

[Clin Biomech \(Bristol, Avon\)](#). 2012 Jul;27(6):551-6. doi: 10.1016/j.clinbiomech.2012.02.003. Epub 2012 Mar 4.

The stabilizing role of the rotator cuff at the shoulder--responses to external perturbations.

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Source

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Abstract

BACKGROUND:

The rotator cuff has been hypothesized as a dynamic stabilizer at the shoulder joint yet evidence supporting this role remains inconclusive. We aimed to investigate the activity levels and recruitment patterns between the rotator cuff and superficial shoulder muscles in response to external perturbations to provide insight into the stabilizing role of the rotator cuff.

METHODS:

Surface and intramuscular electromyography (EMG) were used to measure timing of onset and level of activation (EMG amplitude as a percentage of maximum voluntary isometric contraction, % MVIC) of rotator cuff (supraspinatus, infraspinatus and subscapularis) and superficial muscles (anterior and posterior deltoid) on 19 healthy participants. Participants received expected and unexpected externally applied perturbations in directions of internal and external rotation at the glenohumeral joint.

FINDINGS:

All three rotator cuff muscles demonstrated pre-activation in anticipation of the perturbation prior to their representative global synergists, anterior and posterior deltoid ($P < 0.05$). Subscapularis and infraspinatus were activated prior to all other muscles during external rotation and internal rotation perturbation trials respectively ($P < 0.01$). Direction specific activation levels were observed; subscapularis was moderately strongly active (37% MVIC) in response to an external rotation perturbation and infraspinatus was moderately active (28% MVIC) in response to an internal rotation perturbation. No muscle was activated $> 10\%$ MVIC when not acting as the main muscle opposing the movement.

INTERPRETATION:

The rotator cuff may function in part as a dynamic stabilizing unit of the shoulder demonstrating a feedforward muscle activation pattern. These results may assist in improving assessment and treatment of shoulder dysfunction.

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PMID:

22391506

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