nature research

https://doi.org/10.1038/s41593-020-00742-z

Supplementary information

Acute social isolation evokes midbrain craving responses similar to hunger

In the format provided by the authors and unedited

Supplementary Material

Acute social isolation evokes midbrain craving responses similar to hunger.

Livia Tomova [1*], Kimberly L. Wang [1], Todd Thompson [1], Gillian A. Matthews [3], Atsushi Takahashi [2], Kay M. Tye, [3], Rebecca Saxe [1,2,4]

Affiliations:
[1]Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts.
[2]McGovern Institute for Brain Research, Massachusetts Institute of Technology, Cambridge, Massachusetts.
[3]Salk Institute for Biological Studies, La Jolla, California.
[4]Center for Brains, Minds and Machines, Massachusetts Institute of Technology, Cambridge, Massachusetts.

[*]Correspondence to: Livia Tomova, tomova@mit.edu

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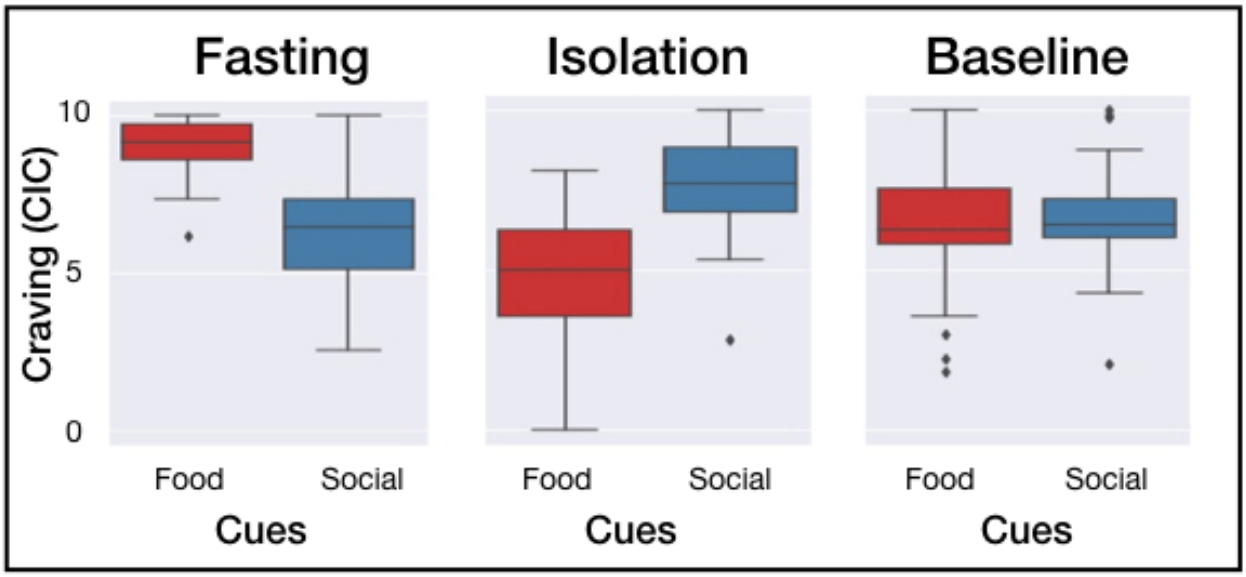
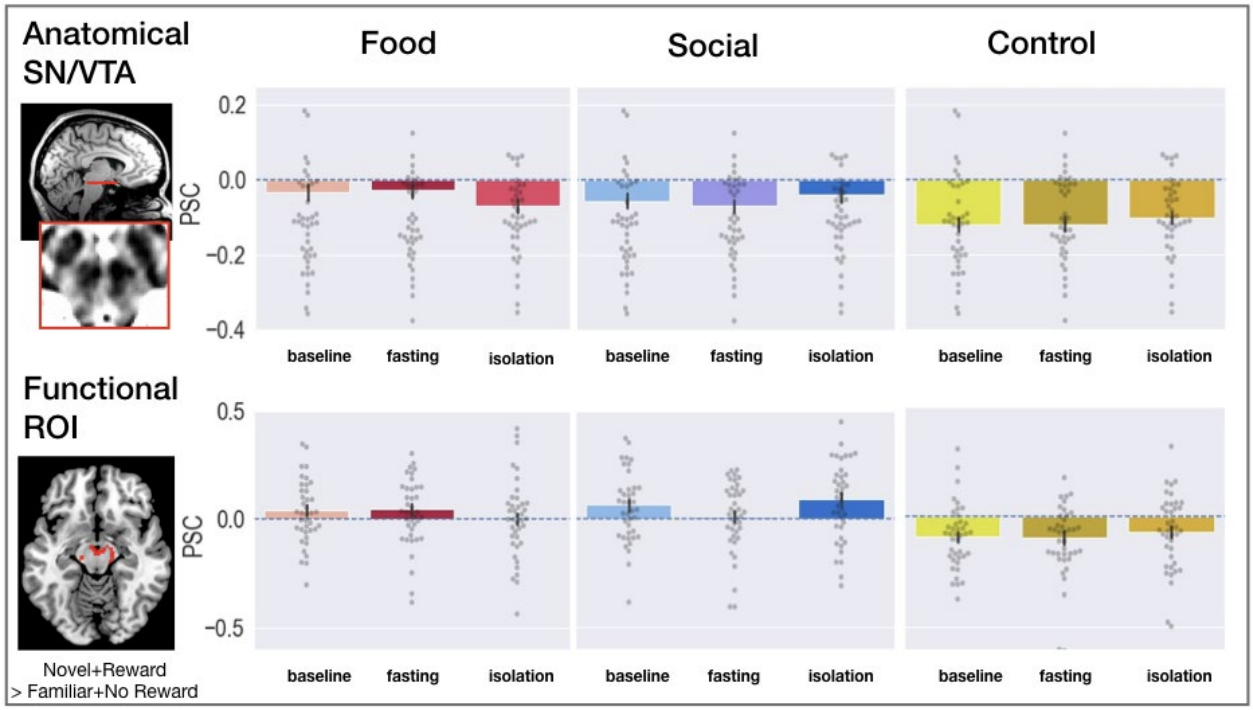
Supplementary Figures

Craving ratings all sessions



Supplementary Figure 1. Craving ratings (n = 40) during the cue induced craving task in response to food cues and social cues for each session. The boxplots in indicate the median (dark center line), the interquartile range (IQR; box) and the 1.5 IQR minima and maxima (whiskers). Datapoints outside the whiskers are shown as individual data points.

SN/VTA: Full data for all sessions and all cues

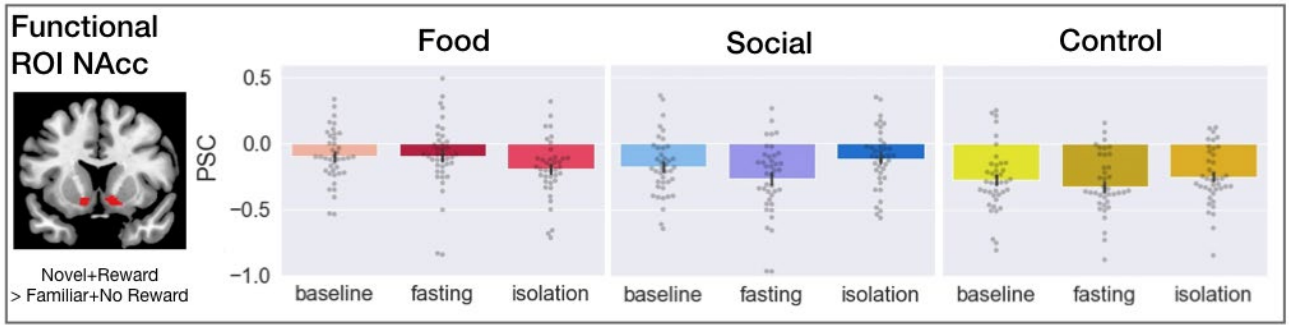


Supplementary Figure 2. Full data (n = 40): Univariate activity in the SN/VTA (upper row)[1] and the midbrain functional ROI (lower row), for all cues and all sessions. The bar plots depict the mean beta values for food, social and control cues. The grey dots indicate individual data points and the error bars indicate standard errors of the mean. The dashed blue horizontal line indicates zero.

[1] Please note that the sign of the activation depends on the implicit baseline when modeling the data which makes the absolute value difficult to interpret (for a discussion on this issue, see Stark & Squire 2001[1]). When compared to the control condition (flower images), we see the expected higher activation in response to the craving cues (food and social).

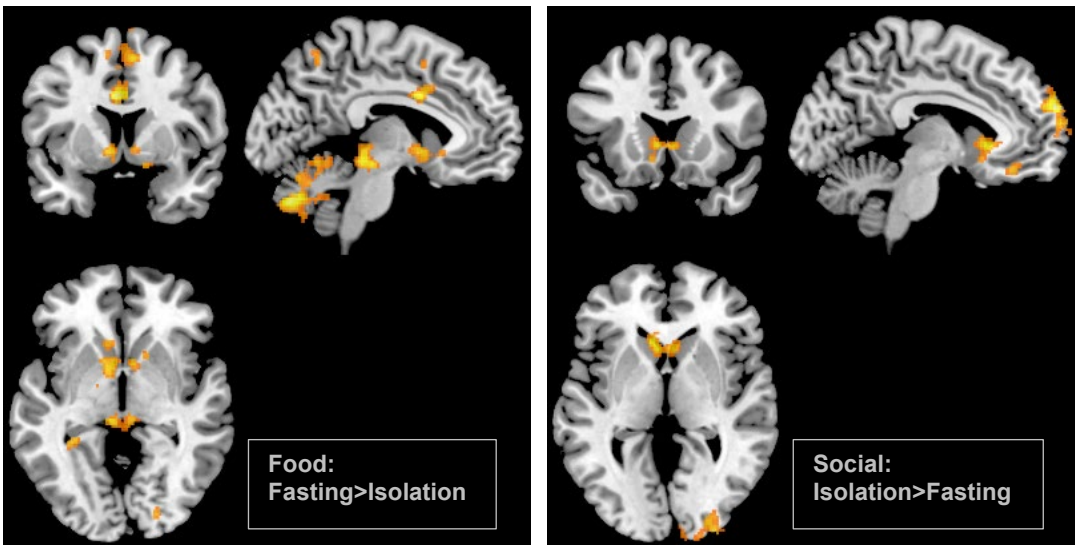
1 Stark, C. E. L. & Squire, L. R. When zero is not zero: The problem of ambiguous baseline conditions in fMRI. *Proceedings of the National Academy of Sciences* **98**, 12760-12766, doi:10.1073/pnas.221462998 (2001).

NAcc – functional ROI: Full data for all sessions and all cues



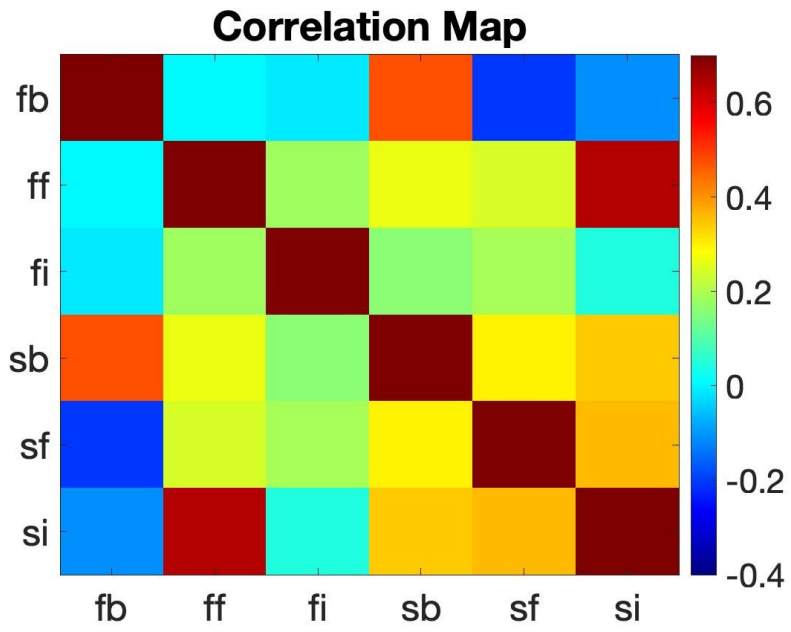
Supplementary Figure 3. Univariate activity in the NAcc functional ROI for all cues and all sessions (n = 40). The bar plots depict the mean beta values for food, social and control cues. The dots indicate individual data points and the error bars indicate standard errors of the mean.

Group level whole brain: session * cue interaction



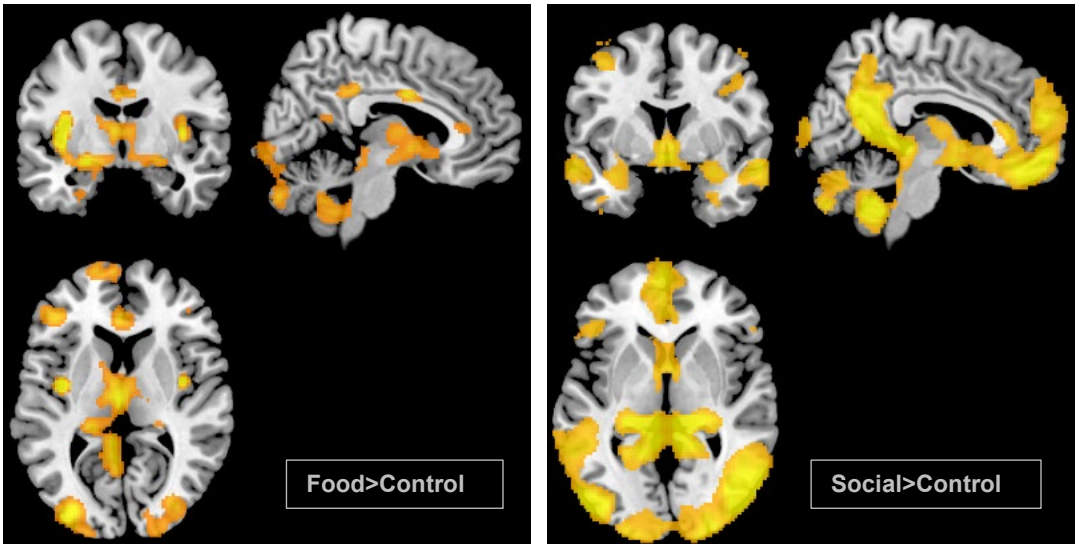
Supplementary Figure 4. Univariate group-level activity cluster-level corrected over the whole brain (n = 40). Left: contrast food>control: fasting > isolation; Right: contrast social>control: isolation > fasting. Tables 21 (food > control) and 22 (social > control) show the results for this analysis.

Correlations between craving ratings



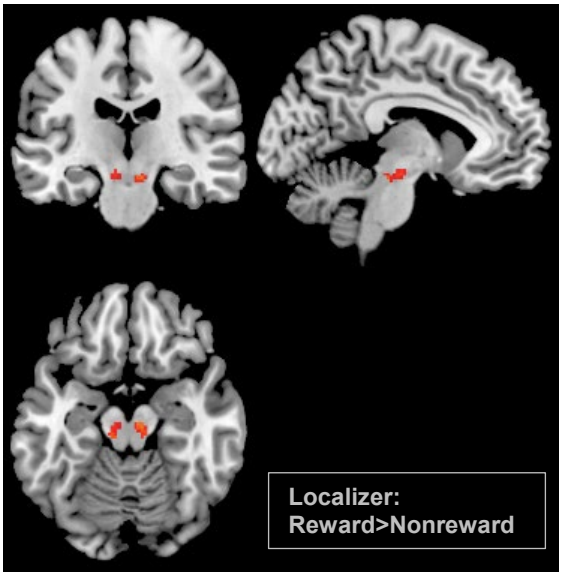
Supplementary Figure 5. Correlations between craving ratings during the cue induced craving task for each session (n = 40). fb = food craving, baseline session; ff = food craving, fasting session; fi = food craving, isolation session; sb = social craving, baseline session; sf = social craving, fasting session; si = social craving, isolation session.

Group level whole brain: main of effects of cue



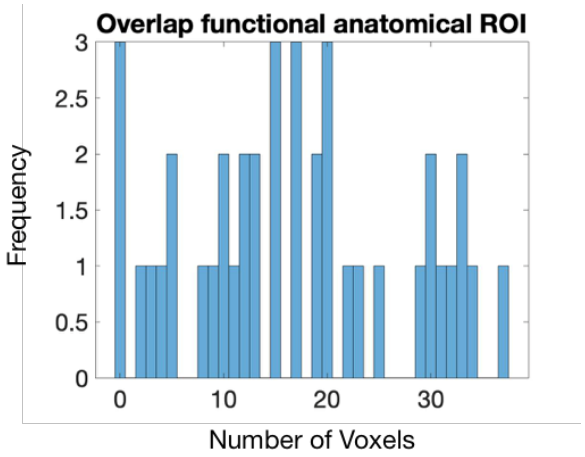
Supplementary Figure 6. Univariate whole brain group-level activity family-wise error corrected at the voxel level (n = 40) : Left: contrast food>control (mean across all sessions: baseline, fasting, isolation). Right: social>control (mean across all sessions). Table 23 shows the results for this analysis.

Midbrain localizer: group analysis

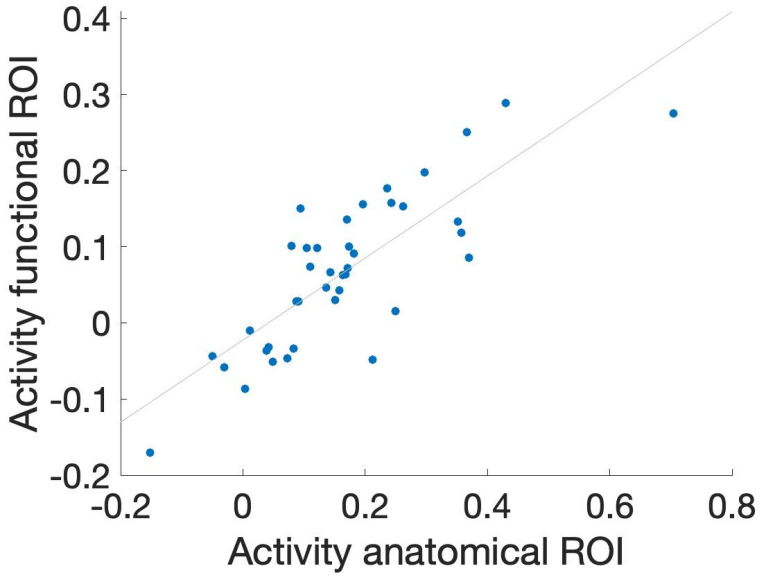


Supplementary Figure 7. Univariate group-level activity in the midbrain localizer task within the midbrain for the contrast reward > nonreward (n = 40). All voxels with $p<0.001$ within the midbrain are displayed (no correction for multiple comparisons).

Comparison anatomical and functional SN/VTA ROIs



Supplementary Figure 8. Number of overlapping voxels between the functional and anatomical midbrain ROI (n = 40). The overlap ranged between 0-30 voxels out of a possible 100 voxels.



Supplementary Figure 9. Correlation between activity in functional and anatomical ROIs across subjects (n = 40).

Supplementary Tables

Results: SN/VTA

Fasting vs Isolation contrast, anatomical SN/VTA

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.009	1.2	0.230
Cue: Food	0.08	7.0	3.13e-11
Cue: Social	0.06	5.2	4.28e-7
Interaction: session – cue (food)	-0.03	-4.0	0.0005
Interaction: session – cue (social)	0.006	0.6	0.535

Supplementary Table 1. *Output mixed effects model: Fasting vs. Isolation contrast, SN/VTA anatomical ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Fasting vs Isolation contrast, midbrain functional ROI

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.006	0.36	0.720
Cue: Food	0.11	6.7	1.60e-10
Cue: Social	0.13	7.2	1.04e-11
Interaction: session – cue (food)	-0.03	-3.3	0.001
Interaction: session – cue (social)	0.03	2.5	0.015

Supplementary Table 2. *Output mixed effects model: Fasting vs. Isolation contrast, midbrain functional ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Fasting and Isolation compared to baseline session, anatomical SN/VTA

Predictors	Estimates	t	p
Session: Fasting	0.01	0.3	0.795
Session: Isolation	0.01	0.7	0.496
Cue: Food	0.09	4.0	8.06e-5
Cue: Social	0.06	3.0	0.003
Interaction: session (fasting) – cue (food)	0.005	0.2	0.836
Interaction: session (isolation) – cue (food)	-0.05	-2.1	0.038
Interaction: session (fasting) – cue (social)	-0.01	-0.6	0.576
Interaction: session (isolation) – cue (social)	-0.002	-0.1	0.941

Supplementary Table 3. *Output mixed effects model: Fasting and Isolation compared to Baseline, SN/VTA anatomical ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Fasting and Isolation compared to baseline session, midbrain functional ROI

Predictors	Estimates	t	p
Session: Fasting	0.005	0.2	0.857
Session: Isolation	0.02	0.6	0.531
Cue: Food	0.14	5.2	2.67e-7
Cue: Social	0.16	5.8	1.14e-8
Interaction: session (fasting) – cue (food)	0.004	0.14	0.900
Interaction: session (isolation) – cue (food)	-0.06	-2.4	0.018
Interaction: session (fasting) – cue (social)	-0.05	-1.8	0.070
Interaction: session (isolation) – cue (social)	0.004	0.14	0.900

Supplementary Table 4. *Output mixed effects model: Fasting and Isolation compared to Baseline, midbrain functional ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Putamen

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.003	0.3	0.751
Cue: Food	0.024	1.8	0.077
Cue: Social	-0.006	-0.4	0.673
Interaction: session * cue (food)	-0.033	-3.2	0.002
Interaction: session * cue (social)	0.016	1.4	0.173

Supplementary Table 5. *Output mixed effects model: Fasting vs. Isolation contrast, Putamen ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	0.004	0.1	0.886
Session: Isolation	0.012	0.4	0.676
Cue: Food	0.047	2.2	0.031
Cue: Social	0.011	0.6	0.535
Interaction: session (fasting) – cue (food)	0.010	0.3	0.742
Interaction: session (isolation) – cue (food)	-0.060	-2.5	0.012
Interaction: session (fasting) – cue (social)	-0.033	-1.2	0.222
Interaction: session (isolation) – cue (social)	-0.002	-0.1	0.935

Supplementary Table 6. *Output mixed effects model: Fasting and Isolation compared to Baseline, Putamen ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

NAcc

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.033	1.9	0.060
Cue: Food	0.128	6.4	1.09e-9
Cue: Social	0.114	5.2	3.70e-7
Interaction: session * cue (food)	-0.080	-4.7	4.51e-6
Interaction: session * cue (social)	0.038	2.1	0.040

Supplementary Table 7. *Output mixed effects model: Fasting vs. Isolation contrast, NAcc ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	-0.051	-1.2	0.241
Session: Isolation	0.020	0.5	0.643
Cue: Food	0.161	5.7	2.87e-8
Cue: Social	0.104	3.3	0.001
Interaction: session (fasting) – cue (food)	0.048	1.1	0.260
Interaction: session (isolation) – cue (food)	-0.113	-3.0	0.004
Interaction: session (fasting) – cue (social)	-0.028	-0.8	0.455
Interaction: session (isolation) – cue (social)	0.050	1.3	0.192

Supplementary Table 8. *Output mixed effects model: Fasting and Isolation compared to Baseline, NAcc ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

NAcc – exploratory functional ROI

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.030	1.6	0.122
Cue: Food	0.142	6.1	4.70e-9
Cue: Social	0.100	4.2	3.40e-5
Interaction: session * cue (food)	-0.090	-4.3	2.23e-5
Interaction: session * cue (social)	0.038	1.9	0.061

Supplementary Table 9. *Output mixed effects model: Fasting vs. Isolation contrast, NAcc functional ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	-0.042	-0.9	0.384
Session: Isolation	0.020	0.4	0.657
Cue: Food	0.176	6.1	2.71e-9
Cue: Social	0.100	3.3	0.001
Interaction: session (fasting) – cue (food)	0.052	1.1	0.292
Interaction: session (isolation) – cue (food)	-0.121	-3.0	0.004
Interaction: session (fasting) – cue (social)	-0.040	-1.0	0.315
Interaction: session (isolation) – cue (social)	0.040	1.0	0.322

Supplementary Table 10. *Output mixed effects model: Fasting and Isolation compared to Baseline, NAcc functional ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Caudate

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	-0.003	-0.2	0.849
Cue: Food	0.058	4.0	8.49e-5
Cue: Social	0.023	1.3	0.181
Interaction: session * cue (food)	-0.025	-1.9	0.061
Interaction: session * cue (social)	0.035	3.0	0.003

Supplementary Table 11. *Output mixed effects model: Fasting vs. Isolation contrast, Caudate ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	0.011	0.3	0.740
Session: Isolation	0.006	0.2	0.860
Cue: Food	0.077	4.0	8.12e-5
Cue: Social	0.010	0.5	0.614
Interaction: session (fasting) – cue (food)	0.007	0.2	0.832
Interaction: session (isolation) – cue (food)	-0.044	-2.0	0.053
Interaction: session (fasting) – cue (social)	-0.022	-0.8	0.440
Interaction: session (isolation) – cue (social)	0.048	2.2	0.033

Supplementary Table 12. *Output mixed effects model: Fasting and Isolation compared to Baseline, Caudate ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Orbitofrontal cortex (OFC)

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	-0.006	-0.2	0.857
Cue: Food	0.249	5.5	1.26e-7
Cue: Social	0.968	12.5	1.09e-27
Interaction: session * cue (food)	-0.033	-1.0	0.337
Interaction: session * cue (social)	0.112	2.5	0.0121

Supplementary Table 13. *Output mixed effects model: Fasting vs. Isolation contrast, OFC ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	0.079	1.0	0.311
Session: Isolation	0.078	1.0	0.330
Cue: Food	0.288	4.6	6.35e-6
Cue: Social	0.897	9.5	2.56e-19
Interaction: session (fasting) – cue (food)	-0.006	-0.1	0.926
Interaction: session (isolation) – cue (food)	-0.072	-0.8	0.416
Interaction: session (fasting) – cue (social)	-0.041	-0.5	0.601
Interaction: session (isolation) – cue (social)	0.184	2.1	0.039

Supplementary Table 14. *Output mixed effects model: Fasting and Isolation compared to Baseline, OFC ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Amygdala

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.026	1.4	0.160
Cue: Food	0.145	6.4	1.04e-9
Cue: Social	0.259	9.2	1.78e-17
Interaction: session * cue (food)	-0.035	-1.9	0.055
Interaction: session * cue (social)	0.019	1.0	0.334

Supplementary Table 15. *Output mixed effects model: Fasting vs. Isolation contrast, Amygdala ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	-0.022	-0.6	0.548
Session: Isolation	0.029	0.7	0.463
Cue: Food	0.142	5.3	1.89e-7
Cue: Social	0.275	6.6	1.78e-10
Interaction: session (fasting) – cue (food)	0.037	0.7	0.300
Interaction: session (isolation) – cue (food)	-0.032	-0.8	0.404
Interaction: session (fasting) – cue (social)	-0.035	-0.9	0.391
Interaction: session (isolation) – cue (social)	0.003	0.1	0.941

Supplementary Table 16. *Output mixed effects model: Fasting and Isolation compared to Baseline, Amygdala ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Insula

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.015	0.8	0.433
Cue: Food	0.165	7.1	1.47e-11
Cue: Social	-0.223	-9.6	9.81e-19
Interaction: session * cue (food)	-0.034	-2.0	0.052
Interaction: session * cue (social)	-0.021	-1.0	0.324

Supplementary Table 17. *Output mixed effects model: Fasting vs. Isolation contrast, Insula ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	0.020	0.6	0.583
Session: Isolation	0.051	1.1	0.266
Cue: Food	0.196	6.6	1.26e-10
Cue: Social	-0.186	-5.5	6.36e-8
Interaction: session (fasting) – cue (food)	0.004	0.1	0.924
Interaction: session (isolation) – cue (food)	-0.065	-1.8	0.070
Interaction: session (fasting) – cue (social)	-0.016	-0.4	0.701
Interaction: session (isolation) – cue (social)	-0.057	-1.4	0.151

Supplementary Table 18. *Output mixed effects model: Fasting and Isolation compared to Baseline, Insula ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Anterior Cingulate Cortex (ACC)

Fasting vs Isolation contrast

Predictors	Estimates	t	p
Session: Isolation > Fasting	0.007	0.3	0.766
Cue: Food	0.117	3.6	0.0004
Cue: Social	0.034	1.0	0.337
Interaction: session * cue (food)	-0.073	-2.9	0.005
Interaction: session * cue (social)	-0.007	-0.3	0.787

Supplementary Table 19. *Output mixed effects model: Fasting vs. Isolation contrast, ACC ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Comparison to baseline session

Predictors	Estimates	t	p
Session: Fasting	0.034	0.6	0.542
Session: Isolation	0.057	1.1	0.253
Cue: Food	0.139	3.4	0.0008
Cue: Social	0.022	0.5	0.634
Interaction: session (fasting) – cue (food)	0.052	1.1	0.273
Interaction: session (isolation) – cue (food)	-0.095	-1.8	0.078
Interaction: session (fasting) – cue (social)	0.019	0.3	0.736
Interaction: session (isolation) – cue (social)	0.005	0.1	0.908

Supplementary Table 20. *Output mixed effects model: Fasting and Isolation compared to Baseline, ACC ROI.* Results are shown for a mixed effects regressions (using Matlab 2019b's *fitlme* function) to estimate the fixed effects of cue, deprivation session, and their interaction on response magnitude in the ROI, controlling for each session's average framewise displacement (i.e. head motion), with participant included as a random effect with both random intercepts and random slopes. The reported p-values (two-tailed) are not corrected for multiple comparisons.

Group level whole brain: session * cue interaction

Area	MNI coordinates cluster peak			t value
	x	y	z	
Right cerebellum	14	-48	-46	5.90
Left anterior cingulate cortex	-4	6	32	5.21
Right occipital cortex	26	-84	20	5.11
Left cerebellum	-24	-68	-52	5.06
Left superior parietal cortex	-26	-82	48	4.74
Left midbrain (periaqueductal gray)	-8	-30	-12	4.73
Left amygdala	-18	-2	-10	4.72
Right premotor cortex	4	-2	72	4.60
Left dorsolateral prefrontal cortex	-30	38	30	4.57
Left superior parietal cortex	-14	-54	62	4.52
Right nucleus accumbens	14	12	-10	4.46
Right superior parietal cortex	20	-54	60	4.06

Supplementary Table 21. *Group level whole brain session * cue interaction - Food: Fasting > Isolation.* Flexible factorial model using the first-level contrasts food > control and social > control from each session. Statistical inference was performed using a threshold of $p < 0.05$ corrected for multiple comparisons over the whole brain, using cluster-level correction. Supplementary Figure 4 (left) depicts the results from this table.

Area	MNI coordinates cluster peak			t value
	x	y	z	
Left dorsomedial prefrontal cortex	-10	64	24	5.93
Right occipital cortex	34	-96	6	5.15
Left caudate nucleus	-8	22	0	4.58
Left orbitofrontal cortex	-2	40	-24	4.47
Left occipital cortex	-14	-100	-8	4.19
Left occipital cortex	-38	-94	-6	4.12
Left occipital cortex	-26	-104	0	3.85

Supplementary Table 22. *Group level whole brain session * cue interaction - Social: Isolation > Fasting.* Flexible factorial model using the first-level contrasts food > control and social > control from each session. Statistical inference was performed using a threshold of $p < 0.05$ corrected for multiple comparisons over the whole brain, using cluster-level correction. Supplementary Figure 4 (right) depicts the results from this table.

Group level whole brain: main of effects cue

Food > Control

Area	Peak MNI coordinates			t value
	x	y	z	
Left fusiform gyrus	-30	-54	-12	19.04
Left orbitofrontal cortex	-24	36	-14	15.01
Left dorsolateral prefrontal cortex	-46	36	14	12.96
Left anterior cingulate cortex	-4	4	30	11.68
Right orbitofrontal cortex	22	32	-16	10.37
Right cerebellum	18	-40	-44	10.29
Left postcentral gyrus	-64	-18	30	9.98
Left cerebellum	-22	-38	-42	9.81
Left anterior cingulate cortex	-2	34	10	9.13
Right parietal cortex	28	-76	48	7.87
Left perirhinal cortex	-24	-2	-32	7.74
Left frontal cortex	-20	34	48	7.15
Right fusiform gyrus	52	-50	-18	6.19
Right supramarginal gyrus	66	-16	24	6.04
Left frontal cortex	-8	50	52	5.47
Left premotor cortex	-24	22	68	5.46
Left perirhinal cortex	-18	-20	-24	5.30
Right dorsolateral prefrontal cortex	42	42	8	5.27
Left premotor cortex	-20	24	70	5.23
Left premotor cortex	-32	16	66	5.19
Right parietal cortex	26	-62	62	5.18
Left caudate nucleus	-10	14	2	5.17

Social > Control

Area	Peak MNI coordinates			t value
	x	y	z	
Left fusiform gyrus	40	-48	-18	34.95
Right inferior frontal gyrus	48	22	22	12.77
Right frontal cortex	24	34	50	7.98
Right premotor cortex	48	2	58	7.46
Right premotor cortex	40	0	50	7.04
Left posterior cingulate cortex	-4	-16	38	6.27
Cerebellum	0	-96	-24	5.78
Left superior parietal cortex	-2	-64	-50	5.77
Left cerebellum	-30	-64	-50	5.75
Left frontal cortex	-4	36	64	5.55
Left inferior temporal gyrus	-42	4	-44	5.50
Left premotor cortex	-10	6	78	5.25
Left premotor cortex	-14	28	68	5.24
Right dorsolateral prefrontal cortex	12	56	48	5.18

Supplementary Table 23. *Main effects of cue (food > control and social > control).* Flexible factorial model using the first-level contrasts food > control and social > control. Statistical inference was performed using a threshold of $p < 0.05$ corrected for multiple comparisons over the whole brain, using family-wise error correction at the voxel level. Supplementary Figure 6 depicts the results for this analysis.