### Additional Information About MDD Patients

| Patient Number | Gender | Age  | CGI-Severity | HDRS-21 | List of medications                                      | Currently on medication | Number of past hospitalizations |
|----------------|--------|------|--------------|---------|----------------------------------------------------------|-------------------------|--------------------------------|
| 1              | F      | 29   | 6=severely ill | 24      | Fluoxetine 40mg                                          | Yes                     | 0                              |
| 2              | F      | 58   | 5=markedly ill | 29      | Bupropion 150mg, Fluoxetine 40mg                          | Yes                     | 0                              |
| 3              | M      | 42   | 5=markedly ill | 27      | Nortriptyline 150mg, Bupropion 150mg                     | Yes                     | 2                              |
| 4              | M      | 41   | 4=moderately ill | 25      | Mianserin 60mg                                           | Yes                     | 0                              |
| 5              | M      | 33   | 4=moderately ill | 25      | Escitalopram 20mg, Lorazepam 1mg                         | Yes                     | 0                              |
| 6              | M      | 60   | 4=moderately ill | 25      | Amitriptyline 150mg, Lorazepam 2mg, Mirtazapine 30mg    | Yes                     | 0                              |
| 7              | F      | 49   | 6=severely ill | 25      | Aripiprazole 10mg, Clonazepam 1mg                        | Yes                     | 0                              |
| 8              | M      | 47   | 5=markedly ill | 25      | Escitalopram 40mg, Clonazepam 1.5mg, Olanzapine 20mg, Amitriptyline 200mg | Yes                     | 0                              |
| 9              | F      | 56   | 5=markedly ill | 25      | Milnacipran 50mg                                         | Yes                     | 0                              |
| 10             | M      | 24   | 4=moderately ill | 25      | Licarbuim 1350mg                                        | Yes                     | 0                              |
| 11             | F      | 39   | 5=markedly ill | 25      | Quetiapine 100mg, Clonazepam 0.5mg, Fluoxetine 50 mg, Topiramate 25mg | Yes                     | 1                              |
| 12             | M      | 35   | 3=mildly ill  | 25      | Escitalopram 20mg                                       | Yes                     | 0                              |
| 13             | M      | 34   | 4=moderately ill | 26      | Venlafaxine 150mg, Perphenazine 4mg                       | Yes                     | 0                              |
| 14             | M      | 42   | 4=moderately ill | 25      | Vortioxetine 20mg, Aripiprazole 5mg                      | Yes                     | 1                              |
| 15             | M      | 31   | 6=severely ill | 25      | Clomipramine 300mg, Escitalopram 20mg, Duloxetine 30mg   | No                      | 0                              |
| 16             | M      | 29   | 4=moderately ill | 25      | Sertraline 100mg, Vortioxetine 10mg                       | Yes                     | 0                              |
| 17             | M      | 27   | 4=moderately ill | 25      | Vortioxetine 20mg, lamotrigine 400mg                     | Yes                     | 1                              |
| 18             | M      | 54   | 5=markedly ill | 27      | Fluvoxamine 150mg, Aripiprazole 5 mg                      | Yes                     | 0                              |
| 19             | F      | 28   | 4=moderately ill | 27      | Venlafaxine 150mg, Clonazepam 1mg                        | No                      | 0                              |
| 20             | M      | 43   | 4=moderately ill | 27      | Vortioxetine 20mg, Quetiapine 100mg                     | Yes                     | 0                              |
| 21             | F      | 30   | 4=moderately ill | 31      | Venlafaxine 150mg                                       | Yes                     | 0                              |
| 22             | F      | 53   | 4=moderately ill | 32      | Venlafaxine 150mg, Clonazepam 1mg                        | Yes                     | 0                              |
| 23             | M      | 38   | 4=moderately ill | 25      | None                                                   | No                      | 0                              |

Table S1. Demographic, clinical and drug information about MDD patients. The clinical assessments included the clinical global impression (CGI) scale (Bunser and Targum, 2007; Guy, 1976), and Hamilton Depression Rating Scale (HDRS; Hamilton, 1960).

*Note: MDD=major depressive disorder*
Table S2. Left OFC showing increased functional connectivity with NAcc during RS as a factor of rumination levels. Results are based on a threshold $p<0.005$ (unc.) for individual voxel and $p<0.05$ (corrected) for cluster extent.

*Note:* VS=ventral striatum; NAcc=nucleus accumbens; rsFC=resting-state functional connectivity; RS=resting-state; OFC=orbitofrontal cortex.
Figure S3. VS/NAcc activity as a function of RRS scores: split by group. Positive correlation between VS/NAcc activation during reward processing and RRS scores was found in the community sample group (n=45). This correlation remains significant while controlling for BDI scores and scanner type ($r(36)=0.41, p=0.01$). Correlation when only the MDD group was considered didn’t yield significant results.

Note: VS=ventral striatum; NAcc=nucleus accumbens; RRS=Ruminative Response Scale; BDI=Beck Depression Inventory; MDD=Major Depressive Disorder.
Figures S3 and S4-note:
In exploratory post-hoc analyses, we also examined the associations between RRS scores and VS/NAcc activation and connectivity separately within the community sample and the MDD sample (see Figures S3 and S4 above). For activation data, similarly to the analysis on the full sample, a significant correlation emerged in the community sample group, \( r(36)=0.41, p=0.01 \); however, no significant correlation was observed in the MDD sample, \( r(20)=-0.01, p=0.96 \). For connectivity data, a significant correlation emerged both in the community sample group and the MDD group (community sample: \( r(39)=0.49, p=0.001 \); MDD: \( r(21)=0.51, p=0.013 \)).
References

Busner J and Targum SD., (2007). The clinical global impressions scale: applying a research tool in clinical practice. Psychiatry (Edgmont) 4, 28–37.

Guy W., (1976). ECDEU Assessment Manual for Psychopharmacology. Rockville, MD: US Department of Health, Education, and Welfare Public Health Service Alcohol, Drug Abuse, and Mental Health Administration.

Hamilton M., (1960). A rating scale for depression. Journal of Neurology, Neurosurgery and Psychiatry 23, 56–61.