Asymmetry in bilateral scapulothoracic motion and scapular dyskinesis

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Scapular Dyskinesis (SD) refers to improper movement of the scapulothoracic (ST) joint, manifesting secondary to or causative of pathology. Scapular dyskinesis is clinically assessed/categorized based on observational asymmetries of scapular segmental prominence and ST upward rotation (UR), internal/external rotation (IER) and anterior/posterior tilt (APT). Bilateral ST motion symmetry is assumed in healthy individuals. The diagnostic distinction between non-pathological and pathological asymmetry for SD has not been elucidated.

This experimental study assesses bilateral ST 3D-motion using simultaneously a laboratory camera-based validated passive reflective marker methodology (acromion marker clusters – AMC) and a non-invasive portable/clinically-feasible technology (inertia measurement units – IMU). The IMU derived 3D ST motion and asymmetry will be validated against the AMC system over six (6) bilateral simple arm elevation and compound tasks. Our experimental protocol is in progress with 7 of 15 right-handed, male, healthy subjects enrolled.

Assessment of bilateral ST asymmetry has been reported as related to arm dominance, healthy-overhead athletes, and sex, with the latter two lacking sufficient consistency for comparison across studies. Specific to arm dominance, average bilateral ST motion differences across all planes of arm elevation are 2.95°, 1.39° and −1.92° for UR, APT and IER, respectively. These differences were observed on average dominant and non-dominant ST: UR of 34.2° and 32.65°, APT of 11.56° and 10.06°, and IER of 4.17° and 3.08°, respectively.

The literature and our experimental data will be used to validate the IMU accuracy for the clinical setting and to determine acceptable ranges for non-pathological baselines for 3D ST motion and asymmetry.