A Systematic Review of the Effect of Changing Thoracic Position on Shoulder Muscle Activities

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Background

- Thoracic position has an important role in shoulder movement due to its anatomical structure that involves the rotator cuff (RC) and shoulder girdle (SG)
- It is also the athletic functional kinetic chain in overhead sports
- Cocking phase: RC activation + SG control scapular position + thoracic extension posture
- Thoracic kyphosis + scapular dyskinesis → Upper crossed syndrome - SG weakness and muscle imbalance
- SG provides stable scapular foundation base for RC to function
- RC and SG strength and muscle balance are closely associated and important to shoulder movement
- RC and SG activities are connected with thoracic posture

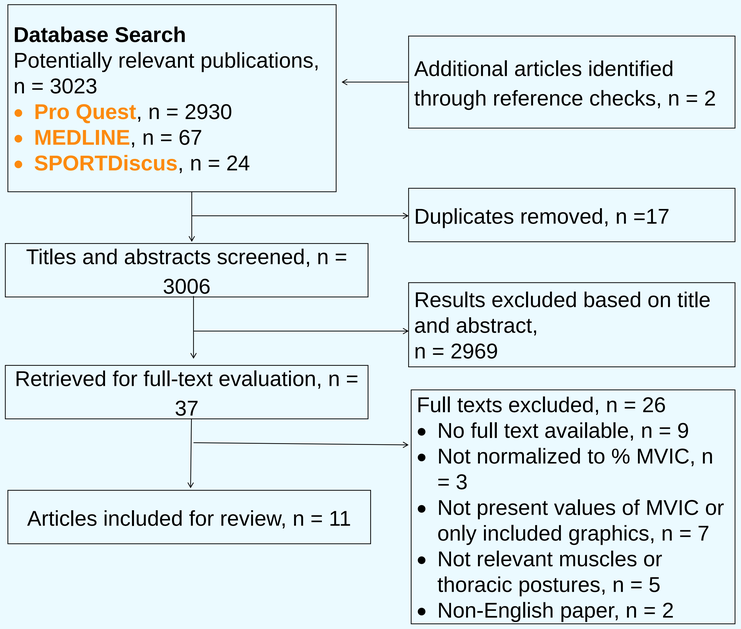
✧Thoracic position↔Shoulder muscle activities✧

- No studies have conducted a systematic review regarding this topic

Research Objectives

- Evaluate the literature from the past 10 years investigating electromyography (EMG) during shoulder exercises and intervention in relation to thoracic postures
- Identify the effect of thoracic flexion and extension on the activation of the upper trapezius (UT), middle trapezius (MT), lower trapezius (LT), serratus anterior (SA), and infraspinatus (IS) and the potential practical application

Methodology



Preferred Reporting of Items for Systematic reviews and Meta-Analyses (PRISMA) statement guidelines

P
- Males or females or both
- 18 years old or above
- healthy, asymptomatic, with or without postural abnormality individual

I
- Any kind of shoulder and/ or scapular muscles related movements or exercises

C
- Thoracic and/ or trunk position related which in flexion and/or extension and/or neutral position

O
- EMG outcome described the neuromuscular activity of shoulder or scapular muscles; the data had to be normalised to the percentage of MVIC (% MVIC) with quantitative mean % MVIC value

S
- Any interventional or laboratory or longitudinal, or cross-sectional studies

Participants-Intervention-Control-Outcome-Study design (PICOS)

Findings

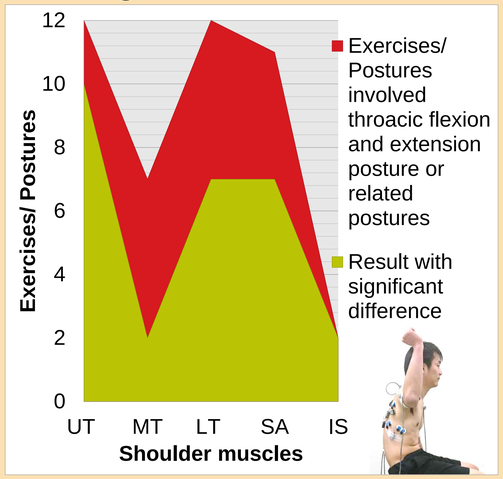


Figure 2. The selected exercises or postures from the included studies and the result with statistical significant difference (p<0.05).

Muscles had Distinctive Activation Pattern in Both Thoracic Flexion and Extension Posture

Middle Trapezius · Lower Trapezius · Serratus Anterior · Infraspinatus

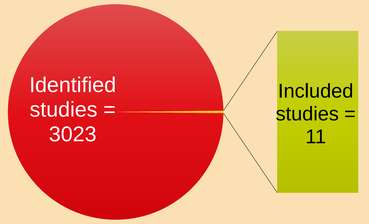
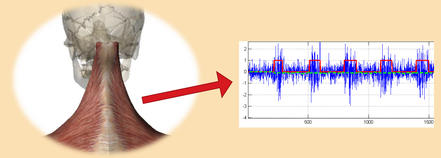


Figure 1. The proportion of identified and included studies.



Higher Upper Trapezius Means of % MVIC was found in interventions or exercises when:

✓Greater kyphosis angle or forward shoulder angle / Pre-intervention or Pre-test/ Trunk or Thoracic flexion posture

✓ Prone shoulder 125° horizontal abduction exercise in intended scapular posterior tilt position without and with truck extension

Conclusion

UT activation pattern

- Clavicle protracts in thoracic flexion posture → UT activates to retract the clavicle for postural maintenance
- Anatomical body position → UT supports neck & head against gravity in prone lying thoracic extension → ↑ UT MVIC

➔ Shoulder rehabilitation exercise / preventive measure with thoracic extension in non-prone postures for overly active UT

MT, LT, SA, and IS activation patterns

- Anatomical structure: scapular position affects activity patterns
- Compensation activity among force couple muscles
- Pre-condition of the shoulder muscle activity – particular with overly active muscle

➔MT, LT, SA, and IS activities are affected by more than the thoracic postures

*MVIC = maximal voluntary isometric contraction