# Supplementary material

# Neurophysiological Correlates of Autobiographical Memory in Anorexia Nervosa

**List of abbreviations:**

AM: Autobiographical Memory

AN: Anorexia Nervosa

HC: Healthy controls

CELEX: Lexical database with information on orthography, phonology, morphology, syntax as well as word frequency

SAM: Self-Assessment Manikin

MPRAGE: Magnetization Prepared Rapid Acquisition with Gradient Echoes

fMRI: functional magnetic resonance imaging

BOLD: Blood Oxygen Level Dependent

AC-PC: Anterior commissure – posterior commissure line

k: Cluster size (number of voxels)

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# Supplementary Methods

### fMRI task

Before entering the scanner, participants performed a practice version of the task with different cue-words lasting 10-15min. During imaging, participants were presented a total of 60 cue words: 30 disorder-related (i.e. food-related: e.g. ‘chips’, ‘bread’ and body-related: e.g. ‘waist’, ‘belly’) cue words, and 30 neutral (e.g. ‘filter’) cue words. Cue words were selected using the following procedure: in a first step, 40 food/body-related and 40 neutral words were selected from the CELEX database (Baayen *et al.*, 1996) and matched according to word frequency (i.e. total and relative frequency of occurrence) and word length (i.e. number of letters and syllables). In a second step, we conducted a pilot-study where 12 healthy normal weight participants and 10 patients with Anorexia Nervosa rated each word on a SAM-scale according to valence, arousal, perceived category affiliation (i.e. participants had to indicate which category each word belongs to) and ease of memory retrieval. Our aim was to identify words with similar ratings in both groups. Accordingly, the last step was to select 30 words from each category with the smallest difference in ratings between groups. During the experimental condition, 20 cue-words from both categories were presented for 12sec each, and participants were instructed to recall a past experience. Participants were then asked to rate the retrieved memory in regards to specificity (i.e. specific, categorical, extended or semantic memory) and their valence (negative, somewhat negative, neutral, somewhat positive, positive). Duration of each rating was 10sec. Following each trial, a jittered interval (ranging from 1 to 6sec with a mean duration of 3.5sec) featuring a fixation cross was presented.

Furthermore, a semantic example generation condition was employed to control for abstract or general knowledge retrieval. Specifically, 10 food- and body-related and 10 neutral cue-words were presented for 12sec each, and participants were instructed to think examples related to the presented cue word. Following this, participants had to rate the perceived degree of difficulty to generate examples (very easy, easy, somewhat easy, somewhat difficult, difficult, or very difficult) and the number of examples generated (0,1-2,3-4,5-6,7,or≥8). Duration of rating was 10sec.

In order to control for visual input as well as attention, participants were presented with a riser detection task following the presentation of each cue and each set of ratings. In line with Young et al.(Young *et al.*, 2013), all cue words were scrambled into lowercase non-word letter strings, and participants had to count the number of “risers” in the string (i.e., a letter rising above the top of the other letters, e.g., “cbor” has the riser b). The presentation time was jittered with a mean of 6sec. For 50% of riser-strings (randomly selected), participants had to indicate whether the number of risers in the previous string was even or odd via button press.

The sequence of cue word presentations was pseudorandomized (to prevent sequential presentations of cue-type). The task was divided in 3 runs, each run was composed of 13 (and in one run 14) memory cue words, 6 example generation (and in one run 7) cue words, and 19 riser letter strings. The total duration of the task was 70min. Stimuli were presented and responses recorded using Presentation V18 (Neurobehavioral Systems, Berkeley, Calif., USA).

### fMRI acquisition

Prior to performing the experimental paradigm, participants underwent a resting-state fMRI acquisition lasting 5.2min (120 images). Participants were instructed to keep still with their eyes closed, not to think of anything in particular, and not to fall asleep. Following this, participants performed an AM-task (see above), lasting 70min (1.674 images). The scanning parameters were the same for resting-state fMRI and the AM-task: a T2\*-sensitive single-shot EPI sequence composed of 30 oblique interleaved slices with no interslice gap were collected. Slices were acquired parallel to the AC-PC axis with the following parameters: TR=2,000ms, TE=30ms (which resulted in an in-plane resolution of 3x3x4mm³), flip angle=80°, and field of view=192x192mm with a matrix size of 64x64. Finally, high-resolution T1 MPRAGE anatomical images were acquired (192 slices, voxel size 1x1x1mm³, TR=1.570ms, TE=2.63ms, flip angle=9°, duration 5min) for anatomical reference.

**Analysis of Behavioral Performance.** Data were analysed using SPSS (Version 25; SPSS Inc., Chicago, IL., USA). Group differences in age, BMI, intelligence, symptom ratings, performance on the riser detection and example generation control task, and percentage of memories recalled at each specificity level (specific, categorical, extended, semantic, repeat, no memory, and can’t recall after imaging) were assessed using independent-sample *t* tests. Group differences in AM-recall and example generation were assessed using a two-way mixed ANOVA with between-subjects factor ‘group’ (AN vs. HC) and within-subjects factor ‘category’ (eating disorder related word stimuli vs. neutral word stimuli). Post-hoc tests were performed using two-sample t-tests. To assess group differences in ratings of recalled AMs, i.e. arousal, vividness, valence, as well as age when the memory occurred (>10years, 1 year to 10 years, 6 months to 1 year, recent), independent-sample t-tests were performed separately for food- and body-related as well as neutral words. Associations between the number of specific disorder-related / neutral AMs and neuropsychological (TMT A/B, WMS-R forwards/backwards) as well as psychometric (PHQ-9, EDE-Q, TFEQ, ERQ) test results were assessed using Pearson correlations (Bonferroni correction for multiple testing, *P*=0.05/4=0.0125)

**Resting state data analysis.** Resting-state fMRI data were preprocessed and analyzed using SPM8 (http://www.fil.ion.ucl.ac.uk/spm/software/spm8/). The preprocessing procedure was identical for both resting-state and event-related fMRI data (see above). The TsDiffAna toolbox (http://www.fil.ion.ucl.ac.uk/spm/ext/#TSDiffAna) was used to control for data artefacts. Furthermore, we employed Artifact Detection Tools (http://www.nitrc.org/projects/artifact\_detect) to identify outlier images: head displacement exceeding a threshold of 2-mm normalized movement in any direction or a global mean intensity threshold exceeding three SDs relative to the mean image intensity. Two participants from the HC group showed outlier images that were replaced by mean EPI-images (3 outlier images and 2 outlier images, respectively) and one patient with AN showed two outlier images that were also replaced by the mean image. No participant exceeded head movement of ±4-mm translational motion and ±3° rotation throughout the entire resting-state scan. Following preprocessing, we performed a spatial group independent component analysis(Calhoun *et al.*, 2001) using the Group ICA fMRI Toolbox (GIFT; http://mialab.mrn.org/software/) to identify temporally coherent networks. The dimensionality of rs-fMRI data from each participant was reduced through principal component analysis. Data was decomposed into 25 spatial independent components according to the infomax algorithm(Bell and Sejnowski, 1995). We performed 20 ICA (ICASSO) to ensure stability of components. For each subject, Individual component spatial maps were reconstructed using GICA3 Erhardt EB(Erhardt *et al.*, 2011) and converted to z values. To select components of interest, we performed a spatial correlation using anatomical masks taken from the Willard atlas (RRID:SCR\_014756)(Richiardi *et al.*, 2015). Masks representing the default mode network (including the medial prefrontal cortex, posterior cingulate cortex, retrosplenial cortex and medial temporal lobe), salience network (including the anterior and posterior insula, dorsal anterior cingulate cortex, thalamus, caudatus and putamen) and executive network (left and right dorsolateral prefrontal cortex and bilateral parietal cortex) were used. Components showing the highest correlation with the respective masks were used for subsequent analysis. The obtained components were visualized with a one-sample t-test in SPM8 including age as covariate of no interest (N=59). Group comparison was performed using two-sample t-tests including the individual component images for each network of interest and with age as covariate of no interest. Results significant at P<.05 cluster level FWE-corrected are reported, with a cluster-defining threshold of P<.001 uncorrected and minimal cluster size of k>50. All results were inclusively masked with the corresponding mask of interest.

**fMRI analysis – AM task – MRI-data preprocessing**

To account for magnetic field equilibration, four volumes from the start of each run were excluded from the analysis. Images were pre-processed using the following steps: slice-time correction with reference to the middle slice using Fourier phase-shift interpolation; realignment with maximal allowed translational motion of ±4mm and rotation of ±3°; unwarping to correct for artifacts due to susceptibility-by-movement interactions; coregistration of anatomical images with the mean functional image and subsequent segmentation of anatomical images; normalization of both anatomical and functional images to the standard anatomical Montreal Neurological Institute space using the transformation parameters from the segmentation and bilinear interpolation as implemented in SPM (resulting in a voxel size of 3x3x3mm3 for the functional and 1x1x1mm3 for the anatomical images) and smoothing of functional images with a 8mm full-width half-maximum isotropic Gaussian kernel.

# Supplementary Results

**Table S1:** Increases in BOLD response during the AM task: within group results – healthy controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Contrast / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Specific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| Angular gyrus | 13.5 | <0.001 | 6694 | 48 | -70 | 31 |
| Precuneus | 12.4 | Id. |  | 9 | -58 | 28 |
| Parahippocampal gyrus | 11.0 | Id. |  | -33 | -43 | -8 |
| Middle frontal gyrus | 7.5 | <0.001 | 978 | 24 | 23 | 43 |
| Medial orbitofrontal cortex | 6.7 | <0.001 | 902 | 6 | 50 | -5 |
| Middle temporal gyrus | 6.4 | 0,002 | 241 | 51 | -1 | -23 |
| Cerebellum | 5.4 | 0,007 | 192 | -18 | -88 | -29 |
| *Specific neutral AM vs. neutral example generation* |  |  |  |  |  |  |
| Posterior cingulate cortex | 12.5 | <0.001 | 3654 | 9 | -55 | 28 |
| Angular gyrus | 12.3 | Id. |  | 42 | -76 | 31 |
| Angular gyrus | 11.3 | <0.001 | 573 | -57 | -55 | 40 |
| Medial orbitofrontal cortex | 8.2 | <0.001 | 1192 | 6 | 53 | -2 |
| Middle frontal gyrus | 5.9 | 0,001 | 285 | 27 | 29 | 40 |
| Middle temporal gyrus | 5.2 | 0,016 | 156 | 54 | 2 | -23 |
| *Unspecific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| Posterior cingulate cortex | 9 | <0.001 | 3082 | 3 | -43 | 43 |
| Angular gyrus | 8.5 | Id. |  | 54 | -46 | 40 |
| Superior frontal gyrus | 7.4 | <0.001 | 1666 | 21 | 59 | 4 |
| Middle frontal gyrus | 7.1 | Id. |  | 21 | 23 | 43 |
| Angular gyrus | 5.9 | <0.001 | 276 | -42 | -79 | 34 |
| Parahippocampal gyrus | 4.9 | 0,048 | 84 | 27 | -40 | -5 |
| *Specific food/body-related AM vs. specific neutral AM* |  |  |  |  |  |  |
| N/A |  |  |  |  |  |  |
| *food/body-related example generation vs. neutral example generation* |  |  |  |  |  |  |
| N/A |  |  |  |  |  |  |
| *Specific food/body-related AM vs. unspecific food/body-related AM* |  |  |  |  |  |  |
| Angular gyrus | 5.5 | <0.001 | 363 | 33 | -55 | 10 |
| Precuneus | 5.19 | 0.003 | 228 | 9 | -55 | 46 |
| *Specific neutral AM vs. unspecific neutral AM* |  |  |  |  |  |  |
| Superior / middle temporal gyrus | 5.32 | 0.009 | 166 | -51 | 8 | -20 |
| Middle occipital gyrus / precuneus | 5.08 | 0.047 | 103 | 39 | -64 | 25 |
| Medial frontal gyrus | 5.08 | 0.042 | 107 | -3 | -7 | 61 |
| Precentral gyrus | 5.03 | 0.008 | 169 | -42 | -7 | 58 |
| Anterior cerebellum | 4.96 | 0.042 | 107 | -27 | -49 | -26 |
| Precuneus | 4.79 | 0.001 | 267 | 3 | -58 | 28 |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at PFWE<0.05 are reported, with a cluster-defining threshold of P<.001 uncorrected and minimal cluster size of k>50.

**Table S2:** Increases in BOLD response during the AM task: within group results – patients with anorexia nervosa

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Contrast / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Specific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| Posterior cingulate cortex | 9.6 | <0.001 | 2033 | -12 | -58 | 25 |
| Angular gyrus | 7.8 | <0.001 | 487 | -39 | -73 | 31 |
| Medial orbitofrontal cortex | 7.6 | <0.001 | 836 | 0 | 50 | -8 |
| Angular gyrus | 7.1 | <0.001 | 376 | 45 | -67 | 40 |
| *Specific neutral AM vs. neutral example generation* |  |  |  |  |  |  |
| Posterior cingulate cortex | 10.8 | <0.001 | 2492 | -9 | -55 | 31 |
| Angular gyrus | 8.1 | Id. |  | -45 | -70 | 37 |
| Medial orbitofrontal cortex | 8.2 | <0.001 | 1832 | 3 | 50 | -8 |
| Lateral superior frontal gyrus | 7.7 | Id. |  | 21 | 32 | 43 |
| Angular gyrus | 6.8 | <0.001 | 405 | 48 | -70 | 37 |
| Middle temporal gyrus | 5.9 | 0.028 | 119 | -57 | -19 | -20 |
| *Unspecific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| Angular gyrus | 6.4 | 0.002 | 258 | -39 | -73 | 34 |
| Angular gyrus | 6.1 | <0.001 | 371 | 45 | -70 | 40 |
| Posterior cingulate cortex | 6.0 | <0.001 | 1049 | -3 | -46 | 34 |
| *Specific food/body-related AM vs. specific neutral AM* |  |  |  |  |  |  |
| Medial superior frontal gyrus | 5.6 | 0.007 | 185 | -3 | 56 | 34 |
| Posterior cingulate cortex | 5.3 | 0.002 | 251 | -12 | -49 | 31 |
| *food/body-related example generation vs. neutral example generation* |  |  |  |  |  |  |
| Posterior cingulate cortex | 5.6 | 0.001 | 259 | -6 | -52 | 31 |
| Superior parietal gyrus | 4.3 | Id. |  | -33 | -55 | 61 |
| Medial superior frontal gyrus | 5.1 | <0.001 | 824 | -3 | 59 | 13 |
| Anterior cingulate cortex | 4.8 | Id. |  | -3 | 53 | -2 |
| Lateral superior frontal gyrus | 4.6 | Id. |  | -15 | 62 | 25 |
| *Specific food/body-related AM vs. unspecific food/body-related AM* |  |  |  |  |  |  |
| Precuneus | 5.68 | 0.001 | 303 | 15 | -49 | 22 |
| *Specific neutral AM vs. unspecific neutral AM* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at PFWE<0.05 are reported, with a cluster-defining threshold of P<.001 uncorrected and minimal cluster size of k>50.

**Table S3:** Increases in BOLD response during the AM task:**:** Between group results – Healthy controls (HC) vs. patients with anorexia nervosa (AN)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Contrast / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Specific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| Middle temporal gyrus / Angular gyrus | 5.1 | 0.018 | 157 | 51 | -67 | 19 |
| Precuneus | 4.5 | 0.024 | 144 | 3 | -46 | 46 |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific neutral AM vs. neutral example generation* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| Precentral / postcentral gyrus | 4.7 | 0.003 | 249 | -51 | -7 | 37 |
| *Unspecific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific food/body-related AM vs. specific neutral AM* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN-relevant example generation vs. neutral example generation* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| Right Precentral Gyrus | 5.5 | <0.001 | 2626 | 27 | -7 | 43 |
| Left Precentral Gyrus | 4.9 | Id. |  | -45 | -1 | 49 |
| Occipital cortex | 4.8 | 0.030 | 143 | -36 | -76 | 10 |
| Middle temporal gyrus | 4.5 | 0.011 | 195 | 45 | -67 | 19 |
| *Example generation (food/body-related and neutral) vs. implicit baseline (i.e. riser task)* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific* *food/body-related AM vs. unspecific food/body-related AM* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific neutral AM vs. unspecific neutral AM* |  |  |  |  |  |  |
| *HC > AN* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at *P*FWE<0.05 are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of *k*>50.

**Table S4:** Within group results – Psychophysiological interaction analysis: Whole-brain connectivity with the precuneus during specific food/body-related AM vs. food/body-related example generation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group / Brain regions** | ***t*-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Healthy Controls\** |  |  |  |  |  |  |
| Cerebellum | 11.4 | <0.001 | 417 | 30 | -67 | -32 |
| Right caudate Nucleus | 9.1 | <0.001 | 678 | 18 | -10 | 19 |
| Left Caudate Nucleus | 8.2 |  |  | -18 | -16 | 19 |
| Cerebellum (vermis cerebelli) | 8.6 | <0.001 | 182 | 0 | -55 | -23 |
| Precentral gyrus | 8.5 | <0.001 | 849 | -45 | 8 | 34 |
| Middle frontal gyrus | 8.4 |  |  | -30 | 2 | 55 |
| Supplementary motor area | 7.8 |  |  | -9 | -4 | 64 |
| Medial dorsal cingulate cortex | 7.2 | <0.001 | 147 | -3 | 14 | 43 |
| *Anorexia Nervosa* |  |  |  |  |  |  |
| Inferior frontal gyrus / frontal operculum | 5.1 | <0.001 | 250 | -48 | 32 | 28 |
| Caudate nucleus | 4.7 | 0.002 | 203 | -15 | -4 | 16 |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at *P*FWE<0.05 are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of k>50. \*Within group results of HC reported with a cluster-defining threshold of *P*FWE<0.05 and minimal cluster size of k>50.

**Table S5:** Between group results – Psychophysiological interaction analysis: Whole-brain connectivity with the precuneus during specific food/body-related AM vs. food/body-related example generation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *HC > AN* |  |  |  |  |  |  |
| Posterior cingulate cortex | 4.8 | <0.001 | 289 | -12 | -55 | 25 |
| Middle frontal gyrus | 4.2 | <0.001 | 340 | -21 | 17 | 40 |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |

AM=Autobiographical memory, HC=Healthy controls, AN=Anorexia nervosa, *k*=Cluster size (voxels). Results significant at *P*FWE<0.05 are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of k>50.

**Table S6:** Within group results – Psychophysiological interaction analysis: Whole-brain connectivity with the angular gyrus during specific food/body-related AM vs. food/body-related example generation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group / Brain regions** | ***t*-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Healthy Controls\** |  |  |  |  |  |  |
| Caudatus nucleus | 9.5 | <0.001 | 3136 | 21 | 8 | 10 |
| Inferior frontal operculum | 9.5 | Id. |  | -45 | 17 | 13 |
| Superior frontal gyrus | 9.4 | Id. |  | -12 | 20 | 52 |
| Middle temporal gyrus | 8.3 | <0.001 | 128 | -57 | -16 | -14 |
| Cerebellum | 7.9 | <0.001 | 117 | 30 | -64 | -29 |
| Gyrus rectus / medial orbitofrontal gyrus | 7.6 | <0.001 | 70 | -3 | 41 | -17 |
| *Anorexia Nervosa* |  |  |  |  |  |  |
| Dorsolateral prefrontal cortex | 5.1 | <0.001 | 471 | -57 | 26 | 28 |
| Inferior frontal operculum | 4.5 | Id. |  | -51 | 14 | 19 |
| Supplementary motor area / medial frontal gyrus | 4.7 | 0.003 | 168 | -9 | 17 | 52 |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at PFWE<0.05 are reported, with a cluster-defining threshold of P<.001 uncorrected and minimal cluster size of k>50. \*Within group results of HC reported with a cluster-defining threshold of PFWE<0.05 and minimal cluster size of k>50.

**Table S7:** Between group results – Psychophysiological interaction analysis: Whole-brain connectivity with the angular gyrus during specific food/body-relatedAM vs. food/body-related example generation.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group / Brain regions** | ***t*-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *HC > AN* |  |  |  |  |  |  |
| Inferior frontal gyrus, pars triangularis | 3.9 | 0.004 | 177 | -42 | 29 | 13 |
| Middle frontal gyrus | 3.8 | Id. |  | -30 | 56 | 10 |
| Superior frontal gyrus | 3.8 | Id. |  | -18 | 50 | 10 |
| *AN > HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |

AM=Autobiographical memory, HC=Healthy controls, AN=Anorexia nervosa, *k*=Cluster size (voxels). Results significant at *P*FWE<0.05 are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of k>50.

**Table S8:** Whole-brain regression analysis: Positive correlation with depression scores (PHQ-scale) during specific food/body-related AM vs. food/body-related example generation in Healthy Controls (HC) and patients with Anorexia Nervosa (AN).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *HC* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN* |  |  |  |  |  |  |
| Fusiform gyrus | 4,7 | 0.036 | 114 | -36 | -79 | -14 |
| Lingual gyrus | 4,6 |  |  | -18 | -97 | -14 |
| Posterior cingulate cortex | 4,4 | 0.029 | 123 | 0 | -46 | 25 |

AM=Autobiographical memory, *k*=Cluster size (voxels). Results significant at PFWE<0.05 are reported, with a cluster-defining threshold of P<.001 uncorrected and minimal cluster size of k>50.

**Table S9:** Increases in BOLD response during the AM task: Subgroup analysis – anorexia nervosa restrictive vs. anorexia nervosa purging

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Contrast / Brain regions** | **t-value** | ***P-value*** | ***k*** | **x** | **y** | **z** |
| *Specific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| Thalamus | 5.24 | <0.001 | 410 | 9 | -19 | 16 |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific neutral AM vs. neutral example generation* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Unspecific food/body-related AM vs. food/body-related example generation* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific food/body-related AM vs. specific neutral AM* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *food/body-related example generation vs. neutral example generation* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Example generation (food/body-related and neutral) vs. implicit baseline* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific food/body-related AM vs. unspecific food/body-related AM* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *Specific neutral AM vs. unspecific neutral AM* |  |  |  |  |  |  |
| *AN restrictive > AN purging* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |
| *AN purging > AN restrictive* |  |  |  |  |  |  |
| NA |  |  |  |  |  |  |

AM=Autobiographical memory, AN=Anorexia nervosa, k=Cluster size (voxels). Results significant at *P*FWE<0.05 are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of *k*>50.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table S10: Rating of Specific and Categorical AMs** | | | | |
| **Variable** | **AN**  **(N = 29)** | **HC**  **(N = 30)** | ***t*** | ***Pa*** |
| **Age at memory, Mean (SD)** |  |  |  |  |
| Specific memories, % |  |  |  |  |
| Disorder-related (food / body) |  |  |  |  |
| > 10 y | 3.6 (6.9) | 3.7 (5.3) | 0.104 | n.s. |
| 1y to 10 y | 26.6 (20.1) | 23.2 (21.3) | -0.631 | n.s. |
| 6 mo to 1 y | 10.8 (9.7) | 10.3 (10.4) | -0.184 | n.s. |
| Recent | 59.0 (23.4) | 62.7 (26.3) | 0.574 | n.s. |
| Neutral |  |  |  |  |
| > 10 y | 14.1 (15.8) | 10.3 (13.1) | 1.492 | n.s. |
| 1y to 10 y | 36.1 (18.6) | 31.0 (19.1) | 0.015 | n.s. |
| 6 mo to 1 y | 10.4 (7.9) | 10.4 (8.7) | -1.026 | n.s. |
| Recent | 39.4 (21.8) | 48.2 (23.5) | -1.002 | n.s. |
| Non-specific memories, % |  |  |  |  |
| Disorder-related (food / body) |  |  |  |  |
| > 10 y | 5.3 (10.2) | 16.3 (31.3) | 1.825 | n.s. |
| 1y to 10 y | 39.6 (30.8) | 29.0 (27.3) | -1.405 | n.s. |
| 6 mo to 1 y | 13.2 (17.0) | 13.1 (17.5) | -0.010 | n.s. |
| Recent | 41.9 (29.0) | 41.6 (31.7) | -0.039 | n.s. |
| Neutral |  |  |  |  |
| > 10 y | 17.3 (18.4) | 18.8 (26.4) | 0.245 | n.s. |
| 1y to 10 y | 46.3 (27.7) | 30.6 (27.4) | -2.188 | <0.05 |
| 6 mo to 1 y | 10.7 (16.3) | 9.0 (12.1) | -0.452 | n.s. |
| Recent | 25.7 (21.6) | 35.0 (25.4) | 1.510 | n.s. |

AN=Anorexia nervosa, HC=Healthy controls, The participants indicated how old they were at the time of each memory.

**FIGURE S1:** **Timeline of study participation / Standardized protocol of data**

|  |  |  |
| --- | --- | --- |
| **Timeline of study participation / Standardized protocol of data collection** | | |
| Step 1 | **SCID Interview:** Exploring and making the major DSM-5 diagnoses | 5-20 min |
| Step 2 | **Questionnaire survey:** socio-demographic data, EDE-Q, FEV, PTQ, ERQ, PHQ-9, STAI | 15 min |
| Step 3 | **Cognitive testing:** WIE matrix reasoning, MWT-B, TMT-A/B, WMS digit span forwards / backwards | 15-25 min |
| Step 4 | **AMT:** Explanation of the concept of autobiographical memory as well as its subdivision according to degrees of specificity | 10 min |
| Step 5 | **AMT:** Training of the paradigm on the computer | 10 min |
| Step 6 | **fMRI-measurement:** AMT, example generation, riser task   * **Trial 1:** 14 memories, 6 example generations * **Trial 2:** 14 memories, 6 example generations * **Trial 3:** 14 memories, 6 example generations | 70 min |
| Step 7 | **AMT:** Rating / review of specifity categories post-fMRI | 15 min |
| Total duration | | 150 min |

**FIGURE S2:** **Components of interest resulting from the resting state fMRI analysis.a**



aOne-sample t-test in SPM8 including age as covariate of no interest (entire group, N=59). **a**) Default mode network, correlation with template mask, r = 0.418, composed of regions in the posterior cingulate cortex/retrosplenial cortex, medial prefrontal and temporal cortex, **b**) salience network, correlation with template mask, r = 0.27, consisting of the anterior insula and dorsal anterior cingulate cortex **c**) executive network, correlation with template mask, r = 0.426, significant activations in the bilateral dorsolateral prefrontal and bilateral parietal cortices. Results significant at *P*<.05 cluster level FWE-corrected are reported, with a cluster-defining threshold of *P*<.001 uncorrected and minimal cluster size of k>50. T-maps are inclusively masked with the corresponding mask of interest.

**FIGURE S3:** Graphical depiction of the fMRI-task

**Cue Word**

(12 sec)

**Riser Task**

(avg. 6 sec. jittered)

**Riser:** even/odd?

(2 sec.; following ½ of risers)

**Ratings**

**Cue Word**

(10 sec. each)

**Riser Task**

(avg. 6 sec. jittered)

**Riser:** even/odd?

(2 sec.; following ½ of risers)

First, 20 cue-words from both categories (i.e. neutral, food/body-related) were presented for 12sec each, and participants were instructed to recall a past experience. Second, participants were presented with a riser detection task following the presentation of each cue and each set of ratings, and participants had to indicate whether the risers were even or odd. Following the riser task, participants were then asked to rate the before retrieved memory in regards to specificity (i.e. specific, categorical, extended or semantic memory) and their valence (negative, somewhat negative, neutral, somewhat positive, positive). Duration of each rating was 10sec.

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