

Appendix 1 to Skunde M, Walther S, Simon JJ, et al. Neural signature of behavioural inhibition in women with bulimia nervosa. *J Psychiatry Neurosci* 2016.

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No-go

Methods

Description of the no-go task

For general stimuli, we used pictures of squares and circles of two different sizes and four different colors (see Figure S1A). Before each run, the participants were instructed to press a response button with their right index finger for each square presented (go stimulus) or inhibit their response for every circle (no-go stimulus). For the food blocks, we used food and nonfood (household items, see Figure S1B) pictures. The participants were instructed to press a response button with their right index finger for each household item (go stimulus) and inhibit their response for every food picture (no-go stimulus). In both modalities, each block consisted of 40 stimuli presented in a pseudorandom order with no-go stimuli occurring during 20% of the trials. Before each block, a short visual instruction about the frequent target stimulus of the following block was presented for 2000 ms (i.e., ‘square, frequent’ or ‘household items, frequent’). The first stimulus in a block was always a go stimulus. There were at most two consecutive no-go stimuli in a row. The no-go stimuli in a block had a temporal distance between 1500 and 31500 ms with a mean of 6000 ms. Each block ended with a rest period of 13000 ms, during which subjects viewed a fixation cross on the screen. Each trial had a duration of 1500 ms including 500 ms for the presentation of the stimuli in both conditions. During the inter-trial interval of 1000 ms, a fixation cross was presented.

Image acquisition parameters

The participants wore earplugs, and their heads were stabilized with padding to restrict head motion. The participants viewed the visual stimuli on a projection screen through a mirror on

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the head coil positioned above their eyes. Functional scans depicting the blood oxygenation level-dependent (BOLD) signal used a T2*-weighted, single-shot EPI sequence. Thirty axial slices (4 mm thickness) parallel to the anterior and posterior commissure covering the whole brain were acquired (TR=2000 ms, TE=30 ms, flip angle=80°, interleaved modus, field of view 192x192 mm², 1 mm interslice gap), with an in-plane resolution of 3x3x4 mm³. A T1-weighted sequence (MPRAGE) was used to collect structural scans for detailed anatomical reference (192 slices, 1 mm thick, voxel size=1x1x1 mm³, TR=1570 ms, TE=2.63 ms, flip angle=9°).

Image acquisition and analysis

The first four scans in each run were excluded from the analysis to consider the equilibrium of longitudinal magnetization. Images were manually reoriented to the AC-PC line and slice time corrected. For each participant, each functional EPI scan was then spatially realigned to the mean of all functional images, with the allowed motion limited to ±3 mm translation and to ±3 degree rotation over the whole experiment. Coregistration of the T1 image with the mean T2*-image was performed, as well as normalization of functional and anatomical images to a standard MNI template brain (ICBM152, Montreal Neurological Institute, MNI). Finally, the functional images were spatially smoothed using an 8 mm full-width half-maximum isotropic Gaussian kernel to increase the signal-to-noise ratio.

On the first-level analysis there were four inhibition-related regressors of interest based on the correct go and no-go trials in both conditions: go_square, no-go_circle, go_nonfood, no-go_food. Incorrect responses were modeled as regressors of no interest: go_square-incorrect,

no-go_circle–incorrect, go_nonfood–incorrect, no-go_food–incorrect, as well as the instruction and rest period. The six movement parameters (translation and rotation) generated during realignment were entered as regressors in the GLM. To compare differences in the hemodynamic response associated with response inhibition, we contrasted general no-go trials and food no-go trials, respectively, with general go trials and food go trials (no-go_circle–go_square, no-go_food–go_nonfood).

Results

Table S1

Clinical data of the two BN subgroups

	Low-BN	High-BN (n=14)		
	(n=14)	M (S.D.) or %	<i>t-value</i>	<i>p</i>
BDI-II total score	23.46 (9.73)	27.79 (14.71)	-0.917	0.368
DEBQ - Restrained Eating	29.93 (6.08)	27.86 (9.26)	0.699	0.491
DEBQ - Emotional Eating	25.25 (8.06)	31.64 (6.90)	-2.254	0.033
DEBQ - External Eating	21.86 (6.48)	28.43 (6.76)	-2.627	0.014
BIS-11 total score	59.07 (8.21)	64.77 (9.09)	-1.711	0.100
BIS-11 - Attentional impulsiveness	16.93 (3.67)	18.92 (3.62)	-1.421	0.168
BIS-11 - Motor impulsiveness	18.43 (3.78)	19.62 (3.62)	-0.832	0.413
BIS-11 - Non-planning impulsiveness	23.71 (5.69)	26.23 (4.27)	-1.292	0.208
Objective binge eating episodes per week	1.50 (0.65)	5.93 (1.50)	-10.109	< 0.001
Purging-type BN (self-induced vomiting, laxative misuse, diuretics) (%)	78.57	92.86	-1.063	0.297
Duration of disorder (years)	8.58 (11.57)	11.90 (11.32)	-0.745	0.463

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Antidepressants:	14.30	35.70	-1.302	0.204
SSRI (%)	14.30	21.43	-0.478	0.637
Sertraline 50 mg (%)	7.14	7.14		
Citalopram 20 mg (%)	7.14	-		
Fluoxetine 30 mg (%)	-	7.14		
Fluoxetine 40 mg (%)	-	7.14		
SSRI (Paroxetine 20 mg) + tricyclic antidepressant (Opipramol 100 mg) (%)	-	7.14		
SSRI (Fluoxetine 30 mg) + NaSSA (Mirtazapin 30 mg)	-	7.14		
Current psychotherapy (%)	57.14	50.00	0.366	0.717

Significant differences between the two bulimia nervosa subgroups are given in bold font.

Low-BN: bulimia nervosa with low binge eating frequency; High-BN: bulimia nervosa with high binge eating frequency; n=sample size; M=mean; S.D.=standard deviation; BDI=Beck Depression Inventory-II; DEBQ=Dutch Eating Behavior Questionnaire; BIS-11=Barratt Impulsiveness Scale; SSRI=Selective serotonin reuptake inhibitors; NaSSA=Noradrenergic and specific serotonergic antidepressants. Degrees of freedom for the *t-test* = 26.

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Table S2

Group differences regarding behavioral performance in the no-go task of the two BN subgroups

Measure	Low-BN (n=14)	High-BN (n=14)	<i>t-value</i>	<i>p</i>
	M (S.D.)	M (S.D.)		
Correct(%)_go_square	99.22 (1.63)	98.86 (2.25)	0.488	0.630
Correct(%)_no-go_circle	77.68 (12.52)	76.56 (12.56)	0.235	0.816
Correct(%)_go_nonfood	99.27 (1.17)	97.66 (4.63)	1.268	0.216
Correct(%)_no-go_food	78.79 (9.55)	79.02 (7.87)	-0.068	0.947
Mean_RT(ms)_go_square	361.82 (33.58)	355.90 (49.51)	0.370	0.714
Mean_RT(ms)_no-go_circle	330.15 (42.42)	321.89 (57.18)	0.434	0.668
Mean_RT(ms)_go_nonfood	417.63 (40.81)	407.96 (41.47)	0.622	0.539
Mean_RT(ms)_no-go_food	397.05 (63.82)	382.46 (52.86)	0.659	0.516

Low-BN: bulimia nervosa with low binge eating frequency; High-BN: bulimia nervosa with high binge eating frequency; RT=reaction time; ms=milliseconds; n=sample size; M=mean; S.D.=standard deviation. Degrees of freedom for the *t-test* = 26.

Table S3

Regional brain activation of the healthy control group (n=29) during performance of the general no-go task

Region	Laterality	t-value	MNI coordinates			BA	Cluster size
			x	y	z		
Precentral gyrus	R	12.24	48	8	30	6	1172
Insula/ putamen	R	9.94	30	20	6	48	
Supplementary motor area	R	9.08	6	8	52	6	
Postcentral gyrus	R	11.60	48	-31	50	40	608
Superior parietal lobe	R	10.08	42	-43	58	40	
Inferior parietal lobe	R	8.93	30	-52	46	7	
Inferior occipital gyrus	L	10.21	-36	-76	-6	19	374
	L	9.55	-42	-67	-10	19	
Fusiform gyrus	L	8.99	-39	-52	-14	37	
Inferior temporal gyrus	R	9.89	45	-55	-14	37	387
Fusiform gyrus	R	9.84	39	-49	-14	37	
Inferior occipital gyrus	R	8.84	39	-67	-6	19	
Inferior parietal lobe	L	9.61	-33	-43	46	40	202
	L	8.28	-42	-37	42	40	
Superior parietal lobe	L	7.08	-24	-61	50	7	
Middle frontal gyrus	R	7.91	39	35	26	9	113
	R	7.22	48	38	22	9	

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Insula	L	7.73	-30	17	2	48	52
Middle frontal gyrus	L	7.02	-42	35	30	9	31
	L	6.43	-36	44	26	9	
Thalamus	R	6.78	6	-22	-2		13
Supramarginal gyrus	L	6.73	-63	-43	26	40	12
Precentral gyrus	L	6.63	-48	-1	46	4	40
	L	6.62	-45	5	30	6	
Inferior frontal gyrus	L	6.21	-36	5	26	6	

All results $p < 0.05$ cluster level uncorrected (cluster defining threshold $p < 0.05$ FWE corrected), cluster size $k > 10$ voxels. BA=Brodman Area; L=left; R= right; MNI=Montreal Neurological Institute.

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Table S4

Regional brain activation of the healthy control group (n=29) during performance of the food no-go task

Region	Laterality	t-value	MNI coordinates			BA	Cluster size
			x	y	z		
Angular gyrus	R	13.05	30	-52	42	7	758
Supramarginal gyrus	R	10.86	60	-40	26	40	
Superior occipital gyrus	L	8.75	24	-64	42	7	
Insula/ putamen	R	12.99	33	14	2	48	1280
Supplementary motor area	R	8.78	6	11	50	6	
Midcingulate gyrus	R	8.66	9	14	42	32	
Insula	L	11.68	-33	17	-2	48	213
Fusiform gyrus	L	11.63	-39	-52	-18	37	301
Inferior temporal gyrus	L	9.05	-42	-61	-10	37	
Inferior occipital gyrus	L	7.73	-36	-76	-6	19	
Fusiform gyrus	R	9.91	36	-61	-10	37	243
	R	9.11	30	-43	-14	37	
Hippocampus	R	7.81	24	-31	-2		
Cerebellar vermis	R	8.59	0	-58	-30		18
Midcingulate gyrus	R	8.52	6	-28	26	23	87
Midcingulate gyrus	L	8.21	-6	-31	30	23	
Thalamus	L	7.76	-3	-22	-6		67

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Thalamus	R	7.18	9	-16	2		
Thalamus	L	6.37	-9	-13	-2		
Superior occipital gyrus	R	6.55	-18	-64	38	7	82
Inferior parietal lobe	L	6.51	-27	-55	46	7	

All results $p < 0.05$ cluster level uncorrected (cluster defining threshold $p < 0.05$ FWE corrected), cluster size $k > 10$ voxels. BA=Brodman Area; L=left; R=right; MNI=Montreal Neurological Institute.

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Table S5

Regional brain activation of the bulimia nervosa group (n=28) during performance of the general no-go task

Region	Laterality	t-value	MNI coordinates			BA	Cluster size
			x	y	z		
Inferior parietal lobe	R	8.47	48	-34	46	40	229
	R	7.60	42	-40	50	40	
	R	7.14	36	-49	54	7	
Insula/ putamen	R	8.42	30	20	6	48	60
	R	7.17	36	11	-6	48	
	R	6.12	27	17	-14	48	
Supplementary motor area	L	8.40	3	11	50	32	90
	L	7.03	-6	11	46	32	
Inferior temporal gyrus	R	8.22	45	-64	-10	37	130
Inferior occipital gyrus	R	6.01	36	-85	-2	18	
Superior frontal gyrus	R	8.00	18	-1	66	6	212
Inferior frontal gyrus	R	7.25	51	5	22	6	
Inferior parietal lobe	L	7.80	-39	-43	42	40	82
	L	7.25	-33	-49	50	40	
Putamen	L	7.72	-27	14	2	48	23
Inferior occipital gyrus	L	7.62	-36	-88	-6	19	113
Fusiform gyrus	L	7.58	-39	-61	-14	37	

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Inferior occipital gyrus	L	6.40	-42	-76	-6	19	
Middle frontal gyrus	R	7.41	39	32	30	46	38
Middle frontal gyrus	L	7.10	-30	-4	50	6	60
Precentral gyrus	L	6.61	-51	-1	46	6	
	L	6.52	-39	-4	46	6	
Superior parietal lobe	L	6.85	-21	-61	50	7	26
Superior temporal lobe	R	6.70	51	-43	14	41	36
Supramarginal gyrus	R	6.22	51	-46	26	48	
Supramarginal gyrus	R	5.91	63	-37	26	48	

All results $p < 0.05$ cluster level uncorrected (cluster defining threshold $p < 0.05$ FWE corrected), cluster size $k > 10$ voxels. BA=Brodmann Area; L=left; R= right; MNI=Montreal Neurological Institute.

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Table S6

Regional brain activation of the bulimia nervosa group (n=28) during performance of the food no-go task

Region	Laterality	t-value	MNI coordinates			BA	Cluster size
			x	y	z		
Fusiform gyrus	R	9.17	36	-49	-14	37	283
	R	8.34	33	-58	-10	37	
	R	7.57	39	-76	-14	19	
Precentral gyrus	R	9.14	45	8	30	6	234
	R	7.53	39	2	50	6	
Middle frontal gyrus	R	7.04	27	5	50	6	
Inferior parietal lobe	R	8.79	48	-37	50	40	278
Angular gyrus	R	7.43	30	-58	42	7	
Superior parietal lobe	R	6.72	30	-67	54	7	
Fusiform gyrus	L	8.65	-42	-58	-22	37	344
	L	8.55	-33	-76	-14	19	
	L	8.53	-33	-58	-14	37	
Putamen	R	8.47	30	17	-2	48	199
Insula	R	7.35	30	17	-14	48	
Inferior frontal gyrus	R	6.68	27	29	-14	47	
Supplementary motor area	L	7.98	3	11	50	6	89
Supplementary motor area	R	7.79	12	5	66	6	20

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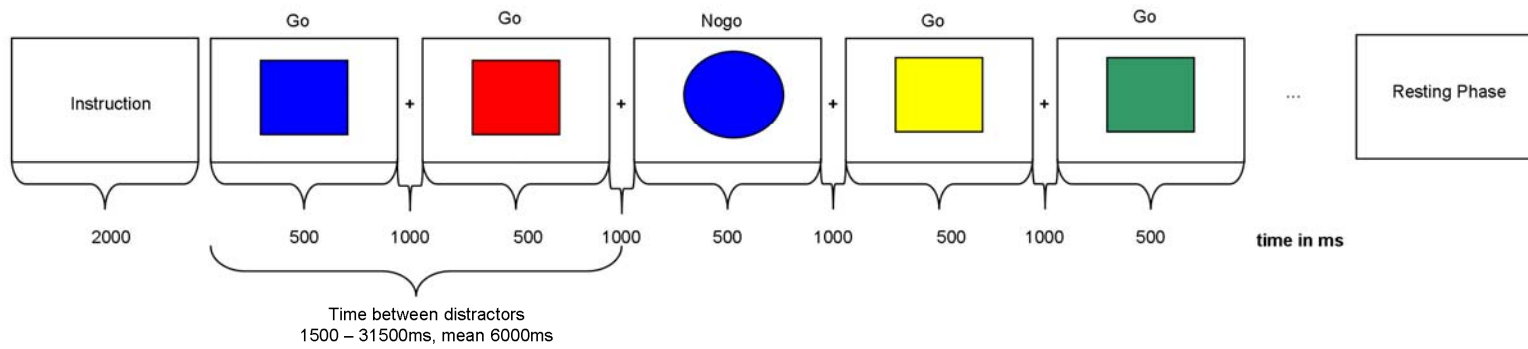
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Insula	L	7.38	-33	17	6	48	48
Midcingulate gyrus	R	7.34	6	-31	26	23	30
Superior parietal lobe	L	7.30	-24	-64	42	7	29
Midcingulate gyrus	L	7.06	-3	-10	30	23	23
Midcingulate gyrus	R	6.71	3	2	30	23	
	R	6.42	6	-16	30	23	

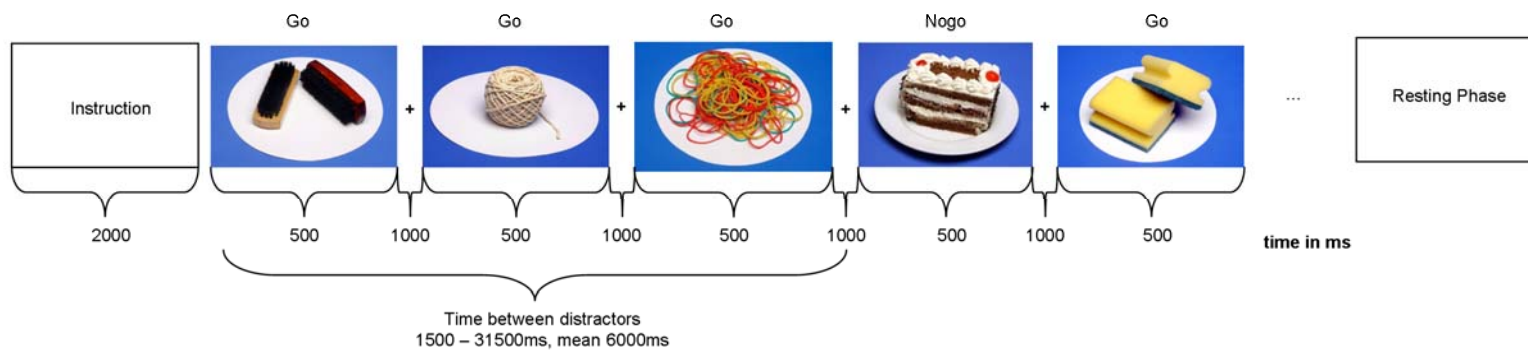
All results $p < 0.05$ cluster level uncorrected (cluster defining threshold $p < 0.05$ FWE corrected), cluster size $k > 10$ voxels. BA=Brodmann Area; L=left; R= right; MNI=Montreal Neurological Institute.

Figure S1: Graphical depiction of the no-go task

A General nogo task



B Food-specific nogo task



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A. Trial design of the general (nonfood) no-go task. For general stimuli, we used pictures of squares and circles of two different sizes and four different colors. The participants were instructed to press a response button for each square presented (go stimulus) and inhibit their response for every circle (no-go stimulus). B. Trial design of the food-specific no-go task. For the food blocks, we used food and nonfood (household items) pictures. The participants were instructed to press a response button for each household item presented (go stimulus) and inhibit their response for every food picture (no-go stimulus).