**Method for Leave-one-subject-out method for creation of functional regions of interest**

While we did not use a functional localizer in this study, we did employ a widely accepted method (see Estermann, 2010) of extracting a functional FFA seed/mask using the leave-one-subject out (LOSO) technique. The functional seeds and masks thus derived include all overlapping regions of the FFA from all subjects, without biasing each participant’s mask by his/her own data. The LOSO technique reduces statistical non-independence bias, by deriving a seed and target for each participant from the group activation of all other participants. We created right and left anterior occipital face area, right posterior occipital face area, left ITG, and right FFA masks to functionally localize face visual processing areas for each of the AN, BDD, and HC groups (see manuscript, Fig 1**).**  We created masks from voxels that overlapped in all of the group LOSO activation masks images for AN, BDD and HC. Voxels in these overlapping clusters were then split to create left and right hemisphere masks. Note that the group LOSO was a whole brain procedure and thus there were resultant activation clusters outside of the regions for our hypothesis testing; therefore, we selected our LOSO seeds by masking with HO templates for our seed regions of interest. This additional masking step removed regions of activation outside the hypothesized seed or target region masks, using overlap with a liberal (75%) region of interest mask from the Harvard-Oxford probabilistic atlas. All seed and target masks were thresholded at a cluster threshold of *Z*>1.7, *p*<0.05.

To confirm that all subjects did indeed have faces activation within our functional LOSO FFA mask, we performed an additional analysis to assess the overlap of the each participant’s first level activation (for the contrast of NSF faces vs shapes) and our FFA mask registered in subject space. The results of that analysis were that all participants showed activation within our FFA mask, with activations cluster-thresholded at z>2.0, p=0.05. The mean number of voxels and mean volume of activation within FFA masks across all 60 participants was 137 voxels with a mean volume of 4627 cubic mm. The maximum and minimum numbers within the FFA mask were 284 voxels /9585 cubic mm and 8 voxels /270 cubic mm, respectively. Furthermore, no difference among groups for the number of voxels within the FFA mask at the p<0.05 level for the three groups [F(2,59)=0.77, p=0.47].

**Method for regression of connectivity in ROIs with clinical variables and post hoc rating scores of degree of self -referential thinking**

Our post-hoc regressions were investigated to lend insight into the imaging results. A 5mm radius sphere was created around the peak activation voxels from the cluster maxima of the group PPI result for the contrast being examined. If the resultant spherical seeds were overlapping, we tested the seed with the largest z-statistic for that region. The mean value of the t-statistic of connectivity strength was used in the regression analysis. The t-statistic was extracted from each subject by registering this spherical seed back into each subject’s native space. Next the mean value of PPI tstat was calculated within that sphere for each participant. To follow up on the significant between-groups results, we performed *post-hoc* regression analyses using Bonferroni adjusted alpha levels for the spherical seeds tested (adjusted alpha levels: Fig 5a, α=0.05/3=0.017, Fig 5b. α=0.05/5=0.01, Fig 5c α=0.05/3=0.017). Note that the number of corrections depended upon the number of cluster maxima in the relevant PPI results.

We calculated leverage statistics to determine if there were any outliers, removing any with values greater than 0.2 (determined by (2k+2)/n). Only one subject was an outlier in the regression analyses (in the BDD-YBOCS regression).

**Method for image quality control, motion measurement, and exclusion**

We visually inspected registration of the functional image to the structural images for each participant. We also visually inspected the relative and absolute motion across the scan for each bold run. Exclusions for motion were determined by absolute and relative motion across the entire bold run. One AN, seven BDD, and two HC were excluded due to having volumes with absolute or relative motion exceeding 1.5 mm (1/2 voxel). Later, to compare among groups, we additionally assessed motion using DVARS (root mean squared change in BOLD signal from volume-to-volume).

A one-way between subjects ANOVA was conducted to compare the effect of group on subject motion, and there was not a significant effect of motion among groups as measured by DVARS, F(57,2)=1.41, p=0.25.

**Method for examining direction of connectivity differences**

We examined each cluster as a region of interest to confirm the direction of connectivity differences between groups. A 5mm radius sphere was created around the peak activation voxel from the cluster maximum of the group PPI result for the contrast being examined. Next, the t-statistic was extracted from each subject by registering this spherical seed back into each subject’s native space. We then extracted the average t-statistic from all subjects and plotted the group results as box plots.

**Supplemental information regarding comorbidities in AN and BDD**

Comorbidities did differ between groups and could affect our results (see Table S4 for a tabulation of specific comorbidities by group) . However, we allowed these comorbidities given their frequency in BDD and AN so that our study sample would be a representative clinical sample. In AN, premorbid anxiety phenotypes are nearly universal and consistent with the morbid phenomenology of anorexia nervosa. As such, evidence is strong that rather than being considered a comorbidity, anxiety may be an element of the developmental vulnerability - the underlying substrate - and thus it would not make sense for it to be controlled. Instead, we analyzed relationships between anxiety and depression scores and connectivity measures.

* 36-76% lifetime prevalence of depression in BDD (Veale, 1996; Gunstad, 2003; Ruffolo, 2006; Zimmerman, 1998; Phillips, 2005; Phillips, 2006)
* 62-73% lifetime prevalence of at least one anxiety disorder in BDD (Phillips, 2005).
* 50% lifetime prevalence of major depression in AN (Kennedy, 1994).
* 33-75% prevalence of at least one anxiety disorder in AN (Swinbourne,2007).

We performed additional regression analyses to see whether the AN and BDD participants showed an association between functional connectivity and HAMA and MADRAS scores. We extracted the tstat from a spherical 10mm diameter seed centered at the maximal voxel for the appropriate contrast. We only tested the peak voxel, and thus did not test for multiple comparisons. The results showed that for AN, there were significant associations for functional connectivity between FFA and the Salience network for both HAMA and MADRAS and for BDD, there were trends for significant associations for the functional connectivity between the L anterior occipital face area and the FFA (HAMA AN: R2 square=0.046, F(1,19)=4.58, p=0.046. MADRAS AN: R2 square=0.29, F(1,19)=7.32, p=0.014 HAMA BDD: R2 square=0.14, F(1,19)=3.29, p=0.086. MADRAS BDD: R2 square=0.33, F(1,19)=2.21, p=0.15 . )

These analyses provide evidence that brain connectivity patterns in both clinical groups may also be influenced by anxiety and depression, although the illness phenotypes and these comorbid symptoms are inextricably intertwined.

**Questionnaire regarding ratings of neutral-face photos**

Ratings of photos:

Neutral faces from face-matching:

Aversiveness (to what degree do you experience a sense of disgust or repulsion)

0. Not aversive 10. Extremely aversive

Attractiveness

0. Very unattractive 10. Very attractive

Degree to which it triggers thoughts about your own appearance

0. Not at all 10. Strong thoughts about your appearance

**References for Supplementary Materials**

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