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## **Data structure:**

Kolmogorov-Smirnov tests as implemented in MATLAB 2017 did not indicate for any variable in either dataset that it was different from normal distribution. Means and distributions of the resting state functional connectivity (RSFC) variables are described in supplementary table 1.

## **Task instructions and Training:**

The instructions were self-explanatory and the participants could go through the instructions at their own pace. When participants reached the end of the instructions, they were asked in writing (as part of the instructions) whether they understood everything and could proceed with 2 examples or whether they needed to go back to the beginning of the instructions. At the end of the 2 example trials, they were verbally asked if they had any questions regarding the task. The experimental task could not start until this phase was completed. None of the participants went back to the instructions and none had any questions.

All instructions were embedded inside the E-Prime experiment program and were presented in writing at the beginning of the experiment. The e-Prime experiment was programmed and delivered on a 1024 x 768 display. The content of each trial was as follows: Fixation cross = jittered 1500-3000ms; Prime (target character) = 2000ms; VAS screen (which showed the image and the decision scale) = 10s

## **Code availability:**

Two-view sCCA for MATLAB used in accordance with (Ing et al., 2019) is available at github (at [https://github.com/alexjamesing/mscca-regression-code/blob/master/SCCA SCCA.m](https://github.com/alexjamesing/mscca-regression-code/blob/master/SCCA_SCCA.m))

Permutations for significance testing and reliability analyses were performed using the PALM toolbox <https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/PALM> (Winkler, Ridgway, Webster, Smith, & Nichols, 2014)

Code for Moser’s RR-score (Moser et al., 2018) is available at:

<https://github.com/domamo/Matlab-code-and-example-to-calculate-RR-score-as-related-to-Moser-et-al-2018>

Code for calculation of CCA related explained variance was newly created for the present publication and is also available at:

<https://github.com/domamo/Matlab-code-and-example-to-calculate-RR-score-as-related-to-Moser-et-al-2018>

## **Additional Data**

Underlying data, including the datasets as they were entered into sCCA, full weights of all sCCAs, result of RR-scores and univariate correlations can be found in an excel file placed at

<https://github.com/domamo/Social_optimims_bias_resting_state>

## **Discussion of effect sizes:**

In order to allow readers and reviewers a quick overview of what effect sizes would have arisen in a bivariate framework, supplementary figure 2 depicts a Manhattan plot of correlation and (uncorrected) p-values. This plot shows that there were numerous correlations in the r>0.3 to r<0.5 range. Nominally highest correlations were found among the WNFC correlations with task-determined social optimism bias and questionnaire pessimism measures. Bivariate correlation coefficients for the association of the psychological measures with BNFC measures were more equally distributed across optimism dataset measures. Previous papers reported bivariate correlation coefficients of questionnaire-assessed personal optimism with specific RSFC and regional homogeneity measures to be in the range of r>0.2 to r<0.6 (Ran et al., 2017; Wang et al., 2018; Wu et al., 2015). The present study’s findings hence are similar to previous literature in terms of effect size.

However, it is important to state that the present paper expressly aims to outpace univariate measures and, instead, use a more overarching data analysis. In our case, therefore, it is generally more informative to determine the extent of variance explained in each analysis performed.

Previous approaches of ours that assessed explained variance in an sCCA of ours were based on the conception that variates are representants of the entire dataset. Therefore, R2 for the two variates (psychological and biological) should be the measure of choice if one wants to calculate the amount of variance explained. For the determination of explained variance for modes 2 and subsequent modes, the obtained values additionally need to be multiplied with the percentage of variance not explained by prior modes. Following this strategy, we observed the following pattern of explained variance for the different sCCAs: overall RSFC mode 1: 66.4%; BNFC mode 1: 64.7%, WNFC mode 1: 48.3%, and WNFC mode 3: 19.7%. These numbers compare to the 53% (mode 1) of variance explained by an qualitatively different optimism dataset on brain structure in a previous study of ours (and 27.4% for mode 2) (Moser, Dricu, Wiest, Schupbach, & Aue, 2020).

This conception may however not be what all readers intuitively understand under explained variance because it does not take into account the variables that were put to zero due to sparsity or contributed little weight. In this sense, our conception of explained variance may overstate effect size and be somewhat vulnerable to overfitting. We therefore also formulated an alternative method to estimate explained variance. In this method, each variate was correlated with each measure of the opposing dataset and R2 of these correlations was then averaged and stated for each dataset. This conception, however, may provoke the inverse effect of the first method: i.e. understate explained variance, as variables with weights put to zero are given equal weight to important ones. Hence, application of this second method runs counter the reasons of why one may be using sCCA rather than other analyses in the first place (i.e., to separate and focus analysis on important and reliable measures and discard unreliable, unconnected and aberrant ones).

In the present study, the average percentage of variance of the individual optimism dataset measures being explained by the RSFC variates was: 16.3% for the overall RSFC variate, 16.0% for the BNFC variate and 7.7% for the WNFC variate (with an additional 4.3% for the third WNFC mode).

Conversely, the average percentage of variance of the RSFC dataset measures being explained by the optimism dataset variate was: 4.2% in the overall RSFC dataset, 4.0% in the BNFC dataset and 10.3% in the WNFC dataset (with an additional 3.7% for the third WNFC mode).

If one were to transform these values back into correlation coefficients, the effect size would be similar to that of a correlation of about r=0.4 for the RSFC variate to average optimism measures and r=0.2 for optimism variate to the average RSFC measures. Consequently, our findings would comply to the range of the correlation coefficients described in previous papers on dispositional optimism and connectivity measures (Ran et al., 2017; Wang et al., 2018; Wu et al., 2015).

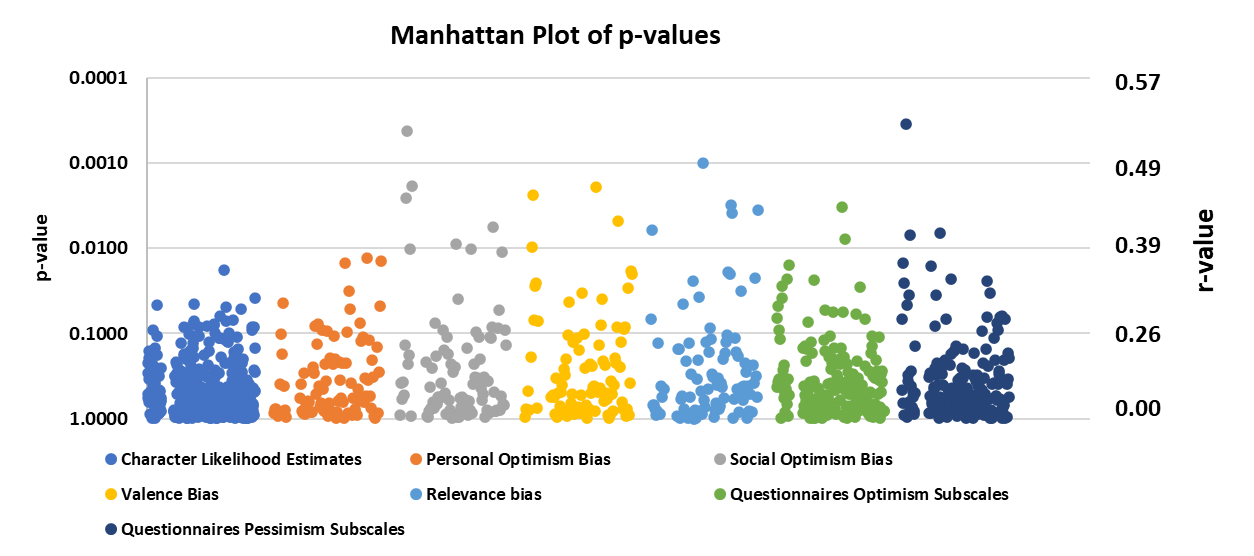
The present findings of up to 16% explained variance compares, among others, to a prior paper of ours that used sCCA to associate a qualitatively different optimism dataset with a dataset on cortical thickness (Moser et al., 2020). In that paper brain structure variance was explained by the optimism variate at an average of 10.4% for mode 1 and 3.9% for mode 2. Inversely, the optimism dataset measures were explained by the cortical thickness variate on average at 7.1% for mode 1 and at 2.6% for mode 2.

Thus, it appears that the effect sizes for the association between RSFC and the diverse optimism measures appear to be similar or slightly higher than the ones we observed for the association between brain structure and partly overlapping optimism measures (Moser et al., 2020). Correspondingly, one might hypothesize that brain structure and function interact with optimistic tendencies and each other to create and perpetuate these associations.

## **Supplementary Figures and Tables**

**Supplementary Figure 1.** Mean mode 1 sCCA correlation coefficient of mode 1 in 1000 random sample redrawings.

**Supplementary Figure 2.** Manhattan plot of bivariate correlations of optimism dataset measures and RSFC dataset measures. WNFC measures are to the left of each part, BNFC measures to the right.



**Supplementary Table 1:** Means and standard deviations for the overall resting state functional connectivity dataset. Abbreviations: BNFC: Between Network Functional Connectivity, CEN: Central executive Network, DMN: Default Mode Network, SMN: SensoriMotor Network, VIS: Visual Network WNFC: Within Network Functional Connectivity. Specific subnetworks are described in figure 1 in the main manuscript.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Measure | mean | std | Measure | mean | std |
| WNFC VIS1 | 0.280 | 0.051 | **BNFC CEN2-DMN3** | -0.200 | 0.232 |
| WNFC Salience | 0.208 | 0.035 | **BNFC DMN5-DMN1** | 0.188 | 0.181 |
| WNFC CEN2 | 0.248 | 0.038 | **BNFC DMN5-VIS2** | -0.179 | 0.253 |
| WNFC DMN5 | 0.299 | 0.045 | **BNFC DMN5-DMN2** | 0.253 | 0.156 |
| WNFC DMN1 | 0.194 | 0.034 | **BNFC DMN5-DMN4** | 0.186 | 0.128 |
| WNFC VIS2 | 0.330 | 0.044 | **BNFC DMN5-SMN1** | -0.142 | 0.195 |
| WNFC DMN2 | 0.226 | 0.050 | **BNFC DMN5-CEN3** | -0.123 | 0.232 |
| WNFC DMN4 | 0.265 | 0.042 | **BNFC DMN5-SMN2** | 0.350 | 0.212 |
| WNFC SMN1 | 0.243 | 0.034 | **BNFC DMN5-CEN1** | -0.115 | 0.161 |
| WNFC CEN3 | 0.144 | 0.021 | **BNFC DMN5-DMN3** | -0.050 | 0.133 |
| WNFC SMN2 | 0.285 | 0.050 | **BNFC DMN1-VIS2** | 0.384 | 0.111 |
| WNFC CEN1 | 0.237 | 0.036 | **BNFC DMN1-DMN2** | 0.012 | 0.234 |
| WNFC DMN3 | 0.338 | 0.044 | **BNFC DMN1-DMN4** | 0.222 | 0.210 |
| BNFC VIS1-Salience | 0.528 | 0.260 | **BNFC DMN1-SMN1** | 0.018 | 0.220 |
| BNFC VIS1-CEN2 | -0.187 | 0.200 | **BNFC DMN1-CEN3** | 0.087 | 0.136 |
| BNFC VIS1-DMN5 | -0.005 | 0.189 | **BNFC DMN1-SMN2** | -0.139 | 0.206 |
| BNFC VIS1-DMN1 | 0.137 | 0.116 | **BNFC DMN1-CEN1** | -0.025 | 0.244 |
| BNFC VIS1-VIS2 | -0.069 | 0.245 | **BNFC DMN1-DMN3** | 0.091 | 0.284 |
| BNFC VIS1-DMN2 | -0.125 | 0.205 | **BNFC VIS2-DMN2** | -0.145 | 0.167 |
| BNFC VIS1-DMN4 | 0.117 | 0.127 | **BNFC VIS2-DMN4** | 0.022 | 0.136 |
| BNFC VIS1-SMN1 | -0.047 | 0.110 | **BNFC VIS2-SMN1** | -0.081 | 0.210 |
| BNFC VIS1-CEN3 | 0.213 | 0.212 | **BNFC VIS2-CEN3** | 0.239 | 0.235 |
| BNFC VIS1-SMN2 | -0.034 | 0.203 | **BNFC VIS2-SMN2** | 0.353 | 0.163 |
| BNFC VIS1-CEN1 | -0.112 | 0.184 | **BNFC VIS2-CEN1** | 0.151 | 0.127 |
| BNFC VIS1-DMN3 | 0.407 | 0.167 | **BNFC VIS2-DMN3** | 0.001 | 0.197 |
| BNFC Salience-CEN2 | 0.283 | 0.108 | **BNFC DMN2-DMN4** | 0.166 | 0.179 |
| BNFC Salience-DMN5 | -0.243 | 0.194 | **BNFC DMN2-SMN1** | -0.119 | 0.202 |
| BNFC Salience-DMN1 | 0.048 | 0.167 | **BNFC DMN2-CEN3** | 0.120 | 0.161 |
| BNFC Salience-VIS2 | 0.190 | 0.175 | **BNFC DMN2-SMN2** | 0.214 | 0.136 |
| BNFC Salience-DMN2 | -0.077 | 0.168 | **BNFC DMN2-CEN1** | -0.182 | 0.185 |
| BNFC Salience-DMN4 | 0.093 | 0.149 | **BNFC DMN2-DMN3** | 0.401 | 0.142 |
| BNFC Salience-SMN1 | 0.343 | 0.159 | **BNFC DMN4-SMN1** | -0.187 | 0.200 |
| BNFC Salience-CEN3 | 0.021 | 0.252 | **BNFC DMN4-CEN3** | -0.005 | 0.189 |
| BNFC Salience-SMN2 | -0.063 | 0.253 | **BNFC DMN4-SMN2** | 0.137 | 0.115 |
| BNFC Salience-CEN1 | 0.161 | 0.139 | **BNFC DMN4-CEN1** | -0.069 | 0.245 |
| BNFC Salience-DMN3 | 0.191 | 0.153 | **BNFC DMN4-DMN3** | -0.125 | 0.205 |
| BNFC CEN2-DMN5 | 0.100 | 0.229 | **BNFC SMN1-CEN3** | 0.208 | 0.035 |
| BNFC CEN2-DMN1 | -0.064 | 0.252 | **BNFC SMN1-SMN2** | 0.117 | 0.127 |
| BNFC CEN2-VIS2 | -0.064 | 0.168 | **BNFC SMN1-CEN1** | -0.047 | 0.110 |
| BNFC CEN2-DMN2 | 0.066 | 0.145 | **BNFC SMN1-DMN3** | 0.213 | 0.212 |
| BNFC CEN2-DMN4 | -0.088 | 0.216 | **BNFC CEN3-SMN2** | -0.034 | 0.203 |
| BNFC CEN2-SMN1 | 0.086 | 0.225 | **BNFC CEN3-CEN1** | -0.112 | 0.184 |
| BNFC CEN2-CEN3 | -0.083 | 0.216 | **BNFC CEN3-DMN3** | 0.354 | 0.120 |
| BNFC CEN2-SMN2 | 0.393 | 0.158 | **BNFC SMN2-CEN1** | 0.283 | 0.108 |
| BNFC CEN2-CEN1 | 0.194 | 0.137 | **BNFC SMN2-DMN3** | -0.243 | 0.194 |

## **Supplementary References**

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