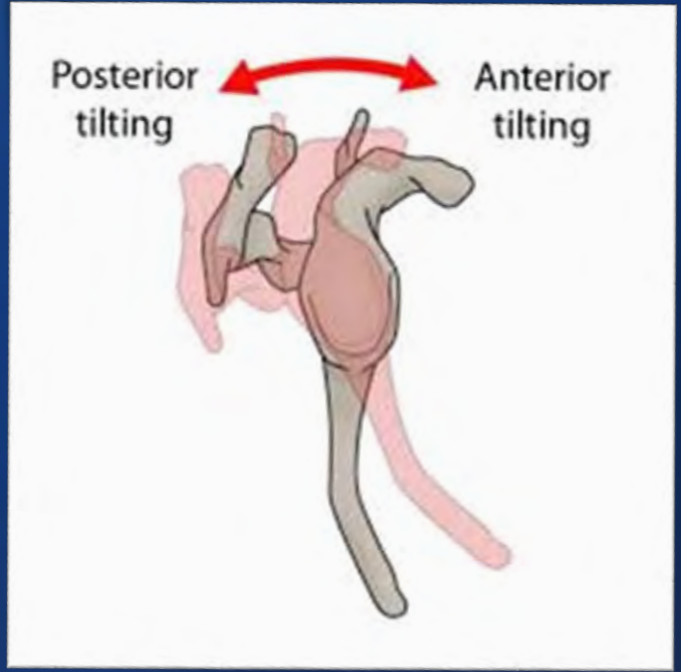

Middle Trapezius


Rhomboids

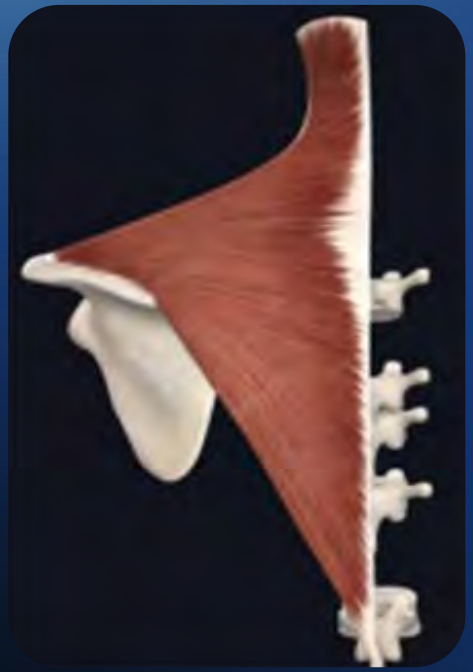

Serratus Anterior

Scapular Posterior Tilt

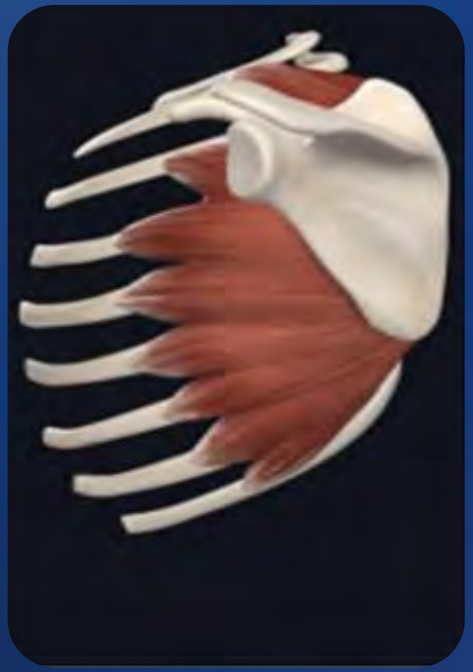
Produced as a consequence of sternoclavicular posterior rotation, and acromioclavicular posterior tilt.



Scapular Posterior Tilters



Trapezius (Lower)



Serratus Anterior

Serratus Anterior

- Superior part; 1st-2nd rib-> superior angle: stabilize scapula on initial abduction (ER & UR)
- Intermediate part; 2nd-3rd rib-> medial border; instrumental in protraction(IR)
- Inferior part;4th-9th rib-> medial border + inferior angle; primarily upward rotation/ posterior tilt

- Upwardly Rotates Scapula
- Posteriorly Tilts Scapula
- Externally Rotates Scapula
- Protracts Scapula

Think!

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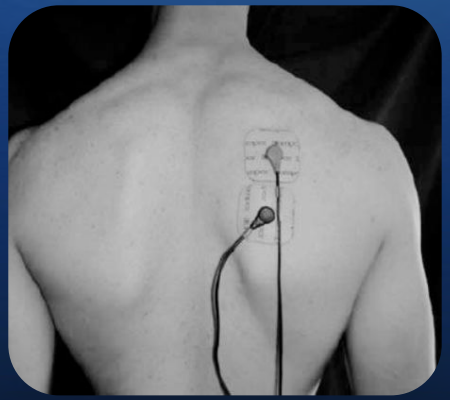
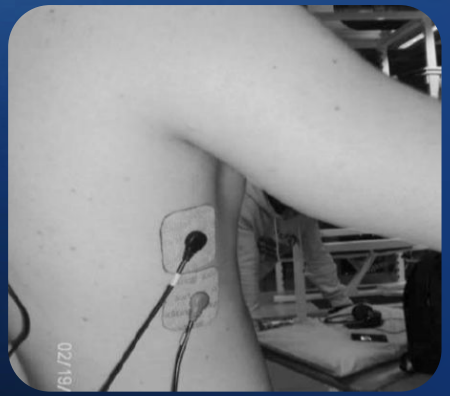
original research

Acromiohumeral Distance During Neuromuscular Electrical Stimulation of the Lower Trapezius and Serratus Anterior Muscles in Healthy Participants

Alya H. Bdaiwi, MSc*; Tanya Anne Mackenzie, MSc*; Lee Herrington, PhD, MCSP*; Ian Horsley, BSc†; Ann M. Cools, PhD, PT‡





Muscle(s)	Time, mm		Mean Change, mm	*P* Value
	Pretest	During Test		
Lower trapezius	9.80 ± 2.31	10.25 ± 2.43	0.45	.004
Serratus anterior	9.35 ± 2.32	10.00 ± 2.36	0.65	.001
Combined lower trapezius and serratus anterior	9.35 ± 2.64	10.25 ± 2.43	0.90	.001

Scapular Muscle Ratios

- Priority should be given to shoulder exercises that produce a high LT/UT/,MT/UT, and SA/UT ratio to allow a more optimal activation of the SA and LT.
- Ratio should be close to 1:1 (Schory et al., 2016)
- Ratio >1 = greater UT activity
- Ratios <1 = considered ideal

IJSPT

SYSTEMATIC REVIEW

A SYSTEMATIC REVIEW OF THE EXERCISES THAT PRODUCE OPTIMAL MUSCLE RATIOS OF THE SCAPULAR STABILIZERS IN NORMAL SHOULDERS

Abbey Schory[1]
Erik Bidinger[1]
Joshua Wolf[1]
Leigh Murray, PT, MA, PhD[1]

Table 4. *Upper Trapezius/Lower Trapezius.*

Optimal Ratios.

	De May, et al[10]	Ekstrom, et al[12]	Marta, et al[14]	Wattanaprakornkul, et al[20]
High SR, Sitting	0.03	–	–	–
High SR, Standing	0.28	–	–	–
Prone ER with Shoulder Abducted to 90°	–	0.25	0.79	–
Prone Flexion	–	–	–	0.06[§]

Table 5. *Upper Trapezius/Serratus Anterior.*

Optimal Ratios.

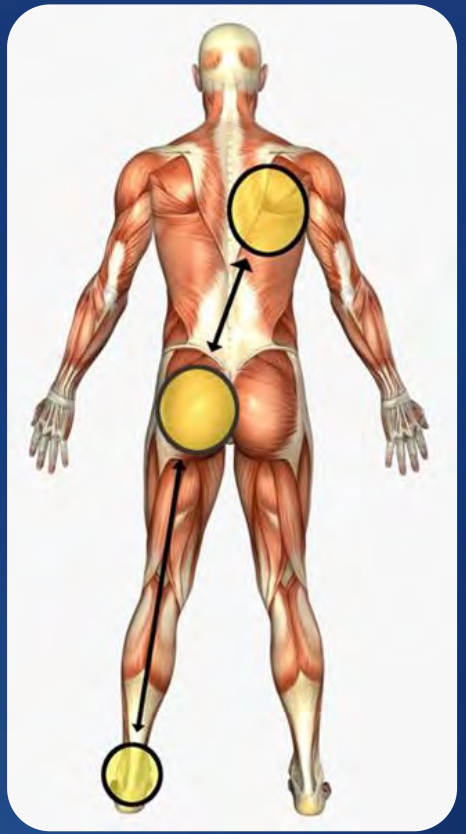
	Ekstrom, et al[12]	Uhl, et al[19]	Wattanaprakornkul, et al[20]
Bench Press, Seated	–	–	0.30[§]
Diagonal Exercise	0.66	–	–
Bilateral Scapular Protraction	0.13	–	–
Supine Press	0.11	0.06	–

Table 3. *Table 3. Upper Trapezius/Middle Trapezius. Optimal Ratios.*

	Cools, et al[21]	Ekstrom, et al[12]	Huang, et al[6]	Kibler, et al[13]	Marta, et al[14]	Park, et al[16]
Abduction 60°, Eccentric	–	–	–	–	–	0.46
Abduction 180°, Eccentric	–	–	–	–	–	0.38
Flexion 180°, Eccentric	–	–	–	–	–	0.12
Prone ER at 90° abd, 90° elbow flexion	–	0.44	–	–	0.72	–
Side-lying ER with elbow at 90°	0.37	–	0.54*	–	0.38	0.44

The Kinetic Chain

Joint	Primary Requirement
1st MTP	Mobility
Mid Tarsal	Stability
Ankle	Mobility
Knee	Stability
Hip	Mobility
Lumbar Spine	Stability
Thoracic Spine	Mobility
Scapula	Stability
Glenohumeral	Mobility



Deeper Dive

- Scapular position
- Scapular stabilizers
- Rotator Cuff
- SCJ
- GHJ ROM
- Strength???

- Thoracic spine
- Breathing
- Abdominals
- Lats
- Infrasternal angle

- Hip joint
- Pelvis
- Knee joint
- Ankle joint
- 1st MTPJ
- Glutes
- Hip flexors

Questions?

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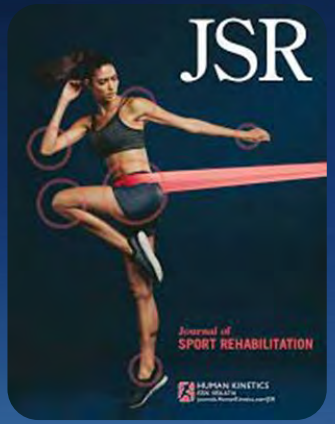

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References

Cools, A. M., Struyf, F., De Mey, K., Maenhout, A., Castelein, B., & Cagnie, B. (2014). Rehabilitation of scapular dyskinesis: From the office worker to the elite overhead athlete. British Journal of Sports Medicine, 48(8), 692–697. https://doi.org/10.1136/bjsports-2013-092148

Kibler, W. B., & McMullen, J. (2003). Scapular dyskinesis and its relation to shoulder injury. Journal of the American Academy of Orthopaedic Surgeons, 11(2), 142–151. https://doi.org/10.5435/00124635-200303000-00008

Ludewig, P. M., & Reynolds, J. F. (2009). The association of scapular kinematics and glenohumeral joint pathologies. Journal of Orthopaedic & Sports Physical Therapy, 39(2), 90–104. https://doi.org/10.2519/jospt.2009.2808

Mottram, S. L., & Woledge, R. C. (2011). Dynamic stability of the scapula. Manual Therapy, 16(1), 33–39. https://doi.org/10.1016/j.math.2010.06.002

ActivBody. (2024). ActivForce2 User Guide and Clinical Applications. Retrieved from https://www.activbody.com