# Supplementary Materials: The effects of 10Hz and 20Hz tACS in network integration and segregation in chronic stroke: A graph theoretical fMRI study

**Cheng Chen, Kai Yuan, Winnie Chiu-wing Chu and Raymond Kai-yu Tong**

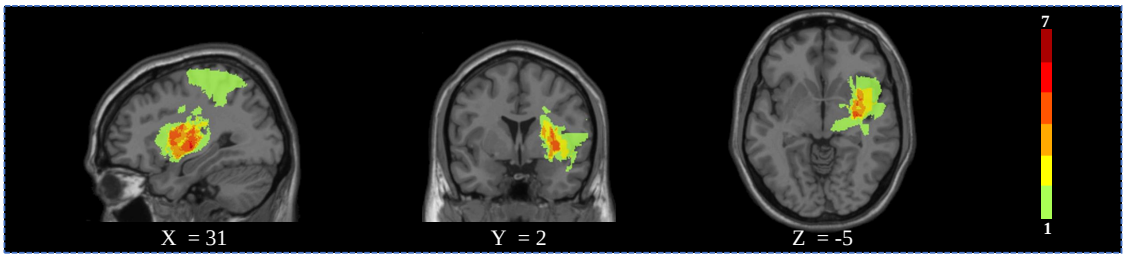


**Figure S1.** Lesion distribution of stroke subjects. The color bar represents the number of patients with lesions in the corresponding areas. The annotation of X, Y, Z represented the coordinate of the slice in MNI space. In second and third plots, left orientation represents left side of the brain.

**Table S1.** Demographics and clinical properties of the participants.

| Subject | Gender | Age | Stroke onset (y) | Stroke type | Lesion side | FMA | ARAT |
|---|---|---|---|---|---|---|---|
| S1 | Male | 65-69 | 0.7 | Ischemic | Left | 4 | 0 |
| S2 | Male | 50-54 | 3 | Ischemic | Right | 15 | 11 |
| S3 | Female | 65-69 | 2 | Ischemic | Left | 17 | 0 |
| S4 | Male | 50-54 | 1 | Ischemic | Left | 32 | 6 |
| S5 | Female | 70-74 | 9 | Ischemic | Left | 22 | 17 |
| S6 | Male | 55-59 | 3 | Ischemic | Left | 55 | 57 |
| S7 | Female | 60-64 | 3 | Ischemic | Left | 47 | 53 |
| S8 | Male | 55-59 | 4 | Ischemic | Right | 49 | 54 |
| S9 | Male | 55-59 | 4 | Ischemic | Right | 27 | 23 |
| S10 | Female | 70-74 | 1 | Ischemic | Right | 8 | 9 |
| S11 | Female | 70-74 | 6 | Ischemic | Right | 45 | 51 |
| S12 | Male | 60-64 | 3 | Hemorrhage | Right | 24 | 22 |
| S13 | Male | 35-39 | 3 | Hemorrhage | Right | 27 | 8 |
| mean±std | | 61±10 | | | | 29±16 | 24±21 |

Abbreviations: FMA = Fugel-Meyer Assessment for upper limb; ARAT = Action Research Arm Test.

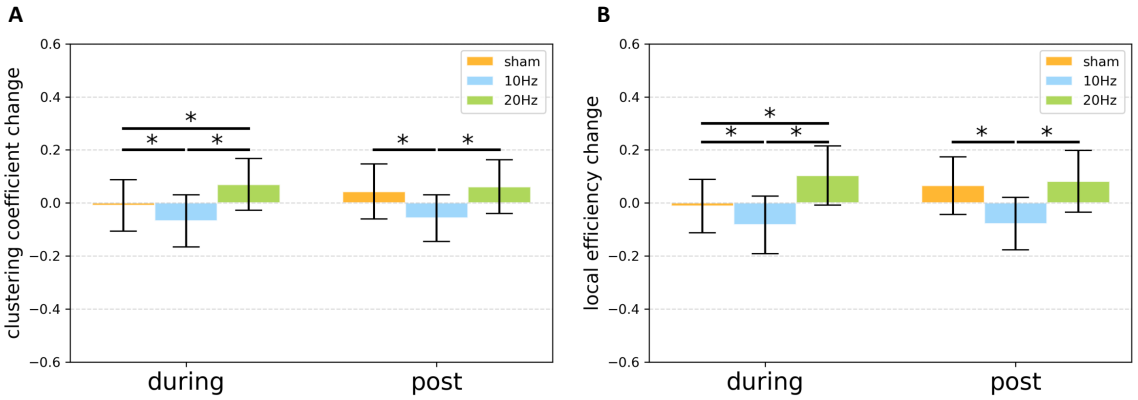


**Figure S2.** The bar chart of (A) clustering coefficient change and (B) local efficiency change of the network at the whole-brain level for various conditions during and after stimulation. Error bar stands for the standard error. Asterisk (*) indicates that a significant difference was observed at $p < 0.05$.

## Clustering coefficient and local efficiency analysis at the whole-brain level

For clustering coefficient change at the whole-brain level, the repeated measure ANOVA showed significant $stimulation - time$ interaction effect ($F(2, 230)=13.025$, $p < 0.001$). During stimulation, $Post - hoc$ tests indicated a significant difference between $sham$ and $10Hz$, $sham$ and $20Hz$, as well as $10Hz$ and $20Hz$ (all $p < 0.001$, Bonferroni corrected). After stimulation, $Post - hoc$ tests indicated a significant difference between $sham$ and $10Hz$ as well as $10Hz$ and $20Hz$ (both $p < 0.001$, Bonferroni corrected) (Figure S2A). Similarly, for local efficiency change at the whole-brain level, the repeated measure ANOVA showed significant $stimulation - time$ interaction effect ($F(2, 230)=30.285$, $p < 0.001$). During stimulation, $Post - hoc$ tests indicated a significant difference between $sham$ and $10Hz$, $sham$ and $20Hz$, as well as $10Hz$ and $20Hz$ (all $p < 0.001$, Bonferroni corrected). After stimulation, $Post - hoc$ tests indicated a significant difference between $sham$ and $10Hz$ as well as $10Hz$ and $20Hz$ (both $p < 0.001$, Bonferroni corrected) (Figure S2B). These results also illustrated the heterogeneous modulation effects of 10Hz and 20Hz tACS. Interestingly, it could be observed that both 10Hz and 20Hz tACS showed a slightly different modulation behaviour between in motor-related regions and at the whole-brain level, compared with the results of corresponding analysis in motor-related regions (Figure 6). This phenomenon could also be found in network integration and segregation properties, which implied that the modulation effect of a specific stimulation might be different if observed from different networks.

**Table S2.** AAL ROIs in motor-related regions.

| | | | MNI coordinates | | |
|---|---|---|---|---|---|
| **Index** | **L (R) side** | **abbreviation** | **X** | **Y** | **Z** |
| 1 | L | Precentral_L | -39 | -6 | 51 |
| 2 | R | Precentral_R | 41 | -8 | 52 |
| 3 | L | Frontal_Sup_L | -18 | 35 | 42 |
| 4 | R | Frontal_Sup_R | 22 | 31 | 44 |
| 19 | L | Supp_Motor_Area_L | -5 | 5 | 61 |
| 20 | R | Supp_Motor_Area_R | 9 | 0 | 62 |
| 31 | L | Cingulum_Ant_L | -4 | 35 | 14 |
| 32 | R | Cingulum_Ant_R | 8 | 37 | 16 |
| 43 | L | Calcarine_L | -7 | -79 | 6 |
| 44 | R | Calcarine_R | 16 | -73 | 9 |
| 57 | L | Postcentral_L | -42 | -23 | 49 |
| 58 | R | Postcentral_R | 41 | -25 | 53 |
| 59 | L | Parietal_Sup_L | -23 | -60 | 59 |
| 60 | R | Parietal_Sup_R | 26 | -59 | 62 |
| 73 | L | Putamen_L | -24 | 4 | 2 |
| 74 | R | Putamen_R | 28 | 5 | 2 |
| 75 | L | Pallidum_L | -18 | 0 | 0 |
| 76 | R | Pallidum_R | 21 | 0 | 0 |
| 77 | L | Thalamus_L | -11 | -18 | 8 |
| 78 | R | Thalamus_R | 13 | -18 | 8 |