**Association between the gut microbiome and functional brain activity in schizophrenia-Supplementary Materials**

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Supplementary Table S1. Alpha diversity in the NC and SZ groups

|  |  |  |  |
| --- | --- | --- | --- |
| Alpha diversity | NC group | SZ group | *p* value |
| Shannon | 4.34±0.70 | 4.17±0.75 | 0.29 |
| Evenness | 0.65±0.08 | 0.64±0.09 | 0.68 |
| Faith’s phylogenetic diversity | 8.06±2.04 | 7.72±1.96 | 0.45 |
| Observed features | 103.47±34.11 | 95.78±32.54 | 0.41 |

**Notes:** NC, normal control; SZ, schizophrenia.

Supplementary Table S2. Difference of MRI indexes between the NC and SZ groups

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| MRI | Index | Regions | NC group | SZ group | *p* value\* |
| GMV | 11 | Frontal\_Inf\_Oper\_L | 0.42±0.04 | 0.39±0.05 | 0.04 |
| 25 | Frontal\_Mid\_Orb\_L | 0.45±0.05 | 0.41±0.07 | 0.02 |
| 29 | Insula\_L  | 0.54±0.04 | 0.50±0.06 | 0.03 |
| 30 | Insula\_R | 0.56±0.04 | 0.53±0.06 | 0.03 |
| 41 | Amygdala\_L | 0.64±0.05 | 0.61±0.07 | 0.03 |
| 44 | Calcarine\_R | 0.43±0.05 | 0.40±0.06 | 0.04 |
| 49 | Occipital\_Sup\_L | 0.33±0.03 | 0.31±0.04 | 0.04 |
| 51 | Occipital\_Mid\_L | 0.42±0.03 | 0.39±0.05 | 0.03 |
| 58 | Postcentral\_R | 0.32±0.03 | 0.30±0.04 | 0.04 |
| 73 | Putamen\_L | 0.45±0.06 | 0.42±0.07 | 0.05 |
| 74 | Putamen\_R | 0.43±0.05 | 0.40±0.06 | 0.01 |
| 77 | Thalamus\_L | 0.41±0.03 | 0.39±0.04 | 0.03 |
| 78 | Thalamus\_R | 0.44±0.03 | 0.41±0.05 | 0.04 |
| 83 | Temporal\_Pole\_Sup\_L | 0.33±0.03 | 0.31±0.04 | 0.01 |
| 84 | Temporal\_Pole\_Sup\_R | 0.34±0.03 | 0.31±0.04 | 0.01 |
| 90 | Temporal\_Inf\_R | 0.49±0.05 | 0.46±0.07 | 0.03 |
| ReHo | 1 | Precentral\_L | 0.43±0.04 | 0.41±0.06 | 0.05 |
| 13 | Frontal\_Inf\_Tri\_L | 0.47±0.03 | 0.45±0.05 | 0.03 |
| 14 | Frontal\_Inf\_Tri\_R  | 0.46±0.03 | 0.44±0.06 | 0.05 |
| 2 | Precentral\_R | 0.44±0.04 | 0.42±0.05 | 0.05 |
| 25 | Frontal\_Mid\_Orb\_L | 0.52±0.05 | 0.49±0.06 | 0.02 |
| 26 | Frontal\_Mid\_Orb\_R | 0.51±0.04 | 0.48±0.06 | 0.004 |
| 27 | Rectus\_L | 0.48±0.08 | 0.44±0.05 | 0.01 |
| 28 | Rectus\_R | 0.48±0.07 | 0.44±0.05 | 0.01 |
| 43 | Calcarine\_L | 0.55±0.08 | 0.50±0.08 | 0.003 |
| 44 | Calcarine\_R | 0.54±0.07 | 0.49±0.08 | 0.01 |
| 45 | Cuneus\_L | 0.55±0.06 | 0.51±0.07 | 0.01 |
| 46 | Cuneus\_R | 0.54±0.05 | 0.51±0.07 | 0.02 |
| 47 | Lingual\_L | 0.50±0.06 | 0.45±0.07 | 0.004 |
| 48 | Lingual\_R | 0.50±0.06 | 0.45±0.08 | 0.002 |
| 49 | Occipital\_Sup\_L | 0.47±0.04 | 0.44±0.07 | 0.01 |
| 5 | Frontal\_Sup\_Orb\_L | 0.45±0.06 | 0.43±0.06 | 0.04 |
| 50 | Occipital\_Sup\_R | 0.50±0.04 | 0.46±0.07 | 0.01 |
| 51 | Occipital\_Mid\_L | 0.51±0.04 | 0.48±0.06 | 0.01 |
| 52 | Occipital\_Mid\_R  | 0.53±0.04 | 0.50±0.07 | 0.01 |
| 53 | Occipital\_Inf\_L | 0.49±0.05 | 0.45±0.07 | 0.01 |
| 54 | Occipital\_Inf\_R | 0.52±0.06 | 0.47±0.08 | 0.002 |
| 57 | Postcentral\_L | 0.43±0.05 | 0.40±0.06 | 0.01 |
| 58 | Postcentral\_R | 0.46±0.05 | 0.42±0.07 | 0.002 |
| 59 | Parietal\_Sup\_L | 0.46±0.05 | 0.43±0.06 | 0.01 |
| 6 | Frontal\_Sup\_Orb\_R | 0.45±0.05 | 0.42±0.05 | 0.02 |
| 60 | Parietal\_Sup\_R | 0.47±0.04 | 0.44±0.06 | 0.003 |
| 61 | Parietal\_Inf\_L | 0.46±0.04 | 0.43±0.06 | 0.04 |
| 62 | Parietal\_Inf\_R | 0.51±0.04 | 0.48±0.06 | 0.01 |
| 67 | Precuneus\_L | 0.54±0.04 | 0.51±0.06 | 0.04 |
| 71 | Caudate\_L | 0.37±0.02 | 0.39±0.06 | 0.05 |
| 8 | Frontal\_Mid\_R | 0.48±0.03 | 0.46±0.06 | 0.03 |
| 81 | Temporal\_Sup\_L | 0.45±0.04 | 0.42±0.06 | 0.03 |
| 82 | Temporal\_Sup\_R | 0.48±0.04 | 0.45±0.05 | 0.03 |
| 86 | Temporal\_Mid\_R | 0.49±0.03 | 0.46±0.05 | 0.02 |
| ALFF | 72 | Caudate\_R | 0.76±0.15 | 0.93±0.5 | 0.04 |

**Notes:** GMV, gray matter volume; ReHo, regional homogeneity, ALFF, amplitude of low-frequency fluctuation; NC, normal control; SZ, schizophrenia; Mid, middle; Inf, inferior; Oper, operculum; Tri, triangularis; Orb, orbitalis; Sup, superior; L (R), left (right) hemisphere; \**p* < 0.05.

Supplementary Table S3. Relationship between the diversity of microbiome and MRI indexes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Alpha diversity | Regions | *r* | *p* value\* | *p­* value\*\* |
| Observed species | Postcentral\_R | 0.41 | 0.011 | 0.024 |
| Insula\_R | 0.41 | 0.012 | 0.026 |
| Insula\_L | 0.40 | 0.016 | 0.032 |
| Faith\_PD | Insula\_L | 0.45 | 0.005 | 0.013 |
| Insula\_R | 0.45 | 0.005 | 0.013 |
| Postcentral\_R | 0.42 | 0.010 | 0.023 |
| Frontal\_Inf\_Oper\_L | 0.40 | 0.015 | 0.030 |
| Evenness | Calcarine\_R | 0.59 | 0.000 | 0.000 |
| Calcarine\_L | 0.49 | 0.002 | 0.003 |
| Lingual\_R | 0.48 | 0.003 | 0.004 |
| Occipital\_Sup\_L | 0.48 | 0.003 | 0.004 |
| Lingual\_L | 0.47 | 0.003 | 0.004 |
| Cuneus\_R | 0.40 | 0.013 | 0.017 |
| Occipital\_Inf\_L | 0.38 | 0.020 | 0.025 |
| Parietal\_Sup\_L | 0.38 | 0.021 | 0.027 |
| Occipital\_Inf\_R | 0.37 | 0.025 | 0.032 |
| Postcentral\_L | 0.36 | 0.028 | 0.036 |
| Parietal\_Sup\_R | 0.36 | 0.028 | 0.036 |
| Shannon | Calcarine\_R | 0.56 | 0.000 | 0.000 |
| Calcarine\_L | 0.47 | 0.003 | 0.004 |
| Lingual\_L | 0.43 | 0.008 | 0.011 |
| Occipital\_Sup\_L | 0.42 | 0.010 | 0.013 |
| Lingual\_R | 0.42 | 0.010 | 0.013 |
| Parietal\_Sup\_R | 0.36 | 0.031 | 0.039 |

**Notes:** Sup, superior; Inf, inferior, L (R), left (right) hemisphere; \**p* < 0.05, \*\**p* < 0.05 with FDR correction.