

Shoulder muscle recruitment patterns during dynamic complex movements in healthy subjects

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Abstract

Background and aim: The shoulder area is the most complex region of the body and inherently unstable that motions are produced and controlled by sequenced activation of muscles in force couple patterns. It seems that investigating of shoulder muscle activation pattern is essential in the various tasks in healthy subjects due to the unstable structure of the shoulder and vital role of muscles in the stability. In order to evaluate motor control changes in the various movement, designing the therapeutic programs suitable to the shoulder pain and to evaluate effects of physiotherapy and preventing of side effects, this study was conducted. Up to now, it has not been evaluated in the D1flex & D1ext patterns yet.

Materials and methods: Thirteen female healthy volunteers participated in the experiment. Dependent variables of muscle activation such as onset and offset as well as sequencing of muscles (upper trapezius, lower trapezius, serratus anterior, pectoralis major, anterior deltoid and posterior deltoid) of dominant side were calculated during D1flex & D1ext patterns by surface EMG and Data log software in the standing position with speed movement of 25 degree/second.

Results: Special patterns of muscle activation were observed during D1flex & D1ext. Sequencing of muscle activation was different in the both movement patterns. Also, significant differences were found in the latency time of all muscles ($p < 0.05$) except upper fibers of trapezius related to flex/ext goniometer ($p = 0.33$) between both movement patterns.

Conclusion: This study demonstrated that there are special patterns of activation of muscles around the scapulohumeral articulation in the normal subjects. Rehabilitation and conditioning programs should be designed to restore and optimize the activation sequences and task specific functions of these muscles.

Key Words: Muscle activation patterns, Sequencing of muscle activation, D1flex pattern, D1ext pattern, Surface electromyography,

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