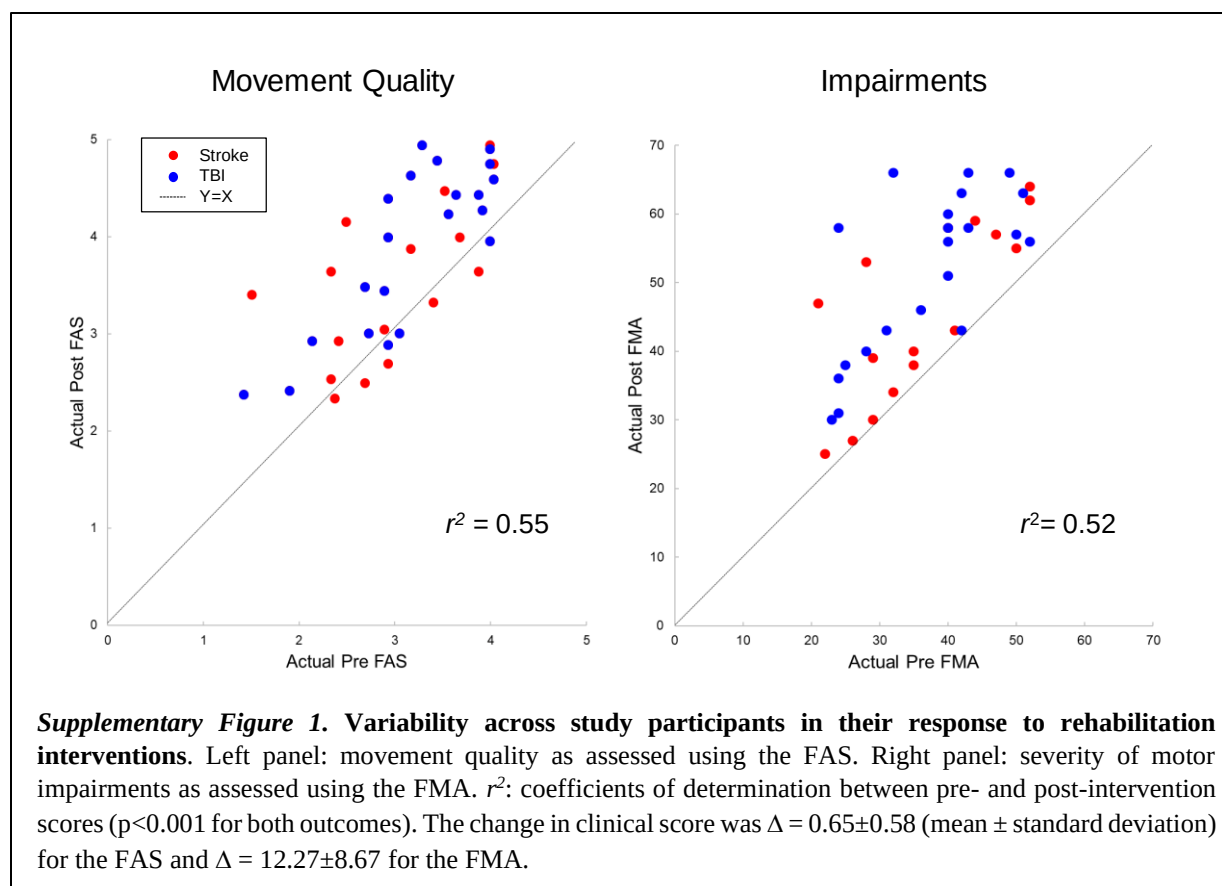
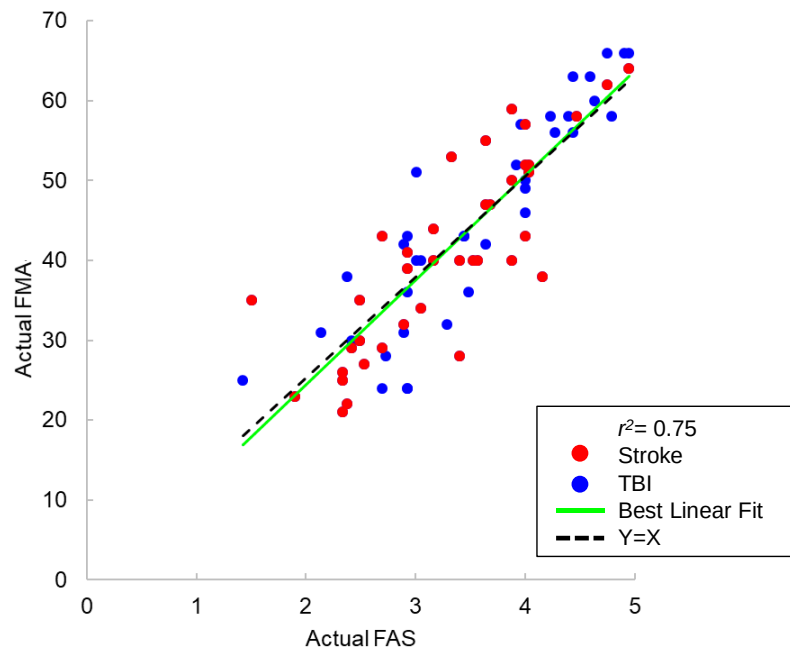


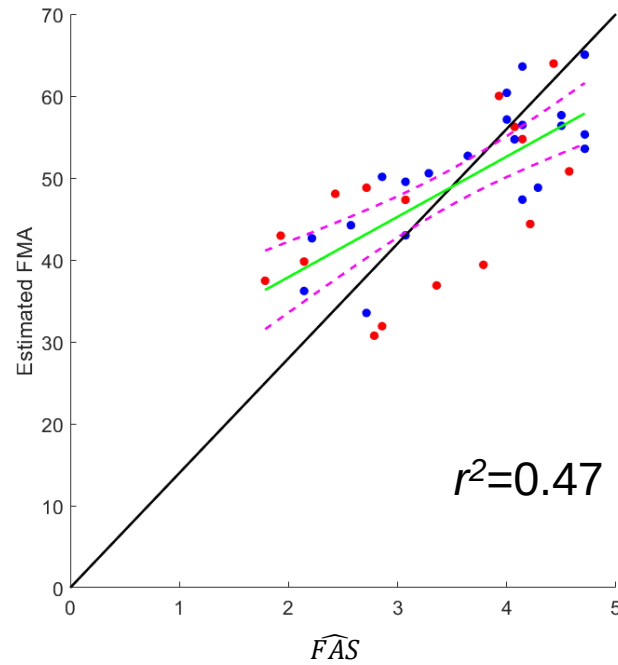
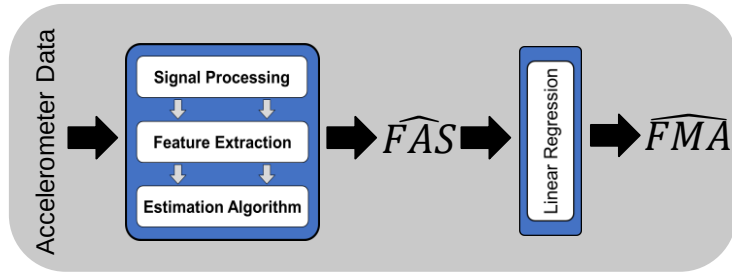
## Supplementary Materials

|                        |                                                                                                                                       |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Supplementary Figure 1 | Variability across study participants in their response to rehabilitation interventions.                                              |
| Supplementary Figure 2 | Relationship between upper-limb impairments (i.e., FMA scores) and quality of movement (i.e., FAS scores).                            |
| Supplementary Figure 3 | Estimation of impairment severity from quality of movement estimates.                                                                 |
| Supplementary Table 1  | Comparison of the proposed method with prior work (Del Din et al., 2011) attempting to generate FMA estimates on a task-by-task basis |





**Supplementary Figure 2. Relationship between upper-limb impairments (i.e., FMA scores) and quality of movement (i.e., FAS scores).** The plot shows, as somewhat expected, a correlation between impairments and quality of movement.



**Supplementary Figure 3. Estimation of impairment severity from quality of movement estimates.** FMA estimation with a linear regression using estimated FAS scores. FAS scores were previously estimated using a Random Forest algorithm based on wearable sensor (i.e., accelerometer) data. Blue and red circles represent datapoints for TBI and stroke survivors, respectively. The green line is the linear regression of the datapoints. The magenta dashed lines represent the confidence intervals.

|                   |       | Task 1                              | Task 4                               | Task 5                       | Task 8                            | Task 9              | Task 10            | Task 13               | Task 15         |
|-------------------|-------|-------------------------------------|--------------------------------------|------------------------------|-----------------------------------|---------------------|--------------------|-----------------------|-----------------|
|                   |       | <i>Forearm<br/>table<br/>(side)</i> | <i>Extend<br/>elbow<br/>(weight)</i> | <i>Hand<br/>to<br/>table</i> | <i>Reach<br/>and<br/>retrieve</i> | <i>Lift<br/>can</i> | <i>Lift pencil</i> | <i>Flip<br/>cards</i> | <i>Turn Key</i> |
| RF 100<br>10-fold | RMSE  | 7.39                                | 6.99                                 | 6.71                         | 7.33                              | 5.66                | 6.81               | 6.41                  | 5.36            |
|                   | $r^2$ | 0.37                                | 0.51                                 | 0.52                         | 0.45                              | 0.68                | 0.53               | 0.57                  | 0.71            |
| RF 100<br>LOO     | RMSE  | 10.77                               | 8.67                                 | 8.64                         | 8.75                              | 6.83                | 8.17               | 7.35                  | 6.17            |
|                   | $r^2$ | 0.01                                | 0.33                                 | 0.36                         | 0.30                              | 0.60                | 0.38               | 0.49                  | 0.65            |

**Supplementary Table 1. Comparison of the proposed method with prior work (Del Din et al., 2011) attempting to generate FMA estimates on a task-by-task basis.** RF 100: Random Forest 100 trees; 10-fold: 10-fold cross-validation; LOO: Leave-One-subject-Out cross-validation; RMSE: root mean square error;  $r^2$ : coefficient of determination