# Supplementary Materials

## Supplementary Table 1 Baseline Characteristics between FD females and males with ghrelin data

|  |  |  |  |
| --- | --- | --- | --- |
|  | FD females (n=35)Mean ± SD | FD males (n=13)Mean ± SD | FD females vs. FD males  |
| T statistic | P |
| Age (Y) | 22.26±2.06 | 23.38±1.50 | -1.796 | 0.079 |
| BMI (kg/m2) | 19.46±1.60 | 19.73±1.99 | -0.491 | 0.626 |
| NDSI score | 44.34±13.97 | 50.54±11.89 | -1.417 | 0.163 |
| Duration (M) | 38.89±27.77 | 36.69±24.78 | 0.250 | 0.804 |
| SAS score | 42.50±7.77 | 39.13±9.08 | 1.274 | 0.209 |
| SDS score | 42.82±8.03 | 41.15±12.26 | 0.455 | 0.655 |
| Ghrelin concentration | 9.63±1.79 | 9.78±1.47 | -0.261 | 0.777 |

BMI, Body mass index; NDSI, Nepean Dyspepsia Symptom Index; SAS, the Zung Self-Rating Anxiety Scale; SDS, the Zung Self-Rating Depression Scale; Y, years; M, months; SD, standard deviation; Groups: FD, functional dyspepsia.

## Supplementary Table 2 Abnormal rsFC between amygdala subregions and the whole brain in FD patients compared with HS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contrast | ROI/Seed | Cluster size | rsFC regions | L/R | BA | MNI | T |
| x | y | z |
| FD>HS | left BLA | 1211 | SMC/MCC | bilateral | 6,32 | 2 | 4 | 50 | 5.55 |
|  |  | 982 | anterior INS/central operculum/STG | R |  | 32 | 14 | 10 | 5.03 |
|  |  | 505 | central/parietal operculum/planum temporale | R |  | 60 | -18 | 20 | 4.94 |
|  |  | 381 | central operculum/PrG/PoG | L | 44 | -48 | 0 | 10 | 4.79 |
|  |  | 130 | SFG | R | 9,46 | 30 | 44 | 22 | 4.20 |
|  |  | 262 | parietal operculum/SMG | L |  | -54 | -36 | 24 | 3.77 |
|  | right BLA | 137 | central operculum | L |  | -48 | 6 | 6 | 4.29 |
|  |  | 246 | SMC /MCC | bilateral | 6 | 2 | 4 | 48 | 4.15 |
|  | left CMA | 218 | SMG | L | 40 | -60 | -56 | 24 | 4.52 |
|  |  | 158 | dlPFC | L | 9 | -40 | 22 | 36 | 4.29 |
|  |  | 161 | angular gyrus | L | 39 | -40 | -54 | 44 | 4.23 |
| FD<HS | left BLA | 911 | angular gyrus | L | 19 | -38 | -72 | 42 | 5.11 |
|  |  | 700 | dlPFC | L |  | -34 | 22 | 56 | 4.89 |
|  |  | 326 | MTG | L | 20 | -62 | -28 | -18 | 4.51 |
|  |  | 345 | FP | R | 10 | 12 | 68 | 20 | 4.32 |
|  |  | 204 | cerebellum | bilateral |  | 6 | -56 | -46 | 4.19 |
|  |  |  | brain stem |  |  | 6 | -44 | -46 | 4.15 |
|  |  | 183 | mPFC | L | 10 | -4 | 62 | 0 | 4.09 |
|  |  | 202 | PCC | L | 31 | -2 | -34 | 32 | 4.03 |
|  | right BLA | 407 | angular gyrus | L | 7 | -38 | -72 | 44 | 4.45 |
|  |  | 134 | dlPFC | L | 9 | -18 | 32 | 50 | 4.00 |
|  | left CMA | 158 | occipital fusiform gyrus | L |  | -24 | -82 | -6 | 3.76 |
|  |  | 290 | occipital fusiform gyrus | R |  | 22 | -84 | -14 | 4.58 |
|  |  | 218 | PrG/SMC | bilateral | 4,6 | -4 | -16 | 62 | 4.18 |
|  |  | 186 | PrG/PoG | R | 4 | 50 | -16 | 64 | 4.13 |
|  | right CMA | 3125 | PrG/PoG | bilateral | 4 | 38 | -16 | 42 | 5.49 |
|  |  | 1559 | precuneus/lingual gyrus | R |  | 26 | -54 | 4 | 4.98 |
|  |  | 142 | anterior INS | R | 13 | 36 | -8 | 16 | 4.13 |
|  |  | 124 | cuneus | R | 18 | 6 | -80 | 18 | 4.13 |
|  |  | 388 | lingual gyrus | L |  | -34 | -56 | -16 | 3.99 |

Cluster level, FWE P<0.05; voxel level, p<0.001; cluster size>20 voxels; with age, gender, SAS, and SDS as covariates. No regions above the threshold in both left and right SFA rsFC. **Abbreviations：Seeds:** BLA, basolateral amygdala; CMA, centromedial amygdala; SFA, superficial amygdala. **Regions:** SMC, supplementary motor cortex; MCC, middle cingulate cortex; STG, superior temporal gyrus; dlPFC, dorsal lateral prefrontal cortex; SMG, supramarginal gyrus; MFG, middle frontal cortex; SFG, superior frontal gyrus; MTG, middle temporal gyrus; FP, frontal pole; mPFC, medial prefrontal cortex; PCC, posterior cingulate cortex; INS, insular cortex.

## Supplementary Table 3 Gender differences in the rsFC of amygdala subregions within all participants

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contrast | ROI/Seed | Cluster size | rsFC regions | L/R | BA | MNI | T |
| x | y | z |
| Female FD>Male FD | left BLA | 153 | TPJ/MTG | L | 22 | -60 | -42 | 12 | 4.52 |
|  |  | 204 | anterior/posterior INS | L | 47 | -38 | -4 | -2 | 4.24 |
|  | right CMA | 154 | putamen | L |  | -24 | -8 | 18 | 4.59 |
|  | right SFA | 607 | putamen/caudate | L |  | -26 | 0 | 0 | 5.15 |
|  |  | 170 | putamen | R |  | 26 | 4 | -8 | 4.26 |
| Male FD>Female FD | left BLA | 150 | dlPFC | R |  | 16 | 54 | 46 | 4.32 |
|  | right BLA | 240 | mPFC | bilateral |  | 0 | 50 | -6 | 4.64 |
| Male HC>Female HC  | right CMA | 201 | cerebellum | R |  | 12 | -54 | -26 | 5.05 |
|  | left SFA | 186 | planum temporale/STG | R | 41,42 | 62 | -22 | 12 | 4.45 |
| Female HC>Male HC | right SFA | 144 | SPL | R |  | 32 | -62 | 58 | 4.45 |
|  |  | 223 | accumbens area/posterior orbital gyrus/putamen | R |  | 8 | 12 | -8 | 4.41 |

Cluster level, FWE P<0.05; voxel level, p<0.001; cluster size>20 voxels; with age, SAS, and SDS as covariates. No regions above the threshold in left CMA rsFC. Contrast: all female, FD patients+HS; all male, FD patients+HS. Abbreviations:Seeds: BLA, basolateral amygdala; CMA, centromedial amygdala; SFA, superficial amygdala. Regions: TPJ, temporal parietal junction; MTG, middle temporal gyrus; INS, insular cortex; STG, superior temporal gyrus; dlPFC, dorsal lateral prefrontal cortex; mPFC, medial prefrontal cortex; SPL, superior parietal lobule.

## Supplementary Table 4 Disease differences in the rsFC of amygdala subregions within the same gender

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Contrast | ROI/Seed | Cluster size | RSFC Regions | L/R | BA | MNI | T |
| x | y | z |
| Female FD>Female HS | left BLA | 1910 | anterior INS/central operculum | R | 13,44 | 36 | 18 | 8 | 5.57 |
|  |  |  | STG | R |  | 62 | -6 | 2 | 4.83 |
|  |  | 1307 | Postcentral gyrus/SFG | bilateral | 32 | 4 | 4 | 48 | 5.40 |
|  |  | 2402 | anterior/posterior INS | L | 44 | -44 | 4 | 10 | 5.29 |
|  |  | 1164 | central operculum/planum temporale | R | 40 | 60 | -18 | 20 | 5.24 |
|  |  | 317 | MFG | R | 10 | 26 | 32 | 24 | 4.35 |
|  | right BLA | 303 | SMC | bilateral | 6 | 6 | -4 | 74 | 4.82 |
|  |  | 135 | Anterior INS/frontal operculum | R |  | 36 | 18 | 8 | 4.11 |
| Female FD<Female HS | left BLA | 937 | dlPFC/FP | R | 10 | 14 | 66 | 18 | 5.05 |
|  |  | 917 | angular gyrus | L | 39 | -48 | -66 | 38 | 5.05 |
|  |  | 344 | cerebellum | bilateral |  | -4 | -58 | -46 | 5.01 |
|  |  |  | brain stem |  |  | 6 | -44 | -46 | 4.31 |
|  |  | 504 | MTG | L |  | -68 | -22 | -20 | 4.99 |
|  |  | 318 | angular gyrus | R | 40 | 52 | -62 | 42 | 4.86 |
|  |  | 369 | mPFC | bilateral | 10 | -6 | 52 | -4 | 4.44 |
|  |  | 371 | PCC/precuneus | L | 31 | -4 | -46 | 30 | 4.10 |
|  | left CMA | 380 | medial PrG | bilateral |  | -6 | -18 | 58 | 4.88 |
|  |  |  | SMC | R | 6 | 4 | -8 | 60 | 3.61 |
|  |  | 467 | PrG/PoG/SFG | R | 4 | 22 | -26 | 76 | 4.68 |
|  | right CMA | 381 | occipital fusiform gyrus/lingual gyrus | R |  | 28 | -84 | -6 | 4.43 |
|  |  | 184 | PrG/PoG | R | 4 | 20 | -30 | 60 | 3.98 |
|  | left SFA | 248 | SPL | R |  | 32 | -62 | 64 | 4.42 |
| Male FD>Male HS | right SFA | 740 | SPL/angular gyrus | R | 7 | 32 | -64 | 58 | 5.39 |
| Male FD<Male HS | right CMA | 149 | cerebellum | R |  | 36 | -52 | -32 | 5.12 |
|  |  | 331 | PrG/PoG | R |  | 50 | 2 | 32 | 5.06 |
|  |  | 178 | PrG/PoG | L | 6 | -42 | -6 | 38 | 4.94 |
|  |  | 155 | anterior insula/central operculum | R | 13 | 28 | 16 | 10 | 4.39 |
|  |  |  | putamen | R |  | 28 | 2 | 12 | 4.12 |
|  |  | 167 | MCC/SMC | L | 32 | -6 | 6 | 44 | 4.10 |
|  | right SFA | 152 | PrG/PoG | bilateral | 6 | -8 | -30 | 68 | 4.59 |

Cluster level, FWE P<0.05; voxel level, p<0.001; cluster size>20 voxels; with age, SAS, and SDS as covariates.

Abbreviation: Seeds: BLA, basolateral amygdala; CMA, centromedial amygdala; SFA, superficial amygdala. Regions: STG, superior temporal gyrus; SFG, superior frontal gyrus; INS, insular cortex; MFG, middle frontal cortex; SMC, supplementary motor cortex; dlPFC, dorsal lateral prefrontal cortex; FP, frontal pole; MTG, middle temporal gyrus; mPFC, medial prefrontal cortex; PCC, posterior cingulate cortex; SPL, superior parietal lobule; MCC, middle cingulate cortex.