



SHOULDER REHAB

THE THREE RENOVATORS

Now, before the damage gets significant, or because shoulder pain has developed during certain exercises, we urgently need to call in the “Shoulder Renovators” – Subscapularis, Serratus Anterior and Lower Trapezius (but Upper Traps also has a ‘renovating’ role).

Hidden beneath the layers of visible, slow and powerful mover muscles of the shoulder (pec major, lat dorsi, rhomboids and deltoids), lies these three less visible, under-trained and de-prioritized muscle groups, that if given enough chance, will function in such a compounding biomechanical way as to ‘renovate’ classic scapular and gleno-humeral imbalances from the inside out. The roof will be less likely to ram down onto the furniture and the floor will be less shaky and prone to uplift!

Certainly you may have heard of these muscles, and you may even have struggled to get yours or your client’s shoulders to use them properly. Generally speaking they are very challenging to recruit – why?

Simply because they are hard to SEE, and even harder to FEEL. Look at your average house: can you see the foundations?

The focus of this article is to clarify some of the biomechanical facts on these three critical shoulder muscles, and to give new suggestions as to how they can be factored into rehab and conditioning routines for injury prevention and minimization

I FACTS TO CONSIDER FROM RESEARCH:

- Altered muscle firing patterns are a predictable lead-up to, and follow-on from gleno-humeral instability and shoulder pain. Serratus anterior and subscapularis are some of the most commonly cited muscles to be inhibited. Extensive research into Baseball pitchers and Rugby players demonstrate how these particular muscles are activated early to stabilize the scapulo-thoracic and gleno-humeral joints, and are inhibited in the context of dysfunction and pain. (2,15,17-20)
- These two large, multi-faceted and powerful muscles easily get dominated by surface musculature and gradually become inhibited in similar imbalance scenarios that Transversus Abdominis and VMO inhibition are involved in with low back and knee pain (3,5,13,14).
- In addition they do not necessarily return to normal function after an injury has settled down; in most cases they are a central factor in the development of on-going overuse injuries of the shoulder. (3,4,13,14)
- The last 10-15 years has seen a shift away from rotator cuff rehab as simply using tubing to do external and internal rotation with the arm by the side. The new paradigm sees the retraining of gleno-humeral dysfunction more in terms of creating a balance of co-contracting cuff forces to optimize the centering of the head of humerus into the glenoid. Think of tightening your grip around a tennis ball to prevent aberrant movement of the ball, or of sucking the ball back into the socket (5,7,9).
- Certain exercises that have been used in old-school rehab have been shown now to be unhelpful or even damaging for the shoulder, the classic one being the "Empty Can" lift for strengthening the supraspinatus: too much deltoid is recruited, superior migration of the head of humerus is inevitable, and therefore it is now recommended to be done in external rotation instead ("Full Can"). (7, 8, 9).
- The primary practical tool for assessing dysfunction of these muscles remains the visualization of the scapula during certain chosen positions and movements: is scapular winging, anterior tilt or excessive depression or other positional anomalies present? If pain or instability is reduced with application of a technique, then we are wiser as to how rehab should progress for that particular shoulder. (5,9)

I WHERE IS SUBSCAPULARIS AND HOW DOES IT WORK?

- There are no surface landmarks with which to locate subscapularis. However you can feel it with your opposite hand if you dig deep in your armpit as you let your hand hang down in front of your body. The fan shaped origins of subscapularis arise on the front side of your scapula and then loop from underneath to attach right on the anterior aspect of your humeral head.
- **How does the muscle act to counteract gleno-humeral imbalances?** It is the perfect humeral depressor and posterior glider. It counter-balances the external rotator force of infraspinatus and teres minor, thereby preventing anterior shearing and elevation into the acromial space.
- According to EMG studies, Subscapularis seems to be divided functionally and neurologically into two independent muscle units, one more active from 0-90° abduction range, and the other above 90°. (19)
- A selection of exercises from the literature that have been shown to use more than 20%MVC of subscapularis include (5,7,12,16,19):
 - Push-up
 - Diagonals (PNF movements across the body)
 - Internal rotation (arm by side pulling tubing)
 - Dynamic hug (arms in front exaggerating a hug)

WHERE IS SERRATUS ANTERIOR AND HOW DOES IT WORK?

- **Where is it?** Serratus originates like fingers on the antero-lateral rib cage from approximately ribs 3-9 and travels backwards and upwards to the medial border of the scapula.
- **How does the muscle act to counteract scapular imbalances?** Anatomists and biomechanists describe two parts to the muscle: one primarily for protraction, and the other for upward rotation. It holds the scapula close to the rib cage, preventing winging (downward rotation and / or internal rotation of the scapula during movement. Serratus' job is to upwardly face the glenoid socket during overhead movement, allowing the rotator cuff to remain biomechanically efficient in controlling the humeral head. During chest / bench press or push-ups it has a critical role, ensuring pure protraction / retraction takes place in synergy with arm movement without winging or downward rotation which would damage the supraspinatus and other sub-acromial furniture. During the push phase it works concentrically, and (less often done well) on the return phase it works eccentrically to slow down retraction and prevent winging. It is surprisingly common to see winging at the top of the push-up movement (even with strong and well-trained individuals).
- Serratus Anterior long ago was termed the "boxers muscle" for its critical role in connecting the arm and the trunk for a solid punch. When weak it has classically been seen to be the primary cause of "winged scapula", as it gets dominated by its antagonists (rhomboids, levator scapulae and pec minor).
- A selection of exercises from the literature that have been shown to use more than 20%MVC of Serratus anterior include (5,7,11,16,19):
 - Push-up plus variations (full protracted position at the top of push-up)
 - Dynamic hug (arms in front exaggerating a hug)
 - Punch movement

WHERE IS LOWER TRAPEZIUS AND HOW DOES IT WORK?

- Lower Trapezius is easily located as it travels from the mid-lower third of the medial border of the scapula to the spinous processes of T4-T12. It can be felt contracting by palpating with your opposite finger as you actively retract and depress your scapula.
- The greatest challenge when it comes to retraining lower trapezius (which also becomes inhibited in the context of pain) is isolating it from other retraction and depression muscles. Ask a client to retract and they will easily use rhomboids or mid-upper traps, and ask a client to depress and they will easily use their pec major/minor and/or lat dorsi. Isolation of lower traps is easier said than done if Rhomboids or lat dorsi are dominant.
- In clients with subacromial impingement, it has been shown that Lower trapezius is dysfunctional (ie it has lost its ability to posteriorly tilt and retract the scapula to keep the roof of the shoulder from crushing the supraspinatus) and is dominated by Upper trapezius (it is presumed in the article). To be specific the UT:LT ratio normally is **1.8:1**, but in clients with subacromial impingement the ratio is more than **3:1**. (1)
- A selection of exercises from the literature that have been shown to require more of Lower Traps than other exercises include (1,2,13,14):
 - Prone full elevation (esp with arm in external rotation)
 - Prone horizontal extension with "Stop" sign position in full external rotation
 - Push-up
 - Scapular retraction