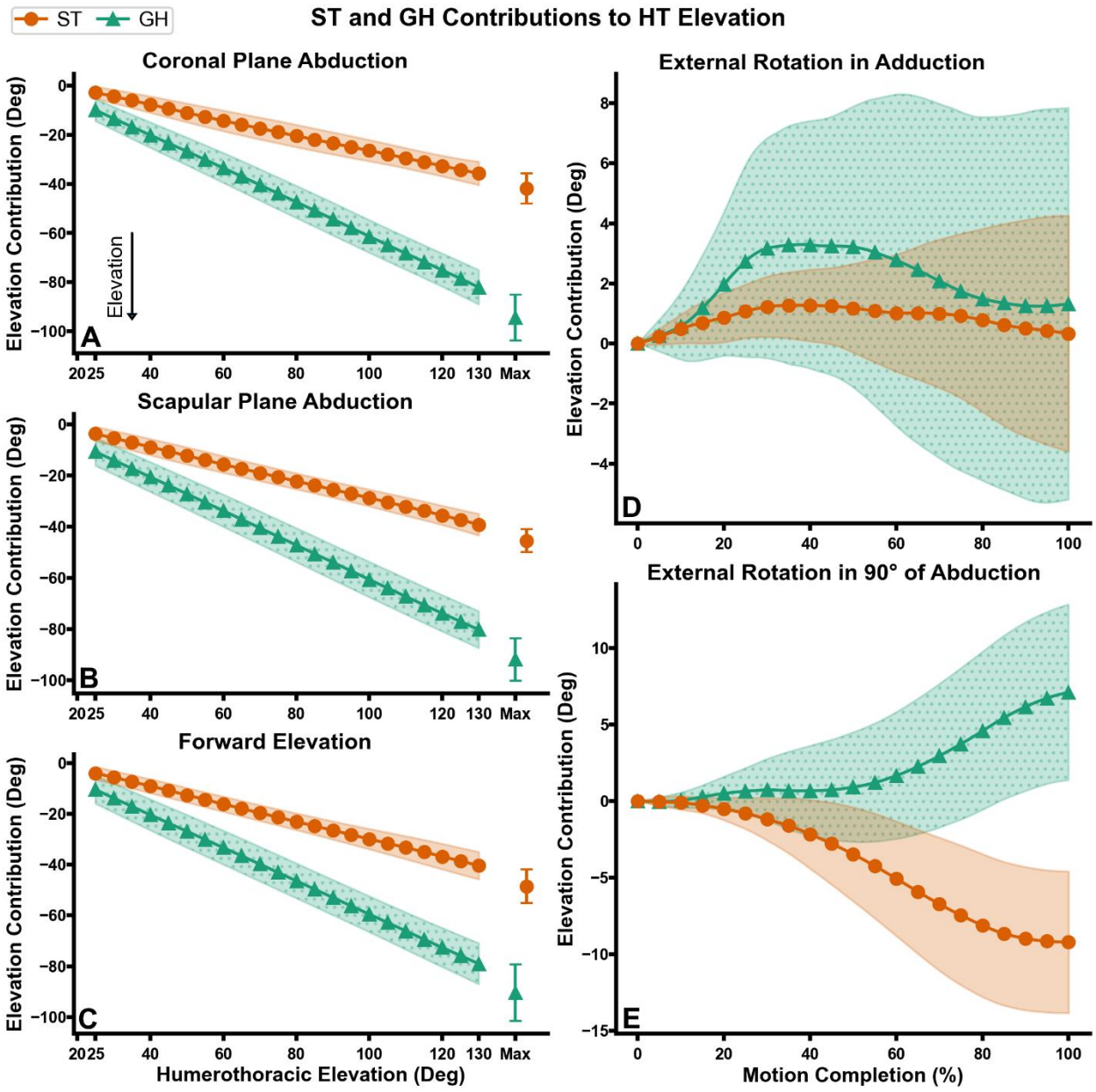

Fig A1a: Contributions of the scapulothoracic (ST) and glenohumeral (GH) joints to humerothoracic (HT) elevation. (**A-C**) Note how glenohumeral contributions were consistently 80-100°, and scapulothoracic contributions were consistently 30-40°, regardless of elevation motions in different PoE. (**D**) There was relatively little elevation contribution for both the scapulothoracic and glenohumeral joints to humerothoracic elevation for ER-ADD. (**E**) For ER-ABD, the scapulothoracic joint elevated the arm while the glenohumeral joint depressed it. This occurs because the scapulothoracic joint generates both axial rotation and elevation via scapulothoracic upward rotation. The glenohumeral joint counteracts the elevation associated with scapulothoracic upward rotation to maintain the humerus relatively still. The singular data points indicate elevation contributions at maximum humerothoracic elevation (differs by subject). The error bars around the singular data point and the shaded regions indicate ±1 standard deviation.

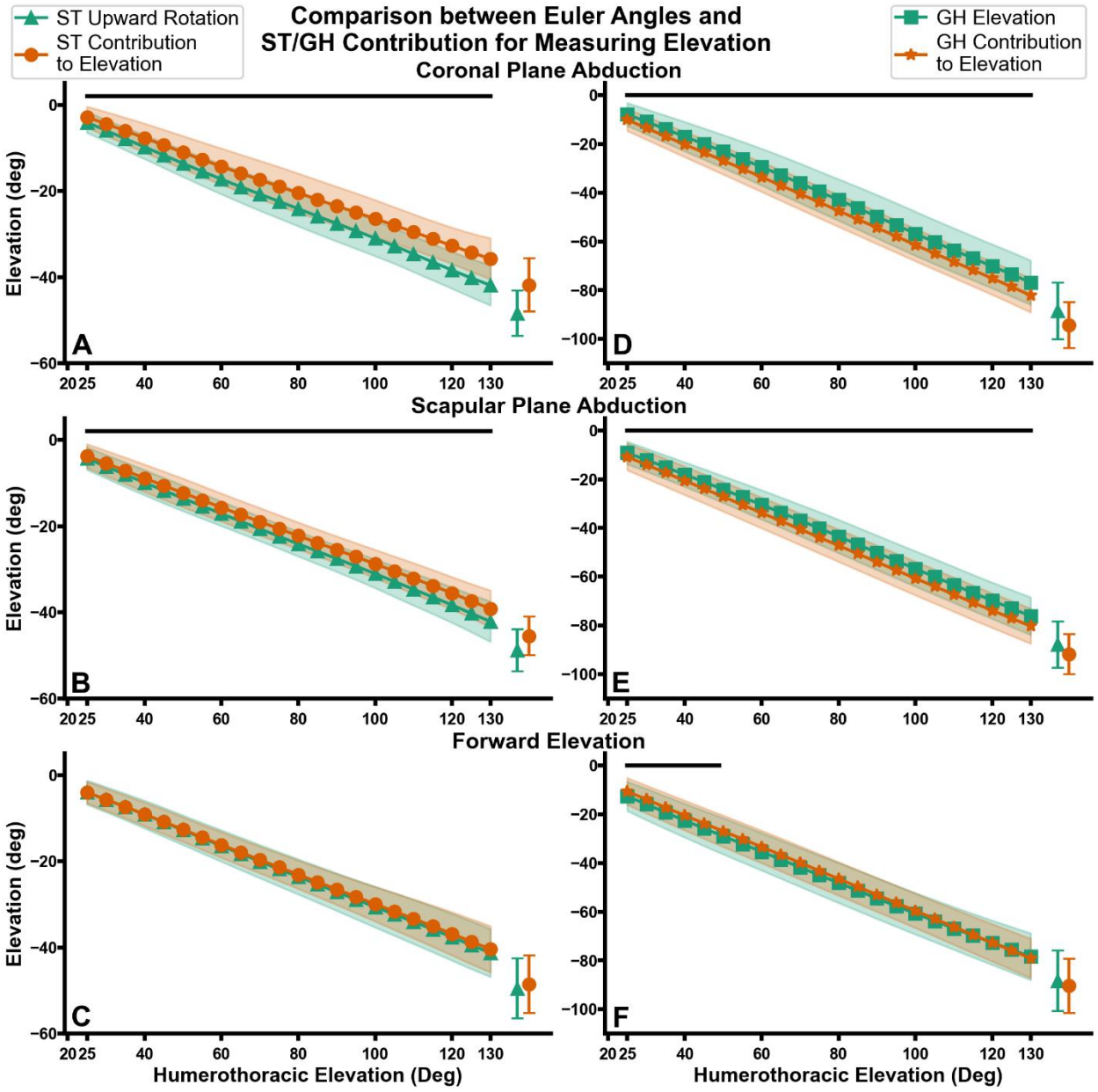

Fig A1b: Comparison of scapulothoracic (ST) upward rotation (**A-C**) and glenohumeral (GH) elevation (**D-F**) versus the contribution of the scapulothoracic and glenohumeral joints to humerothoracic elevation, respectively. The singular data points indicate scapulothoracic upward rotation, glenohumeral elevation or elevation contributions at maximum humerothoracic elevation (differs by subject). The error bars around the singular data point and the shaded regions indicate ±1 standard deviation. The black line at the top of each plot indicates regions where a SPM1D non-parametric, paired t-test found differences. For coronal plane abduction (**A,D**) and scapular plane abduction (**B,E**) there were significant differences between scapulothoracic upward rotation and scapulothoracic contribution to elevation, and for glenohumeral elevation and glenohumeral contribution to elevation across the entire motion range. For forward elevation (**C,F**), the only difference was between glenohumeral elevation and glenohumeral contribution to elevation during the first 50° of humerothoracic elevation.

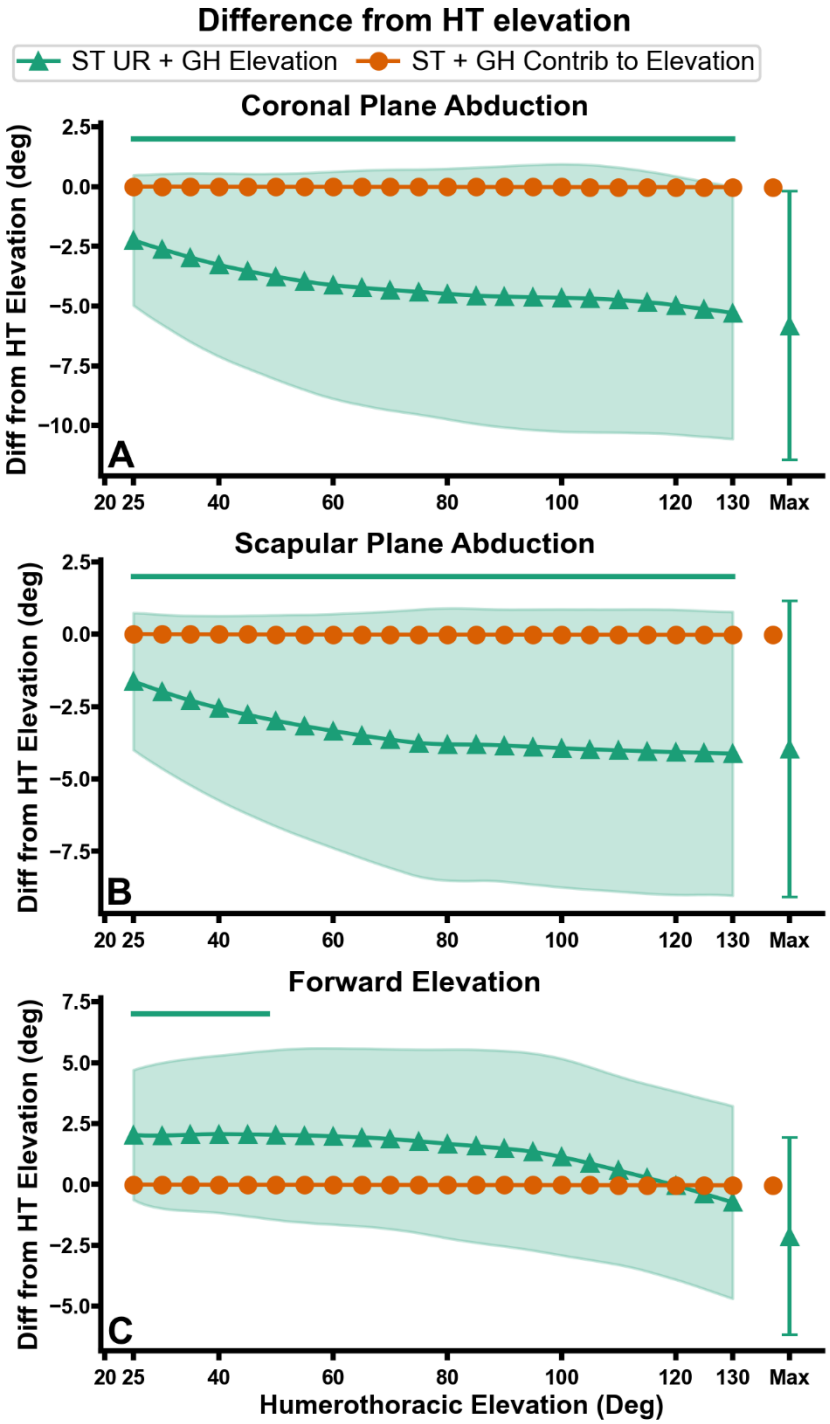

Fig A1c: Comparison of utilizing the sum of scapulothoracic (ST) upward rotation (UR) and glenohumeral (GH) elevation (green) versus the sum of the contributions of the scapulothoracic and glenohumeral joints to humerothoracic (HT) elevation (orange) for computing humerothoracic elevation for coronal plane abduction (**A**), scapular plane abduction (**B**), and forward elevation (**C**). In each plot the difference of each sum from total humerothoracic elevation is shown. The solid green line at the top of each plot indicates regions where the difference between humerothoracic elevation and the sum of scapulothoracic upward rotation and glenohumeral elevation is statistically different than zero according to a SPM1D non-parametric t-test. The difference between humerothoracic elevation and the sum of the scapulothoracic and glenohumeral contributions to humerothoracic elevation was less than 0.15° for all trials and timepoints.