

# Movement Kinematics and Cortical Activation in Children with and without Autism Spectrum Disorder During Sway Synchrony Tasks: An fNIRS Study

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**Supplementary Table S1.** Means and standard errors of HbO<sub>2</sub> concentration in children with and without ASD during Observation, Solo, Face, and Touch conditions of the sway synchrony task.

| Group activation data   | Observation |       | Solo  |       | Face  |       | Touch |       |
|-------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|
|                         | Mean        | SE    | Mean  | SE    | Mean  | SE    | Mean  | SE    |
| <b>TD</b>               |             |       |       |       |       |       |       |       |
| <i>Left hemisphere</i>  |             |       |       |       |       |       |       |       |
| MFG                     | 0.017       | 0.009 | 0.019 | 0.008 | 0.011 | 0.009 | 0.021 | 0.009 |
| IFG                     | 0.023       | 0.011 | 0.031 | 0.009 | 0.035 | 0.010 | 0.053 | 0.010 |
| PCG                     | 0.013       | 0.010 | 0.035 | 0.010 | 0.037 | 0.012 | 0.043 | 0.010 |
| STS                     | 0.031       | 0.015 | 0.089 | 0.014 | 0.103 | 0.017 | 0.115 | 0.015 |
| IPL                     | 0.020       | 0.010 | 0.018 | 0.013 | 0.032 | 0.013 | 0.035 | 0.010 |
| <i>Right hemisphere</i> |             |       |       |       |       |       |       |       |
| MFG                     | 0.013       | 0.008 | 0.026 | 0.009 | 0.022 | 0.009 | 0.028 | 0.009 |
| IFG                     | 0.033       | 0.012 | 0.047 | 0.011 | 0.060 | 0.012 | 0.072 | 0.010 |
| PCG                     | 0.013       | 0.009 | 0.033 | 0.011 | 0.061 | 0.013 | 0.050 | 0.008 |
| STS                     | -0.007      | 0.010 | 0.074 | 0.012 | 0.093 | 0.011 | 0.100 | 0.013 |
| IPL                     | 0.008       | 0.008 | 0.008 | 0.010 | 0.007 | 0.009 | 0.022 | 0.010 |
| <b>ASD</b>              |             |       |       |       |       |       |       |       |
| <i>Left hemisphere</i>  |             |       |       |       |       |       |       |       |
| MFG                     | 0.012       | 0.006 | 0.015 | 0.007 | 0.015 | 0.007 | 0.013 | 0.007 |
| IFG                     | 0.028       | 0.009 | 0.029 | 0.010 | 0.050 | 0.010 | 0.034 | 0.008 |
| PCG                     | 0.027       | 0.009 | 0.064 | 0.010 | 0.069 | 0.009 | 0.063 | 0.011 |
| STS                     | 0.033       | 0.009 | 0.053 | 0.011 | 0.063 | 0.011 | 0.062 | 0.010 |
| IPL                     | 0.037       | 0.009 | 0.052 | 0.011 | 0.043 | 0.010 | 0.040 | 0.010 |
| <i>Right hemisphere</i> |             |       |       |       |       |       |       |       |
| MFG                     | 0.016       | 0.007 | 0.016 | 0.007 | 0.013 | 0.009 | 0.015 | 0.009 |
| IFG                     | 0.044       | 0.011 | 0.024 | 0.009 | 0.039 | 0.011 | 0.035 | 0.011 |
| PCG                     | -0.005      | 0.010 | 0.033 | 0.010 | 0.012 | 0.010 | 0.008 | 0.010 |
| STS                     | 0.005       | 0.010 | 0.053 | 0.012 | 0.056 | 0.012 | 0.069 | 0.012 |
| IPL                     | 0.045       | 0.013 | 0.045 | 0.009 | 0.038 | 0.010 | 0.039 | 0.008 |

**Supplementary Table S2.** Post-hoc analyses for 3-way interactions of Group  $\times$  Condition  $\times$  Region.

| Comparison                          | <i>p</i> -values | Direction of effect              |
|-------------------------------------|------------------|----------------------------------|
| <b>Group related difference</b>     |                  |                                  |
| Observation, IPL                    | 0.008            | ASD > TD <sup>a</sup>            |
| Solo, STS                           | 0.021            | TD > ASD <sup>b</sup>            |
| Solo, IPL                           | 0.001            | ASD > TD <sup>a</sup>            |
| Face, STS                           | 0.004            | TD > ASD <sup>a</sup>            |
| Together, IFG                       | 0.005            | TD > ASD <sup>a</sup>            |
| Together, STS                       | 0.001            | TD > ASD <sup>a</sup>            |
| <b>Condition related difference</b> |                  |                                  |
| TD, IFG                             | 0.024            | Face > Observation <sup>b</sup>  |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |
|                                     | 0.001            | Touch > Solo <sup>a</sup>        |
|                                     | 0.021            | Touch > Face <sup>b</sup>        |
|                                     | 0.026            | Solo > Observation <sup>b</sup>  |
| TD, PCG                             | < 0.001          | Face > Observation <sup>a</sup>  |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |
|                                     | < 0.001          | Solo > Observation <sup>a</sup>  |
|                                     | < 0.001          | Face > Observation <sup>a</sup>  |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |
| TD, STS                             | 0.024            | Touch > Solo <sup>b</sup>        |
|                                     | < 0.001          | Solo > Observation <sup>a</sup>  |
|                                     | 0.002            | Face > Observation <sup>a</sup>  |
|                                     | 0.011            | Touch > Observation <sup>b</sup> |
|                                     | 0.001            | Solo > Observation <sup>a</sup>  |
| ASD, PCG                            | < 0.001          | Face > Observation <sup>a</sup>  |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |
|                                     | 0.024            | Touch > Solo <sup>b</sup>        |
|                                     | < 0.001          | Solo > Observation <sup>a</sup>  |
|                                     | 0.002            | Face > Observation <sup>a</sup>  |
| ASD, STS                            | 0.011            | Touch > Observation <sup>b</sup> |
|                                     | 0.001            | Solo > Observation <sup>a</sup>  |
|                                     | < 0.001          | Face > Observation <sup>a</sup>  |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |
|                                     | < 0.001          | Touch > Observation <sup>a</sup> |

<sup>a</sup>*p*-values which survived the FDR correction. <sup>b</sup>*p*-values < 0.05 which did not survive FDR correction.

**Supplementary Table S3.** Channel assignments based on the anchor registration approach. For each channel, the spatial location in the MNI coordinate system and the probability of covering different brain regions are shown. The channels are symmetrically divided across the two hemispheres (left, right). The color-coded channels were considered within a specific ROI (MFG, IFG, PCG, STS, and IPL).

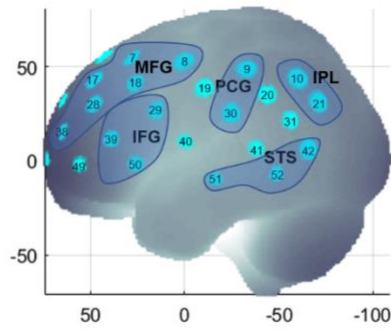
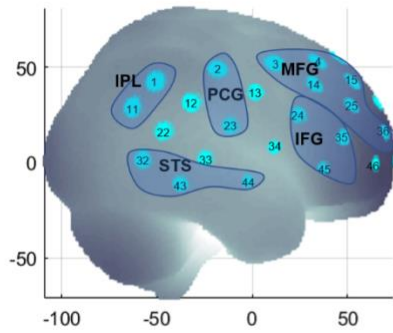
| Side   | CH | MNI's coordinate |       |      | MFG                  | IFG                    | PCG              |                   | STS                     |                       | IPL                 |               | Other                  |                     | Assigned region |
|--------|----|------------------|-------|------|----------------------|------------------------|------------------|-------------------|-------------------------|-----------------------|---------------------|---------------|------------------------|---------------------|-----------------|
|        |    | X                | Y     | Z    | Middle frontal gyrus | Inferior frontal gyrus | Precentral gyrus | Postcentral gyrus | Superior temporal gyrus | Middle temporal gyrus | Supramarginal gyrus | Angular gyrus | Superior frontal gyrus | orbitofrontal gyrus |                 |
| Left   | 7  | -30.7            | 43.7  | 42.7 | 88.1                 |                        |                  |                   |                         |                       |                     |               | 11.9                   |                     | MFG             |
|        | 8  | -47.7            | 23.7  | 44.7 | 100.0                |                        |                  |                   |                         |                       |                     |               |                        |                     | MFG             |
|        | 9  | -58.0            | -2.7  | 45.3 |                      |                        | 72.9             | 27.1              |                         |                       |                     |               |                        |                     | PCG             |
|        | 10 | -63.0            | -28.7 | 47.3 |                      |                        |                  | 9.0               |                         |                       | 91.0                |               |                        |                     | IPL             |
|        | 17 | -22.7            | 59.7  | 31.7 | 96.4                 |                        |                  |                   |                         |                       |                     |               | 3.6                    |                     | MFG             |
|        | 18 | -44.3            | 41.3  | 31.3 | 100.0                |                        |                  |                   |                         |                       |                     |               |                        |                     | MFG             |
|        | 19 | -56.3            | 15.3  | 31.7 | 37.2                 | 23.8                   | 39.0             |                   |                         |                       |                     |               |                        |                     | Excluded        |
|        | 20 | -66.0            | -13.3 | 34.7 |                      |                        |                  | 65.3              |                         |                       | 34.7                |               |                        |                     | Excluded        |
|        | 21 | -66.0            | -40.7 | 38.3 |                      |                        |                  |                   |                         |                       | 91.1                | 8.9           |                        |                     | IPL             |
|        | 28 | -37.3            | 58.3  | 20.3 | 100.0                |                        |                  |                   |                         |                       |                     |               |                        |                     | MFG             |
|        | 29 | -54.0            | 33.7  | 19.7 | 30.3                 | 69.7                   |                  |                   |                         |                       |                     |               |                        |                     | IFG             |
|        | 30 | -65.0            | 3.3   | 21.7 |                      | 1.6                    | 72.0             | 26.3              |                         |                       |                     |               |                        |                     | PCG             |
|        | 31 | -69.0            | -26.6 | 25.3 |                      |                        |                  | 7.5               | 28.0                    |                       | 64.4                |               |                        |                     | Excluded        |
|        | 38 | -24.3            | 70.0  | 6.3  | 99.0                 |                        |                  |                   |                         |                       |                     |               | 1.0                    |                     | MFG             |
|        | 39 | -47.7            | 50.3  | 5.7  | 16.4                 | 83.6                   |                  |                   |                         |                       |                     |               |                        |                     | IFG             |
|        | 40 | -58.7            | 22.7  | 7.7  | 100.0                |                        |                  |                   |                         |                       |                     |               |                        |                     | Excluded        |
|        | 41 | -67.0            | -10.3 | 9.3  |                      |                        | 1.3              | 49.7              | 49.0                    |                       |                     |               |                        |                     | Excluded        |
|        | 42 | -70.0            | -39.3 | 11.7 |                      |                        |                  |                   | 80.1                    | 19.9                  |                     |               |                        |                     | STS             |
|        | 49 | -37.0            | 63.0  | -7.0 | 42.4                 | 28.6                   |                  |                   |                         |                       |                     |               |                        | 29.0                | Excluded        |
|        | 50 | -53.0            | 40.7  | -6.7 |                      | 56.4                   |                  |                   |                         |                       |                     |               |                        | 43.6                | IFG             |
|        | 51 | -62.0            | 5.7   | -6.3 |                      | 4.2                    | 1.8              |                   | 87.7                    | 6.3                   |                     |               |                        |                     | STS             |
|        | 52 | -71.0            | -23.3 | -5.3 |                      |                        |                  |                   | 6.9                     | 93.1                  |                     |               |                        |                     | STS             |
| Center | 5  | 17.3             | 55.3  | 42.3 | 60.1                 |                        |                  |                   |                         |                       |                     |               | 39.9                   |                     | Excluded        |
|        | 6  | -8.3             | 56.3  | 43.7 | 6.0                  |                        |                  |                   |                         |                       |                     |               | 94.0                   |                     | Excluded        |
|        | 16 | 6.3              | 65.0  | 30.7 | 22.4                 |                        |                  |                   |                         |                       |                     |               | 71.6                   |                     | Excluded        |
|        | 26 | 19.7             | 70.0  | 19.7 | 94.5                 |                        |                  |                   |                         |                       |                     |               | 5.5                    |                     | Excluded        |
|        | 27 | -11.3            | 70.0  | 20.3 | 25.4                 |                        |                  |                   |                         |                       |                     |               | 74.6                   |                     | Excluded        |
|        | 37 | 5.3              | 72.3  | 5.7  | 29.8                 |                        |                  |                   |                         |                       |                     |               | 70.2                   |                     | Excluded        |
|        | 47 | 19.3             | 71.7  | -7.7 | 75.9                 |                        |                  |                   |                         |                       |                     |               | 5.3                    | 18.8                | Excluded        |
|        | 48 | -10.3            | 72.0  | -7.3 | 11.3                 |                        |                  |                   |                         |                       |                     |               | 85.6                   | 3.0                 | Excluded        |
| Right  | 1  | 67.0             | -34.7 | 43.7 |                      |                        |                  |                   |                         |                       | 93.0                | 7.0           |                        |                     | IPL             |
|        | 2  | 64.0             | -7.7  | 42.3 |                      |                        | 12.4             | 55.5              |                         |                       | 32.2                |               |                        |                     | PCG             |
|        | 3  | 53.0             | 19.7  | 41.3 | 71.6                 | 5.4                    | 23.0             |                   |                         |                       |                     |               |                        |                     | MFG             |
|        | 4  | 38.7             | 41.7  | 41.7 | 100.0                |                        |                  |                   |                         |                       |                     |               |                        |                     | MFG             |
|        | 11 | 67.0             | -45.3 | 34.3 |                      |                        |                  |                   | 5.6                     |                       | 36.1                | 58.3          |                        |                     | IPL             |



**Supplementary Figure S1.** Probe placement (a), spatial registration output (b), and IMU system placement (c). Written permission has been taken for publication of participant pictures. MFG = middle frontal gyrus, IFG = inferior frontal gyrus; PCG = pre/post central gyrus; STS = superior temporal sulcus; IPL = inferior parietal lobe.



(a)



(b)



(c)