Functionally specific exercises for the treatment of shoulder instability

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Rotator cuff (RC) muscles
actions

Guyot “Atlas of Human Limb Joints”
Springer-Verlag 1981

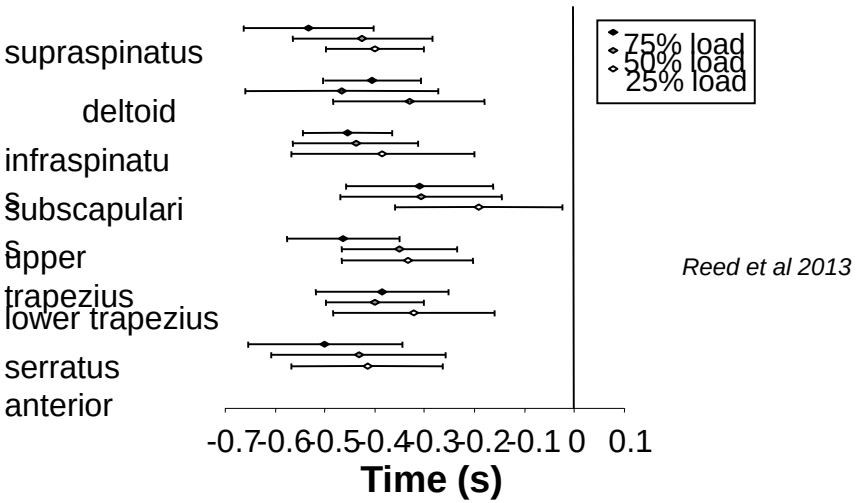
posterior RC

- supraspinatus
- infraspinatus
- teres minor

anterior RC

- subscapularis

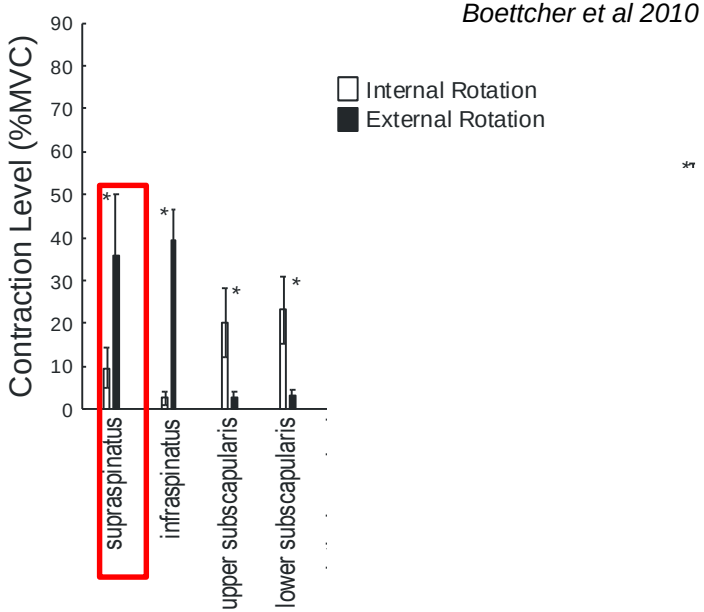
external rotators



Reed et al 2013

internal rotator

Boettcher et al 2010



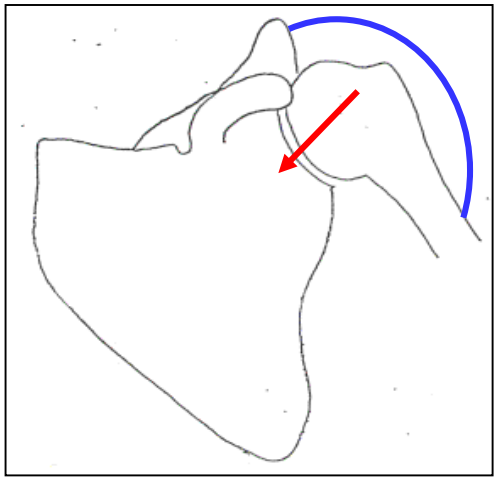
RC muscle
stabiliser function

- during abduction
  - RC muscles contract at similar activity levels (co-contact) to:
    - globally compress the humeral head to provide dynamic stability
    - depress the humeral head to prevent it gliding superiorly (0-90°)

global compression force of all RC

↓

co-ordinate to prevent unwanted rotation



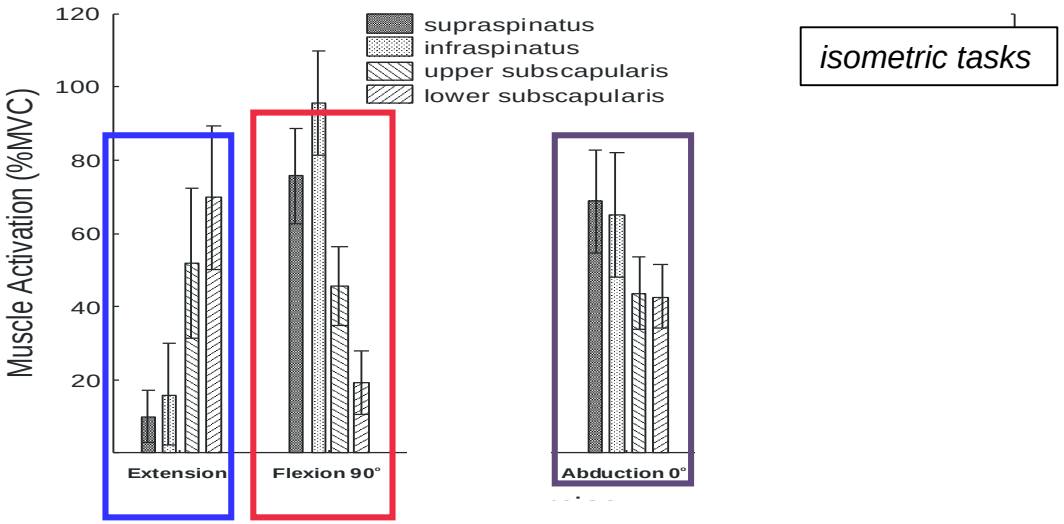
deltoid contraction to produce abduction at the shoulder will cause the humeral head to glide superiorly

- inferior part of subscapularis
- inferior part of infraspinatus
- teres minor

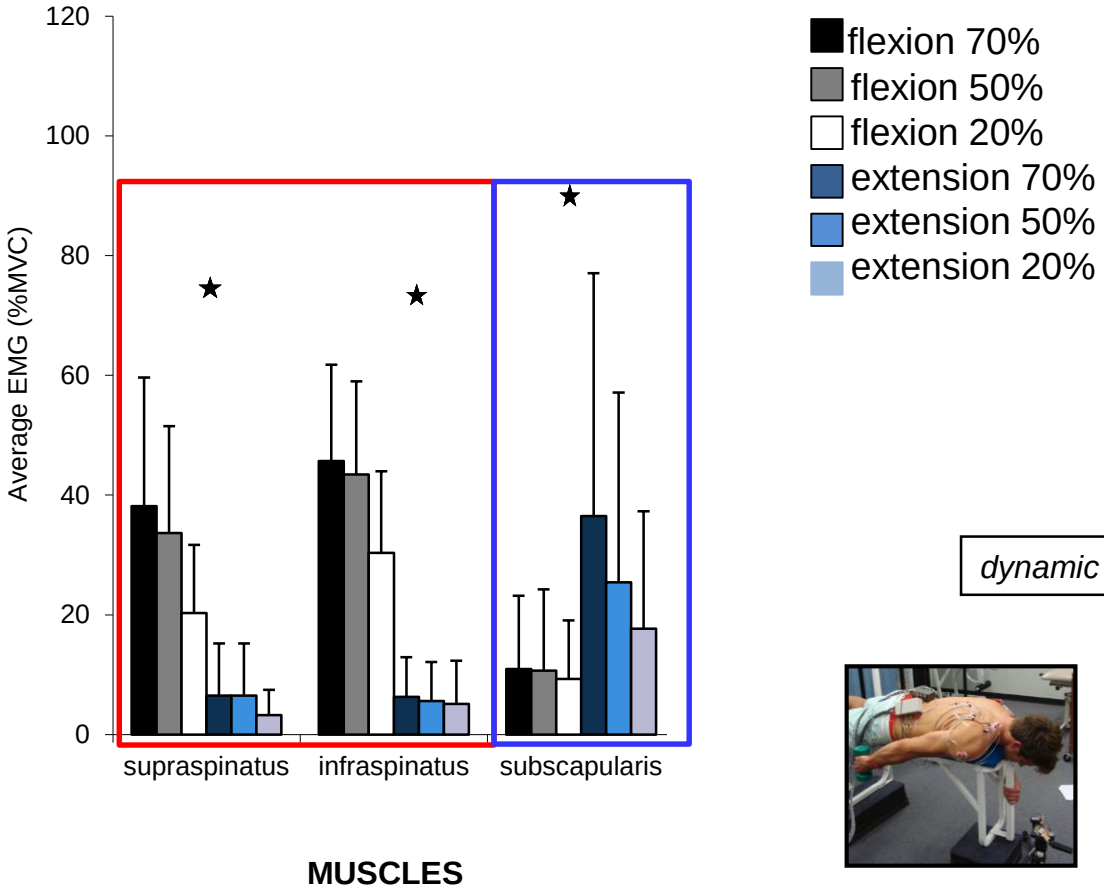
} co-ordinate with deltoid to prevent superior glide of humeral head

RC muscle
stabiliser function

- during flexion & extension
  - RC muscles contract at significantly different levels (reciprocal contraction)
  - infraspinatus & supraspinatus (posterior RC):
    - significantly more active during flexion
    - co-ordinates with extensors to prevent anterior translation of humeral head
  - subscapularis (anterior RC):
    - significantly more active during extension
    - co-ordinates with extensors to prevent posterior translation of humeral head



RC muscles
stabiliser function



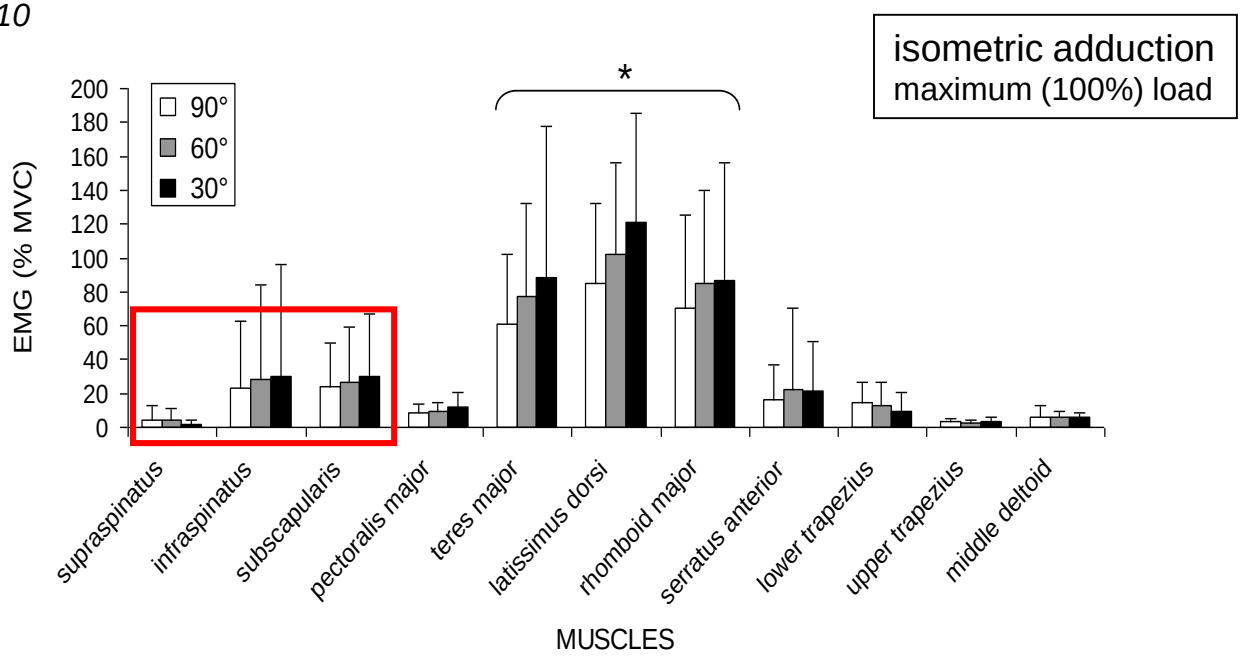
dynamic flexion & extension

Wattanaprakornkul et al 2011

RC muscle
stabiliser function

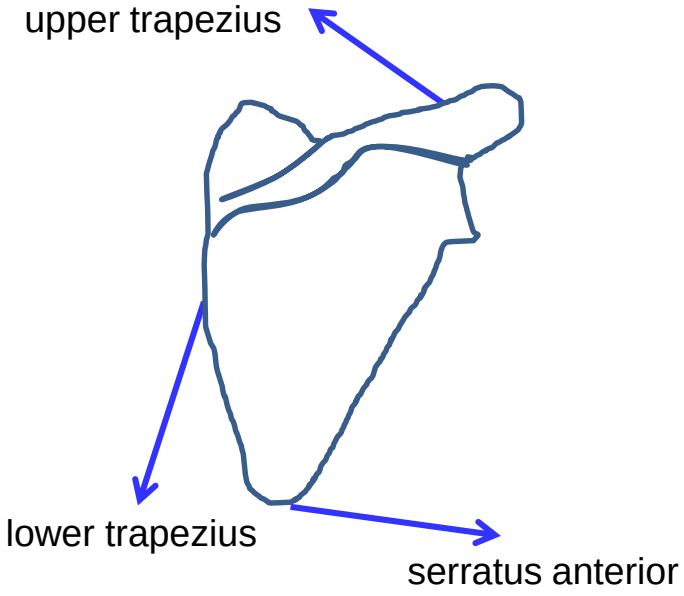
- during adduction
  - RC muscles are minimally active

Reed et al 2010



Implications for rehabilitation of RC in treatment of instability

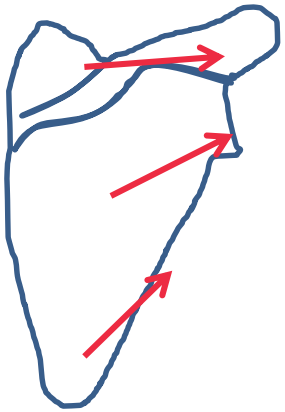
- in order to stabilse the humeral head the RC muscles:
  - must stabilise against destabilising forces created by other shoulder muscles:
    - RC muscles prevent muscles that move the humerus (abductors, flexors, extensors) from translating humeral head on glenoid fossa
    - must train RC to “react” to destabilising muscle forces
  - are reliant on correct positioning of the scapula:
    - axioscapular muscles must:
      - accurately position the scapula
      - “stabilise” the scapula against RC (& deltoid) forces



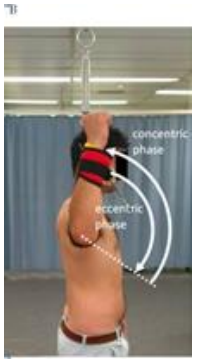
• reposition the glenoid fossa to increase available range of movement at the shoulder joint

• reposition the rotator cuff, (deltoid & teres major) muscles to maintain optimal mechanical alignment through shoulder joint range of motion

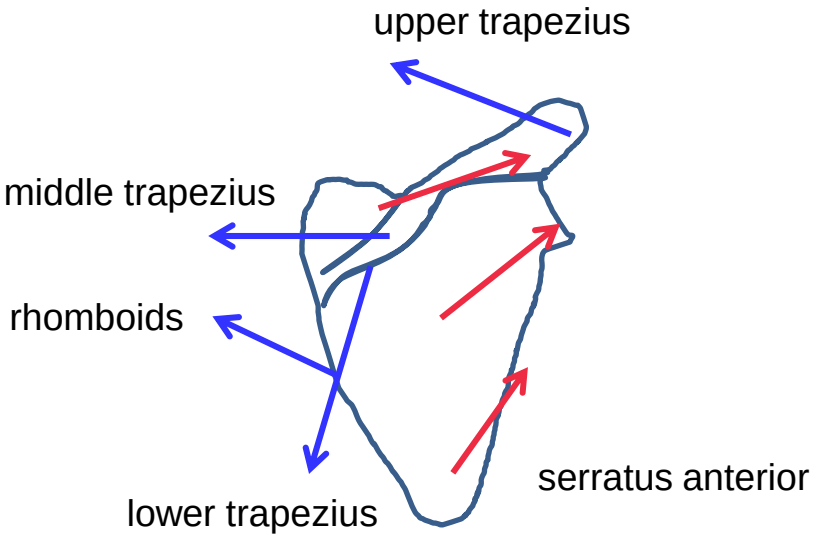
Axioscapular muscle function
stabiliser role

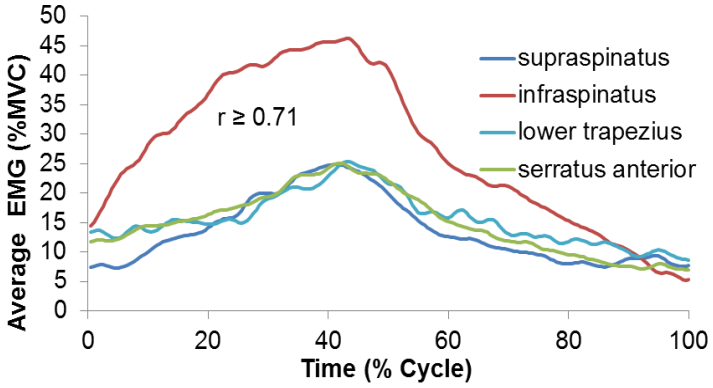


RC muscles



Tardo et al 2013



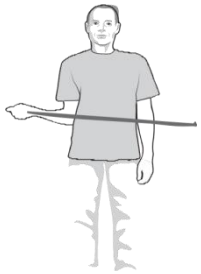


Functionally specific exercises for the treatment of instability

Principles

- aim to rehabilitate the stabiliser function of RC →
  - "teach" RC muscles to co-ordinate with muscles moving the humerus
  - recruitment timing is crucial
- importance of axioscapular muscles to provide accurately positioned, stable base from which RC muscles can contract
- progress exercises by increasing complexity of recruitment pattern

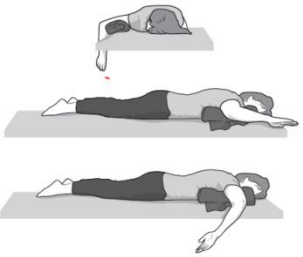
Example: anterior instability



- posterior RC - rotator role
- axioscapular muscles - stabiliser role

- posterior RC - rotator role
- axioscapular muscles - stabiliser & rotator roles

Functionally specific exercises for the treatment of anterior instability



- posterior RC - rotator role + RC co-ordination
- axioscapular muscles - stabiliser & rotator roles

- posterior RC - rotator & stabiliser roles
- axioscapular muscles - stabiliser & rotator roles

rapid small range flexion/extension

- posterior RC - rotator & stabiliser roles
- axioscapular muscles - stabiliser & rotator roles
- shoulder muscle co-ordination

Thank you