

Figure S1. Patient flow chart



Figure S2. Results of negative statement/neutral person (NS/NP) condition during the TAF induction task (uncorrected p < 0.001)



Figure S3. Changes of connectivity among large-scale networks between pre- and post-treatment using paired t-test within the ACT group (unthresholded results). VIS: Visual network, SM: Somatomotor network, DorAtt: Dorsal attention network, VenAtt: Ventral attention network, FP: Frontoparietal control network.

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| Table S1. Change in symptom and process measures between pre- and post-treatment (mean±S.D.) |
| 　 | 　 | ACT (N=21) | 　 | WLC (N=21) | 　 | Paired-t test |  | Independent t-test |
| 　 | Prea | Postb | 　 | Prec | Postd | 　 | *t*a-b | *t*c-d |  | *t*a-c | *t*b-d |
| Symptom measure |  |  |  |  |  |  |  |  |  |  |  |
|  | Y-BOCS | 22.5±7.0 | 18.4±7.7 |  | 23.5±6.8 | 23.8±7.1 |  | 3.9\*\*\* | -0.2 |  | -0.5 | ­2.4\* |
|  | OCI-R | 25.7±12.1 | 20.5±11.3 |  | 26.7±12.7 | 27.0±13.6 |  | 3.7\*\* | -0.3 |  | -0.3 | -1.7 |
|  | BDI | 13.3±7.5 | 10.1±7.8 |  | 16.6±10.3 | 15.0±10.4 |  | 1.8 | 1.6 |  | -1.2 | -1.7 |
| Process measure |  |  |  |  |  |  |  |  |  |  |  |
|  | AAQ-II | 34.3±9.8 | 30.5±12.5 |  | 33.1±10.0 | 35.0±9.7 |  | 2.0 | -1.4 |  | 0.4 | -1.3 |
|  | AAQ-OC | 59.6±17.0 | 43.6±19.9 |  | 53.0±17.3 | 62.1±11.4 |  | 4.0\*\*\* | ­2.3\* |  | 1.3 | ­3.7\*\*\* |
|  | CFQ | 34.9±9.3 | 28.7±10.7 |  | 30.7±11.4 | 33.1±10.0 |  | 3.5\*\* | -1.7 |  | 1.3 | -1.4 |
| 　 | TAFS | 27.4±17.2 | 19.2±14.1 | 　 | 25.4±20.0 | 25.5±19.6 | 　 | 2.4\* | -0.1 | 　 | 0.4 | -1.2 |
| \*p < .05, \*\* p < .005, \*\*\* p < .001  |
| ACT, acceptance-commitment therapy; WLC, wait-list control; Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; OCI-R, Obsessive-Compulsive Inventory-Revised; BDI, Beck Depression Inventory; AAQ-II, -OC, Acceptance and Action Questionnaire-II, - for Obsessions and Compulsions; CFQ, Cognitive Fusion Questionnaire; TAFS, Thought-Action Fusion Scale |

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| Table S2. Regions of interest across different analytic methods (group by time interactiona) |
| Analytic method | Brain region | Cluster size | MNI coordinates | Peak F |
| x | y | z |
| TAF-induced BOLD signal changes | Insula, left | 98 | -44 | -4 | 14 | 35.11 |
| Insula, right | 21 | 36 | -16 | 20 | 24.5 |
| Superior temporal gyrus, left | 87 | -60 | -14 | 12 | 25.35 |
| Superior temporal gyrus, right | 19 | 58 | -2 | -2 | 26.29 |
| Middle cingulate cortex, right | 19 | 8 | -8 | 26 | 22.37 |
| Inferior frontal gyrus, right | 16 | 52 | 16 | 26 | 19.38 |
| Hippocampus, left | 15 | -24 | -14 | -10 | 21.3 |
| PPI (seed: left insula) | Inferior frontal gyrus, left | 104 | -40 | 16 | 28 | 16.95 |
| Inferior frontal gyrus, right | 100 | 34 | 16 | 28 | 26.15 |
| Middle frontal gyrus, right | 108 | 54 | 22 | 32 | 27.12 |
| ICA of resting state fMRI data | Posterior cingulate gyrus, left | 198 | -4 | -66 | 14 | 19.75  |
| Posterior cingulate gyrus, right | 213 | 8 | -56 | 12 | 18.35  |
| Precuneus, bilateral | 33 | -2 | -66 | 16 | 17.94  |
| Lingual gyrus, left | 27 | -6 | -52 | 2 | 20.73  |
| a pre- and post-treatment x ACT and WLC |
|  P < 0.05, FDR corrected for multiple comparisons and minimum cluster size of 10 |
| ACT, acceptance commitment therapy; WLC, waiting list controls; MNI, Montreal Neurological Institute; TAF, thought-action fusion; BOLD, blood oxygen level dependent; PPI, psycho-physiological interaction; ICA, independent component analysis |

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| Table S3. Regions of interest across different analytic methods within the ACT group (post- minus pre-treatment) |
| Analytic method | Brain region | Cluster size | MNI coordinates | Peak T |
| x | y | z |
| TAF-induced BOLD signal changes | Insula, left | 150 | -46 | -4 | 14 | 5.28  |
| Insula, right | 106 | 36 | -16 | 20 | 8.18  |
| Superior temporal gyrus, left | 39 | -64 | -24 | 12 | 4.90  |
| Superior temporal gyrus, right | 32 | 58 | -4 | -2 | 6.14  |
| PPI (seed: left insula) | Inferior frontal gyrus, left | 100 | -40 | 16 | 24 | 4.37 |
| ICA of resting state fMRI data | Posterior cingulate gyrus, left | 184 | -6 | -58 | 4 | 6.55  |
| Posterior cingulate gyrus, right | 56 | 4 | -62 | 14 | 5.00  |
| Precuneus, bilateral | 40 | -4 | -68 | 16 | 4.86  |
| Lingual gyrus, left | 140 | -2 | -60 | 4 | 5.11  |
| Middle temporal gyrus, left | 56 | -56 | -8 | -8 | 5.10  |
| Middle temporal gyrus, right | 75 | 64 | -6 | -8 | 6.90  |
| ACT, acceptance commitment therapy; MNI, Montreal Neurological Institute; TAF, thought-action fusion; BOLD, blood oxygen level-dependent; PPI, psycho-physiological interaction; ICA, independent component analysis |
| P < 0.05, FDR corrected for multiple comparisons and minimum cluster size of 10 |

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| Table S4. Selected regions of interest across different analytic methods within the ACT groupa |
| Analytic method | Brain region | Cluster size | MNI coordinates | Peak T |
| x | y | z |
| TAF-induced BOLD signal changes | Insula, left | 150 | -46 | -4 | 14 | 5.28 |
| Insula, right | 106 | 36 | -16 | 20 | 8.18 |
| Superior temporal gyrus, left | 39 | -64 | -24 | 12 | 4.90 |
| Superior temporal gyrus, right | 32 | 56 | 4 | 2 | 6.14 |
| PPI (seed: left insula) | Inferior frontal gyrus, left | 100 | -40 | 16 | 24 | 4.37 |
| ICA of resting state fMRI data | Posterior cingulate gyrus, left | 184 | -6 | -58 | 4 | 6.55  |
| Posterior cingulate gyrus, right | 56 | 4 | -62 | 14 | 5.00  |
| Precuneus, bilateral | 40 | -4 | -68 | 16 | 4.86  |
| Lingual gyrus, left | 140 | -2 | -60 | 4 | 5.11  |
| a regions were significant both in paired t-test between pre- and post-treatment and in group-by-time interaction |
|  P < 0.05, FDR corrected for multiple comparisons and minimum cluster size of 10 |
| ACT, acceptance commitment therapy; MNI, Montreal Neurological Institute; TAF, thought-action fusion; BOLD, blood oxygen level-dependent; PPI, psycho-physiological interaction; ICA, independent component analysis |

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| Table S5. Correlations between changes in brain activity or connectivity and psychological measures across the entire participants |
| 　 | 　 | YBOCS | OCI-R | AAQ-II | AAQ-OC | CFQ | TAFS |
| **Brain activity during TAF** |
| Left insula | *r* | -0.30  | -0.29  | -0.22  | -0.31 | -0.35  | -0.35 |
| *p-uncorr* | 0.077  | 0.083  | 0.185  | 0.069 | **0.034**  | **0.037**a |
| *p-FDR* | 0.231 | 0.221 | 0.247 | 0.185 | 0.204 | 0.185 |
| Right insula | *r* | -0.29  | -0.37  | -0.06  | -0.28 | -0.18  | -0.33 |
| *p-uncorr* | 0.085  | **0.024**  | 0.713  | 0.105 | 0.279  | 0.051 |
| *p-FDR* | 0.185 | 0.288 | 0.713 | 0.193 | 0.335 | 0.185 |
| Left STG | *r* | -0.23  | -0.24  | -0.08  | -0.12 | -0.23  | -0.25 |
| *p-uncorr* | 0.163  | 0.158  | 0.641  | 0.503 | 0.164  | 0.143 |
| *p-FDR* | 0.261 | 0.271 | 0.399 | 0.574 | 0.246 | 0.231 |
| Right STG　 | *r* | -0.23  | -0.29  | -0.07  | -0.30 | -0.44  | -0.28 |
| *p-uncorr* | 0.178  | 0.083  | 0.670  | 0.078 | **0.007**  | 0.094 |
| *p-FDR* | 0.251 | 0.199 | 0.699 | 0.185 | 0.168 | 0.188 |
| **Brain connectivity during TAF** |
| Left insula – left IFG interaction | *r* | -0.28 | -0.22 | -0.25 | -0.31 | -0.38 | 0.00 |
| *p-uncorr* | 0.093 | 0.196 | 0.130 | 0.068 | **0.022** a | 0.989 |
| *p-FDR* | 0.186 | 0.235 | 0.195 | 0.186 | 0.132 | 0.989 |
| **Resting-state brain connectivity** |
| Left PCG | *r* | -0.17  | -0.16  | -0.09  | -0.44 | -0.25  | -0.24 |
| *p-uncorr* | 0.295  | 0.319  | 0.572  | **0.005** | 0.113  | 0.132 |
| *p-FDR* | 0.354 | 0.333 | 0.572 | **0.040** | 0.247 | 0.243 |
| Right PCG | *r* | -0.25  | -0.20  | -0.19  | -0.47 | -0.32  | -0.20 |
| *p-uncorr* | 0.112  | 0.217  | 0.238  | **0.002** | **0.040**  | 0.221 |
| *p-FDR* | 0.269 | 0.306 | 0.317 | **0.024** | 0.192 | 0.312 |
| Bilateral precuneus | *r* | -0.26  | -0.16  | -0.22  | -0.33 | -0.25  | -0.28 |
| *p-uncorr* | 0.105  | 0.307  | 0.170  | **0.038** a | 0.122  | 0.086 |
| *p-FDR* | 0.280 | 0.351 | 0.272 | 0.192 | 0.225 | 0.243 |
| Left lingual gyrus　 | *r* | -0.18  | -0.21  | -0.16  | -0.51 | -0.29  | -0.26 |
| *p-uncorr* | 0.267  | 0.190  | 0.307  | **< 0.001** | 0.071  | 0.111 |
| *p-FDR* | 0.337 | 0.285 | 0.335 | **< 0.001** | 0.243 | 0.243 |
| For the YBOCS, OCI-R, AAQ-II and CFQ, *r* represents Pearson's correlation coefficients; for the AAQ-OC and TAFS, *r* does Spearman’s coefficients after removing an outlier in a given scale.Bold-face p-values indicate significance level <.05a Statistical significance disappeared after controlling the additional baseline scores. |
| Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; OCI-R, Obsessive-Compulsive Inventory-Revised; AAQ-II, -OC, Acceptance and Action Questionnaire-II, -for Obsessions and Compulsions; CFQ, Cognitive Fusion Questionnaire; TAFS, Thought-Action Fusion Scale; STG, superior temporal gyrus; ; IFG, inferior frontal gyrus; PCG, posterior cingulate gyrus; FDR, false discovery rate |

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| Table S6. Correlations between changes in brain activity or connectivity and psychological measures within the ACT group |
|  |  | YBOCS | OCI-R | AAQ-II | AAQ-OC | CFQ | TAFS |
| **Brain activity during TAF** |
| Left insula | *r* | 0.19 | -0.21 | -0.05 | 0.46 | 0.32 | 0.25 |
| *P* | 0.446 | 0.395 | 0.837 | 0.058 | 0.204 | 0.339 |
| Right insula | *r* | -0.03 | -0.16 | -0.03 | 0.01 | 0.16 | 0.24 |
| *p* | 0.914 | 0.535 | 0.914 | 0.980 | 0.527 | 0.348 |
| Left STG | *r* | -0.05 | -0.03 | 0.14 | 0.14 | 0.32 | 0.01 |
| *p* | 0.831 | 0.908 | 0.569 | 0.588 | 0.198 | 0.979 |
| Right STG | *r* | -0.15 | 0.07 | 0.17 | -0.13 | -0.03 | 0.52 |
| *p* | 0.549 | 0.795 | 0.495 | 0.607 | 0.900 | 0.842 |
| **Brain connectivity during TAF** |
| Left insula – left IFG interaction | *r* | -0.04 | 0.06 | 0.14 | 0.20 | 0.01 | 0.47 |
| *p* | 0.877 | 0.804 | 0.582 | 0.421 | 0.976 | 0.058 |
| **Resting-state brain connectivity** |
| Left PCG | *r* | 0.13 | -0.17 | 0.22 | -0.28 | -0.02 | 0.13 |
| *p* | 0.582 | 0.466 | 0.353 | 0.229 | 0.939 | 0.593 |
| Right PCG | *r* | 0.02 | -0.06 | 0.09 | -0.37 | -0.24 | 0.20 |
| *p* | 0.931 | 0.813 | 0.700 | 0.106 | 0.319 | 0.424 |
| Bilateral precuneus | *r* | 0.19 | -0.18 | -0.11 | 0.06 | -0.07 | 0.10 |
| *p* | 0.414 | 0.452 | 0.645 | 0.799 | 0.773 | 0.698 |
| Left lingual gyrus | *r* | 0.13 | -0.20 | 0.12 | -0.27 | -0.12 | 0.16 |
| *p* | 0.581 | 0.387 | 0.603 | 0.246 | 0.610 | 0.503 |
| *r* represents Pearson's correlation coefficients  |
| Y-BOCS, Yale-Brown Obsessive-Compulsive Scale; OCI-R, Obsessive-Compulsive Inventory-Revised; AAQ-II, -OC, Acceptance and Action Questionnaire-II, -for Obsessions and Compulsions; CFQ, Cognitive Fusion Questionnaire; TAFS, Thought-Action Fusion Scale; STG, superior temporal gyrus; IFG, inferior frontal gyrus; PCG, posterior cingulate gyrus |