SUPPLEMENT

Neuroanatomical Correlates of Emotion-Related Impulsivity

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Supplementary Methods and Materials – Whole Brain (Group) Analysis

To explore the relationship of Pervasive Influence of Feelings with whole-brain local gyrification index at the group level, we used the FreeSurfer (version 6.0) “command-line” group analysis stream. We first designed a FreeSurfer Group Descriptor File containing labels and covariates for each participant. We then created contrast matrices that specified contrast weights for Pervasive Influence of Feelings against a standard control variable.

Using the FreeSurfer (version 6.0) function “mris_preproc,” each participant’s data was resampled to the fsaverage template in MNI space, and each participant’s data was concatenated into a single dataset. Using the FreeSurfer (version 6.0) function “mri_glmfit,” the concatenated dataset was then fit to a general linear model regressing Pervasive Influence of Feelings onto local gyrification index across all cortical vertices, creating group-level contrast maps. We set two thresholds to constrain the findings - a vertex-wise, cluster detection threshold (CDT) and a clusterwise correction for multiple comparisons. We examined two CDT thresholds, \( p < 0.05 \) and \( p < 0.001 \). The clusterwise correction for multiple comparisons was set to \( q < 0.05 \) for all analyses.
**Supplementary Figure 1.** Univariate distributions of three factor impulsivity scores.

Note. FTA = Feelings Trigger Action, LFT = Lack of Follow Through, PIF = Pervasive Influence of Feelings. Box plot elements: centre line, median; box limits, upper and lower quartiles; whiskers, range of non-outlier data (1.5 times the interquartile range or the most extreme value).
Supplementary Figure 2. Univariate distributions of local gyrification index in the cortical regions of interest.

Note. OFC = Orbitofrontal cortex. Box plot elements: centre line, median; box limits, upper and lower quartiles; whiskers, range of non-outlier data (1.5 times the interquartile range or the most extreme value).
**Supplementary Figure 3.** Univariate distributions of cortical thickness in the cortical regions of interest.

Note. OFC = Orbitofrontal cortex. Box plot elements: centre line, median; box limits, upper and lower quartiles; whiskers, range of non-outlier data (1.5 times the interquartile range or the most extreme value).
Supplementary Figure 4. Univariate distributions of structure volume in the subcortical regions of interest.

Note. Box plot elements: centre line, median; box limits, upper and lower quartiles; whiskers, range of non-outlier data (1.5 times the interquartile range or the most extreme value).
**Supplementary Figure 5.** Bootstrapped 95% confidence intervals comparing ERI and non-ERI effect sizes.

Note: Histograms estimating the effect size differences using bootstrap resampling for a. PIF vs. LFT in right lateral OFC LGI (full model), b. PIF vs. LFT in right lateral OFC LGI (LGI-only model), c. PIF vs. LFT in left lateral OFC LGI (LGI-only model), d. FTA vs. LFT in left lateral OFC LGI (LGI-only model). Vertical dashed lines represent the 95% confidence intervals.
**Supplementary Figure 6.** Freesurfer group-level, whole brain analyses.

a.

Note: Group-level general linear model regressing Pervasive Influence of Feelings severity scores onto local gyrification index across all cortical vertices at cluster-wise detection thresholds of a. $p < 0.05$, b. $p < 0.001$. Color bars denote peak statistical thresholds ($t$-values).
Supplementary Table 1

Means, standard deviations, and intercorrelations of Three Factor Impulsivity Index

| Variable | M   | SD  | 1    | 2    |
|----------|-----|-----|------|------|
| 1. FTA   | 2.86| 0.75|      |      |
| 2. PIF   | 3.73| 0.76| .38**|      |
|          |     |     | [0.22, 0.52] |      |
| 3. LFT   | 3.15| 0.80| .23* | .34**|
|          |     |     | [0.06, 0.39] | [0.18, 0.49] |

Note. M and SD are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. * indicates p < .05. ** indicates p < .01.
**Supplementary Table 2**

*Multivariate models regressing impulsivity on neuroanatomical metrics*

| Brain Metric                  | β     | S.E.  | t     | p     |
|------------------------------|-------|-------|-------|-------|
| **Model 1: Predicting Pervasive Influence of Feelings** |       |       |       |       |
| Left Insula CT               | 0.04  | 0.14  | 0.30  | 0.762 |
| Right Insula CT              | -0.09 | 0.14  | -0.64 | 0.524 |
| Left Medial OFC CT           | 0.16  | 0.11  | 1.43  | 0.156 |
| Right Medial OFC CT          | -0.02 | 0.12  | -0.17 | 0.866 |
| Left Lateral OFC CT          | -0.09 | 0.15  | -0.62 | 0.534 |
| Right Lateral OFC CT         | -0.14 | 0.15  | -0.93 | 0.355 |
| Left Insula LGI              | 0.01  | 0.11  | 0.06  | 0.93  |
| Right Insula LGI             | -0.08 | 0.12  | -0.68 | 0.498 |
| Left Medial OFC LGI          | 0.06  | 0.11  | 0.60  | 0.551 |
| Right Medial OFC LGI         | 0.14  | 0.11  | 1.20  | 0.232 |
| Left Lateral OFC LGI         | 0.21  | 0.13  | 1.60  | 0.112 |
| **Right Lateral OFC LGI**    | **-0.31** | **0.14** | **-2.18** | **0.032** |
| Left Amygdala Volume         | 0.07  | 0.15  | 0.49  | 0.628 |
| Right Amygdala Volume        | -0.09 | 0.15  | -0.61 | 0.543 |
| Left Nucleus Accumbens Volume| 0.04  | 0.15  | 0.30  | 0.762 |
| Right Nucleus Accumbens Volume| -0.03 | 0.16  | -0.21 | 0.837 |

Multiple $R^2 = 0.106$; $R^2$ adjusted = -0.029; $F(16,106) = 0.787$; $p = 0.697$

| Brain Metric                  | β     | S.E.  | t     | p     |
|------------------------------|-------|-------|-------|-------|
| **Model 2: Predicting Feelings Trigger Action** |       |       |       |       |
| Left Insula CT               | -0.09 | 0.14  | -0.66 | 0.514 |
| Right Insula CT              | -0.03 | 0.14  | -0.24 | 0.811 |
| Left Medial OFC CT           | 0.03  | 0.11  | 0.23  | 0.822 |
| Right Medial OFC CT          | -0.01 | 0.12  | -0.10 | 0.923 |
| Left Lateral OFC CT          | 0.06  | 0.15  | 0.44  | 0.658 |
| Right Lateral OFC CT         | -0.05 | 0.15  | -0.34 | 0.735 |
| Left Insula LGI              | -0.09 | 0.12  | -0.75 | 0.456 |
| Brain Metric                     | $\beta$ | S.E. | $t$  | $p$   |
|---------------------------------|---------|------|------|-------|
| Right Insula LGI                | -0.09   | 0.12 | -0.73| 0.465 |
| Left Medial OFC LGI             | -0.10   | 0.11 | -0.97| 0.333 |
| Right Medial OFC LGI            | -0.004  | 0.11 | -0.04| 0.972 |
| Left Lateral OFC LGI            | 0.22    | 0.13 | 1.65 | 0.101 |
| Right Lateral OFC LGI           | -0.15   | 0.15 | -1.04| 0.301 |
| Left Amygdala Volume            | 0.03    | 0.15 | 0.23 | 0.819 |
| Right Amygdala Volume           | 0.13    | 0.15 | 0.91 | 0.367 |
| Left Nucleus Accumbens Volume   | 0.14    | 0.15 | 0.91 | 0.365 |
| Right Nucleus Accumbens Volume  | -0.09   | 0.16 | -0.57| 0.567 |

Multiple $R^2 = 0.094$; $R^2$ adjusted = -0.043; $F(16,106) = 0.687$; $p = 0.801$

| Brain Metric                     | $\beta$ | S.E. | $t$  | $p$   |
|---------------------------------|---------|------|------|-------|
| Left Insula CT                  | 0.06    | 0.14 | 0.43 | 0.670 |
| Right Insula CT                 | -0.19   | 0.14 | -1.40| 0.163 |
| Left Medial OFC CT              | 0.02    | 0.11 | 0.22 | 0.830 |
| Right Medial OFC CT             | -0.08   | 0.12 | -0.71| 0.481 |
| Left Lateral OFC CT             | 0.09    | 0.15 | 0.60 | 0.549 |
| Right Lateral OFC CT            | -0.09   | 0.15 | -0.61| 0.542 |
| Left Insula LGI                 | -0.07   | 0.12 | -0.59| 0.557 |
| Right Insula LGI                | -0.17   | 0.12 | -1.42| 0.158 |
| Left Medial OFC LGI             | -0.14   | 0.11 | -1.28| 0.203 |
| Right Medial OFC LGI            | 0.09    | 0.11 | 0.76 | 0.450 |
| Left Lateral OFC LGI            | 0.04    | 0.14 | 0.32 | 0.746 |
| Right Lateral OFC LGI           | 0.02    | 0.15 | 0.13 | 0.896 |
| Left Amygdala Volume            | -0.06   | 0.15 | -0.41| 0.680 |
| Right Amygdala Volume           | 0.004   | 0.15 | 0.03 | 0.979 |
| Left Nucleus Accumbens Volume   | 0.04    | 0.15 | 0.26 | 0.793 |
| Right Nucleus Accumbens Volume  | 0.09    | 0.16 | 0.58 | 0.563 |

Multiple $R^2 = 0.086$; $R^2$ adjusted = -0.052; $F(16,106) = 0.620$; $p = 0.861$

**Note.** CT = cortical thickness, LGI = local gyrification index, OFC = orbitofrontal cortex, Bold = $p < 0.05$, $^\&$ did not pass Bonferroni threshold $\alpha = 0.006$. 
### Supplementary Table 3

*Nested comparison of multivariate regression models with and without quadratic terms*

| Impulsivity Type                        | Model Type | RSS    | df | F     | p     |
|----------------------------------------|------------|--------|----|-------|-------|
| Pervasive Influence of Feelings        | Linear     | 108.15 | 106|       |       |
|                                        | Quadratic  | 95.93  | 90 | 0.717 | 0.770 |
| Feelings Trigger Action                | Linear     | 109.63 | 106|       |       |
|                                        | Quadratic  | 102.45 | 90 | 0.394 | 0.981 |
| Lack of Follow Through                 | Linear     | 110.64 | 106|       |       |
|                                        | Quadratic  | 100.32 | 90 | 0.580 | 0.892 |

Note. df = degrees of freedom, FTA = Feelings Trigger Action, LFT = Lack of Follow Through, PIF = Pervasive Influence of Feelings, RSS = Residual Sum of Squares
Supplementary Table 4

Multivariate models regressing impulsivity on neuroanatomical metrics and including age

Model 1: Predicting Pervasive Influence of Feelings

| Brain Metric          | $\beta$ | S.E. | $t$  | $p$  |
|-----------------------|---------|------|------|------|
| Left Insula CT        | 0.04    | 0.13 | 0.33 | 0.745|
| Right Insula CT       | -0.17   | 0.13 | -1.23| 0.221|
| Left Medial OFC CT    | 0.12    | 0.11 | 1.05 | 0.297|
| Right Medial OFC CT   | -0.01   | 0.11 | -0.06| 0.950|
| Left Lateral OFC CT   | -0.11   | 0.14 | -0.79| 0.431|
| Right Lateral OFC CT  | -0.19   | 0.14 | -1.30| 0.196|
| Left Insula LGI       | 0.04    | 0.11 | 0.33 | 0.746|
| Right Insula LGI      | -0.03   | 0.12 | -0.23| 0.815|
| Left Medial OFC LGI   | 0.03    | 0.10 | 0.26 | 0.797|
| Right Medial OFC LGI  | 0.10    | 0.11 | 0.88 | 0.382|
| Left Lateral OFC LGI  | 0.18    | 0.13 | 1.42 | 0.159|
| **Right Lateral OFC LGI** | **-0.34** | **0.14** | **-2.40** | **0.018**
| Left Amygdala Volume  | 0.01    | 0.15 | 0.06 | 0.953|
| Right Amygdala Volume | -0.02   | 0.14 | -0.17| 0.868|
| Left Nucleus Accumbens Volume | 0.04 | 0.14 | 0.30 | 0.767|
| Right Nucleus Accumbens Volume | -0.05 | 0.15 | -0.34 | 0.732|
| **Age**               | **-0.30** | **0.11** | **-2.70** | **0.009**

Multiple $R^2 = 0.163$; $R^2$ adjusted = 0.028; $F(17,105) = 1.206$; $p = 0.273$

Model 2: Predicting Feelings Trigger Action

| Brain Metric          | $\beta$ | S.E. | $t$  | $p$  |
|-----------------------|---------|------|------|------|
| Left Insula CT        | -0.09   | 0.14 | -0.65| 0.517|
| Right Insula CT       | -0.06   | 0.14 | -0.45| 0.654|
| Left Medial OFC CT    | 0.01    | 0.11 | 0.08 | 0.940|
| Right Medial OFC CT   | -0.01   | 0.12 | -0.06| 0.955|
| Brain Metric                              | β   | S.E.  | t     | p     |
|-----------------------------------------|-----|-------|-------|-------|
| Left Lateral OFC CT                     | 0.06| 0.15  | 0.39  | 0.699 |
| Right Lateral OFC CT                    | -0.07| 0.15 | -0.47 | 0.642 |
| Left Insula LGI                         | -0.08| 0.12 | -0.64 | 0.519 |
| Right Insula LGI                        | -0.07| 0.12 | -0.56 | 0.579 |
| Left Medial OFC LGI                     | -0.12| 0.11 | -1.09 | 0.277 |
| Right Medial OFC LGI                    | -0.02| 0.11 | -0.16 | 0.871 |
| Left Lateral OFC LGI                    | 0.21 | 0.13  | 1.57  | 0.120 |
| Right Lateral OFC LGI                   | -0.16| 0.15 | -1.10 | 0.274 |
| Left Amygdala Volume                    | 0.01 | 0.15  | 0.07  | 0.947 |
| Right Amygdala Volume                   | 0.16 | 0.15  | 1.06  | 0.292 |
| Left Nucleus Accumbens Volume           | 0.13 | 0.15  | 0.90  | 0.368 |
| Right Nucleus Accumbens Volume          | -0.10| 0.16 | -0.62 | 0.536 |
| Age                                     | -0.11| 0.12 | -0.98 | 0.328 |

Multiple $R^2 = 0.102; R^2$ adjusted = -0.043; $F(17,105) = 0.703; p = 0.793$

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| Brain Metric                              | β   | S.E.  | t     | p     |
|-----------------------------------------|-----|-------|-------|-------|
| Left Insula CT                           | 0.06| 0.14  | 0.43  | 0.665 |
| Right Insula CT                          | -0.23| 0.14 | -1.65 | 0.103 |
| Left Medial OFC CT                       | 0.003| 0.11 | 0.03  | 0.979 |
| Right Medial OFC CT                      | -0.08| 0.18 | -0.66 | 0.513 |
| Left Lateral OFC CT                      | 0.08 | 0.15  | 0.53  | 0.597 |
| Right Lateral OFC CT                     | -0.12| 0.15 | -0.77 | 0.441 |
| Left Insula LGI                          | -0.05| 0.12 | -0.47 | 0.643 |
| Right Insula LGI                         | -0.15| 0.12 | -1.19 | 0.235 |
| Left Medial OFC LGI                      | -0.15| 0.11 | -1.44 | 0.154 |
| Right Medial OFC LGI                     | 0.07 | 0.11  | 0.59  | 0.555 |
| Left Lateral OFC LGI                     | 0.03 | 0.14  | 0.22  | 0.826 |
| Right Lateral OFC LGI                    | 0.01 | 0.15  | 0.05  | 0.957 |
| Left Amygdala Volume                     | -0.09| 0.15 | -0.61 | 0.543 |
| Right Amygdala Volume                    | 0.04 | 0.15  | 0.24  | 0.814 |
| Left Nucleus Accumbens Volume            | 0.04 | 0.15  | 0.26  | 0.798 |
| Right Nucleus Accumbens Volume           | 0.08 | 0.16  | 0.52  | 0.604 |
| Age | -0.14 | 0.12 | -1.24 | 0.217 |

Multiple $R^2 = 0.099$; $R^2$ adjusted = -0.047; $F(17,105) = 0.677$; $p = 0.819$

Note. CT = cortical thickness, LGI = local gyrification index, OFC = orbitofrontal cortex, Bold = $p < 0.05$, $\alpha$ = did not pass Bonferroni threshold $\alpha = 0.006$, $#$ = effect not hypothesized.
Supplementary Table 5
*Correlations (Pearson’s r) between cortical thickness and local gyrification index*

| Brain Region            | r      | 95% C.I.                | p     |
|-------------------------|--------|-------------------------|-------|
| Left Insula             | -0.152 | [-0.321 0.026]          | 0.094 |
| Right Insula            | -0.193 | [-0.358 -0.015]         | 0.037 |
| Left Medial OFC         | 0.016  | [-0.162 0.193]          | 0.860 |
| Right Medial OFC        | -0.212 | [-0.376 -0.036]         | 0.019 |
| Left Lateral OFC        | -0.315 | [-0.466 -0.145]         | 0.000 |
| Right Lateral OFC       | -0.495 | [-0.618 -0.348]         | 0.000 |

Note. C.I. = Confidence Interval, OFC = orbitofrontal cortex. Bold = *p* < 0.05.
## Supplementary Table 6

*Multivariate models regressing impulsivity on local gyrification index*

### Model 1: Predicting Pervasive Influence of Feelings

| Brain Metric               | $\beta$ | S.E. | t   | p    |
|----------------------------|---------|------|-----|------|
| Left Insula LGI            | 0.03    | 0.11 | 0.31| 0.757|
| Right Insula LGI           | -0.04   | 0.11 | -0.40| 0.694|
| Left Medial OFC LGI        | 0.03    | 0.10 | 0.28| 0.780|
| Right Medial OFC LGI       | 0.11    | 0.10 | 1.13| 0.263|
| **Left Lateral OFC LGI**   | **0.26**| **0.12**| **2.13**| **0.035***\&* |
| **Right Lateral OFC LGI**  | **-0.25**| **0.12**| **-2.00**| **0.048***\&* |

Multiple $R^2 = 0.066$; $R^2$ adjusted $= 0.018$; $F(6,116) = 1.371$; $p = 0.232$

### Model 2: Predicting Feelings Trigger Action

| Brain Metric               | $\beta$ | S.E. | t   | p    |
|----------------------------|---------|------|-----|------|
| Left Insula LGI            | -0.09   | 0.11 | -0.83| 0.409|
| Right Insula LGI           | -0.05   | 0.11 | -0.47| 0.640|
| Left Medial OFC LGI        | -0.11   | 0.10 | -1.10| 0.270|
| Right Medial OFC LGI       | 0.01    | 0.10 | 0.13 | 0.896|
| **Left Lateral OFC LGI**   | **0.25**| **0.12**| **2.09**| **0.039***\&* |
| **Right Lateral OFC LGI**  | **-0.11**| **0.12**| **-0.91**| **0.364** |

Multiple $R^2 = 0.052$; $R^2$ adjusted $= 0.003$; $F(6,116) = 1.054$; $p = 0.395$

### Model 3: Predicting Lack of Follow Through

| Brain Metric               | $\beta$ | S.E. | t   | p    |
|----------------------------|---------|------|-----|------|
| Left Insula LGI            | -0.09   | 0.11 | -0.87| 0.385|
| Right Insula LGI           | -0.13   | 0.11 | -1.16| 0.249|
| Left Medial OFC LGI        | -0.10   | 0.10 | -1.00| 0.320|
| Right Medial OFC LGI       | 0.13    | 0.10 | 1.26 | 0.209|
| Left Lateral OFC LGI       | 0.05    | 0.12 | 0.42 | 0.675|
| Right Lateral OFC LGI      | 0.05    | 0.13 | 0.40 | 0.693|

Multiple $R^2 = 0.043$; $R^2$ adjusted $= -0.007$; $F(6,115) = 0.860$; $p = 0.527$
Note. LGI = local gyrification index, OFC = orbitofrontal cortex, Bold = $p < 0.05$, $\&$ = did not pass Bonferroni threshold $\alpha = 0.013$. 
**Supplementary Table 7**

*Multivariate models regressing impulsivity on cortical thickness*

| Brain Metric          | $\beta$ | S.E. | $t$  | $p$   |
|-----------------------|---------|------|------|-------|
| Left Insula CT        | 0.05    | 0.13 | 0.37 | 0.711 |
| Right Insula CT       | -0.07   | 0.13 | -0.54| 0.590 |
| Left Medial OFC CT    | 0.16    | 0.10 | 1.58 | 0.118 |
| Right Medial OFC CT   | -0.09   | 0.10 | -0.91| 0.367 |
| Left Lateral OFC CT   | -0.07   | 0.13 | -0.52| 0.604 |
| Right Lateral OFC CT  | -0.05   | 0.12 | -0.37| 0.715 |

Multiple $R^2 = 0.033$; $R^2$ adjusted $= -0.017$; $F(6,116) = 0.654$; $p = 0.687$

| Brain Metric          | $\beta$ | S.E. | $t$  | $p$   |
|-----------------------|---------|------|------|-------|
| Left Insula CT        | -0.05   | 0.13 | -0.40| 0.692 |
| Right Insula CT       | -0.01   | 0.13 | -0.09| 0.932 |
| Left Medial OFC CT    | 0.05    | 0.10 | 0.46 | 0.649 |
| Right Medial OFC CT   | -0.05   | 0.10 | -0.46| 0.644 |
| Left Lateral OFC CT   | 0.03    | 0.13 | 0.24 | 0.811 |
| Right Lateral OFC CT  | -0.01   | 0.13 | -0.09| 0.930 |

Multiple $R^2 = 0.005$; $R^2$ adjusted $= -0.046$; $F(6,116) = 0.099$; $p = 0.996$

| Brain Metric          | $\beta$ | S.E. | $t$  | $p$   |
|-----------------------|---------|------|------|-------|
| Left Insula CT        | 0.03    | 0.13 | 0.25 | 0.801 |
| Right Insula CT       | -0.16   | 0.13 | -1.20| 0.233 |
| Left Medial OFC CT    | 0.02    | 0.10 | 0.21 | 0.836 |
| Right Medial OFC CT   | -0.14   | 0.10 | -1.33| 0.185 |
| Left Lateral OFC CT   | 0.09    | 0.13 | 0.69 | 0.493 |
| Right Lateral OFC CT  | -0.02   | 0.12 | -0.13| 0.900 |

Multiple $R^2 = 0.031$; $R^2$ adjusted $= -0.019$; $F(6,116) = 0.626$; $p = 0.709$
Note. CT = cortical thickness, OFC = orbitofrontal cortex.

Supplementary Table 8
*Group-level general linear model regressing Pervasive Influence of Feelings severity onto whole-cortex local gyrification*

| Structure                      | MNI (x) | MNI (y) | MNI (z) | Size (mm²) | Max (Peak) | CWP         |
|--------------------------------|---------|---------|---------|------------|------------|-------------|
| Lateral OFC (R)                | 20.6    | 26.7    | -14.1   | 2547       | 3.90       | 0.0002      |
| Temporal Pole (R)              | 46.2    | 5.4     | -35.7   | 2220       | 5.14       | 0.0002      |
| Dorsolateral PFC (R)           | 34.3    | 28.0    | 43.5    | 1918       | 3.15       | 0.0002      |
| Middle Temporal Gyrus (R)      | 62.9    | -48.3   | -1.1    | 1405       | 2.79       | 0.0002      |
| Frontal Pole (L)               | -16.6   | 54.9    | -10.3   | 2832       | 4.12       | 0.0002      |
| Dorsolateral PFC (L)           | -39.1   | 30.8    | 29.4    | 1253       | 3.15       | 0.0002      |

| Structure                      | MNI (x) | MNI (y) | MNI (z) | Size (mm²) | Max (Peak) | CWP         |
|--------------------------------|---------|---------|---------|------------|------------|-------------|
| Temporal Pole (R)              | 46.2    | 5.4     | -35.7   | 604        | 5.14       | 0.0002      |
| Frontal Pole (L)               | -16.6   | 54.9    | -10.3   | 232        | 4.12       | 0.0014      |

Note: CWP = clusterwise corrected p-value, MNI = Montreal Neurological Institute