

## **Supplementary Methods**

Neuropsychological Assessment. Mini-Mental State Examination (1) was adopted to measure subjects' global cognitive efficiency, whilst Raven's Progressive Matrices (2) evaluated nonverbal reasoning abilities and fluid intelligence. In addition, the Rey Auditory Verbal Learning Test (3) and the Babcock Story Recall Test (4) assessed immediate and delayed verbal memory; the Forward Digit Span (5), the Attentional Matrices Test (6) and the Trail Making Test A and B (7) were used to measure attention, visual search, working memory storage capacity and task-switching abilities; the Rey–Osterrieth complex figure (8) immediate and delayed recall, as well as the Corsi Block-Tapping Test (9) for visuo-spatial memory performance. The Freehand Drawing Test (6), the Planned Copy Test (10) and the Rey–Osterrieth complex figure freehand copy (8) assessed subjects' praxis abilities. Lastly, the Phonemic and Semantic Fluency Tests (6) measured vocabulary size and lexical access speed, which are two relevant components of language and executive functions.

Clinical Biochemistry Evaluation. We used a General Linear Model (GLM) to estimate the association between tHcy, folate, vitamin B<sub>12</sub> as well as their interactions, and age, including years of education, MMSE scores and fMRI task accuracy as nuisance variables. The same method was employed to test linear relationships between blood biochemistry and subjects' global cognitive status (i.e., MMSE scores). In addition, six independent GLMs were adopted to investigate the differences between healthy elders (HE) and mild cognitive impairment (MCI) participants for each vitamin-related compound (and relative interactions), adding age, education and MMSE scores as regressors of no interest.

fMRI Task Accuracy. GLM analysis was employed to investigate differences between HE and MCI subjects in task accuracy during fMRI acquisition, adding age, years of education and MMSE scores in the model as regressors of no interest (p-value < 0.05). The same approach was also adopted to test relationships between fMRI task accuracy, blood biochemistry, age, years of education and MMSE scores.

MRI Data Analysis. High-resolution structural images were used to compute the transformation from the original to the MNI152 standard space (11) and to define anatomically accurate cerebrospinal fluid (CSF) masks. These masks were used to extract signals of no-interest from subjects' fMRI data that were included as confounds when estimating activation maps at single-subject level. To do so, we first used ANTs to perform accurate brain extraction (`antsBrainExtraction.sh` - <https://github.com/stnava/ANTs/blob/master/Scripts/antsBrainExtraction.sh>) and AFNI's 3dQwarp to non-linearly transform each brain to match the MNI152 template (1x1x1mm resolution). The estimated deformation field was subsequently used to transform single-subject level activation maps from the original into the standard space. Brain extracted images were also segmented into 3 matters (grey, white and CSF) by means of FSL-FAST. Afterwards, CSF probability maps were thresholded and binarized using the stringent value of 100%. The resulting masks were then eroded by 2 voxels and resampled to match the fMRI spatial grid using nearest-neighbour interpolation. The whole procedure ensured that only few and accurately selected voxels formed the extraction masks.

For each subject, the three functional datasets were pre-processed to remove potential confounds related to physiological artifacts and to reduce scanner-related noise before estimating the statistical parametric maps. First, raw data were automatically inspected and corrected for intensity spikes (3dDespike). Second, images were

adjusted for slice acquisition timing accordingly to the ascending interleaved pattern (3dTshift), and head movements were estimated and compensated (3dvolreg) by registering each volume to the last of the third run (i.e., the closest in time to the high-resolution anatomical sequence). To this regard, a rigid body transformation was adopted and the six estimated motion parameters (x- y- and z- rotations and translations) were included as confounds in the single-subject GLM analysis. In addition, transformation matrices were used to compute an aggregated measure - framewise displacement (FD; `fsl_motion_outliers`, 12) - that highlighted timepoints affected by excessive motion. We then thresholded this metric ( $FD \geq 0.5$ ) to generate a regressor for each motion spike, which was then added as confound to the GLM (i.e., spike regression method, 13). Based on the FD metric we excluded four subjects from the group-level analysis, since their FD across three runs exceeded the group average by 3 standard deviations or more (FD group average =  $0.158 \pm 0.074$ ; range: 0.069 - 0.435).

Subsequently, time-series were spatially smoothed using a Gaussian kernel until data reached a full width at half maximum level of 6mm (3dBlurToFWHM), so as the original data smoothness was properly considered. Lastly, each fMRI run was normalized (3dTstat and 3dcalc), meaning that for each voxel the average signal across timepoints was 100 and changes between rest and task periods could be expressed as percentage of increments or decrements. Pre-processed and normalized runs were then fed into the single-subject GLM analysis. To estimate activation maps elicited by the visuo-spatial attention task, we adopted a mass-univariate (i.e., voxel-wise) GLM approach, including brain activity as the explained variable and the task regressor, convolved with a canonical hemodynamic response function (SPMG1 in 3dDeconvolve), as the explanatory variable of interest. A 2nd order degree

polynomial regressor (automatically estimated by AFNI), together with the aforementioned six motion parameters, spike regressors and average CSF signal were included in the model as nuisance variables. Temporal autocorrelation of the fMRI signal was also removed using restricted maximum likelihood method with ARMA(1,1) model (3dREMLfit). Task-related changes in hemodynamic activity were estimated as parameter fitting for the regressor of interest (i.e.,  $\beta$ -values) and were transformed into T-values - i.e.,  $\beta/SE(\beta)$ . GLM residuals were also employed to compute the parameters for the spatial autocorrelation function (3dFWHMx) after being transformed to match the MNI152 standard space and were then used to properly correct group-level results with the AFNI's cluster-based method.

Both  $\beta$ - and T-values were transformed into the MNI152 standard space as well, by applying the already computed deformation field and resampled to a final grid of 2x2x2 mm using sinc interpolation (5mm window). Preprocessed single-subject data were then fed into a group-level correlation analyses to test the relationship between brain activity, blood biochemistry and neuropsychological profiles.

## Supplementary Results

Neuropsychological Assessment. Subjects' performance at the immediate recall for Rey Auditory Verbal Learning Test showed a strong correlation with delayed recall of the same test, Trail Making A and B, Rey–Osterrieth complex figure recall, Babcock Story Recall Test and both Phonemic and Semantic Fluency Tests. The delayed recall for Rey Auditory Verbal Learning Test significantly correlated with Corsi Block-Tapping Test, while Attentional matrices with both the Corsi Block-Tapping Test and the Trail Making A and B. Subjects' scores for the latters were associated with Semantic Fluency and both verbal fluency tests (i.e., Phonemic and Semantic), respectively. Both Trail Making A and B tests were correlated also with Raven Progressive Matrices, performance at the Rey–Osterrieth complex figure copy and between themselves. In addition, copy of the Rey–Osterrieth complex figure was associated to Raven Progressive Matrices, Planned Copy and Drawing and Copying Test. On the other hand, both the immediate and delayed recall of the complex figure were correlated with Semantic Fluency, Raven Progressive Matrices, the delayed recall of the Babcock Story and between themselves as well. In our sample, immediate recall performance at the Babcock Story was associated to the delayed recall of the same test, while the Drawing and Copying Test was correlated with Planned Copy and Raven Progressive Matrices. The latter had a linear relationship with Planned Copy and Semantic Fluency. Lastly, scores at the two verbal fluency tests were significantly correlated.

Clinical Biochemistry Evaluation. Overall, vitamin-related compounds were not associated with age (tHcy ~ age:  $\beta = 0.202$ , p-value = 0.107; folate ~ age:  $\beta = 0.167$ , p-value = 0.185; vitamin B<sub>12</sub> ~ age:  $\beta = -0.131$ , p-value = 0.297; vitamin B<sub>12</sub> \* folate ~ age:  $\beta = -0.095$ , p-value = 0.453; tHcy \* folate ~ age:  $\beta = -0.058$ , p-value = 0.644).

However, the correlation between the vitamin B<sub>12</sub> \* tHcy interaction and age reached  $\beta = 0.272$  (p-value = 0.028).

In addition, MMSE scores were not associated with any of the following blood markers: MMSE scores ~ tHcy:  $\beta = -0.100$ , p-value = 0.429; MMSE scores ~ folate:  $\beta = -0.109$ , p-value = 0.390; MMSE scores ~ vitamin B<sub>12</sub>:  $\beta = -0.005$ , p-value = 0.972; MMSE scores ~ vitamin B<sub>12</sub> \* folate:  $\beta = -0.014$ , p-value = 0.909; MMSE scores ~ tHcy \* folate:  $\beta = -0.158$ , p-value = 0.210. Yet, the correlation between MMSE scores and vitamin B<sub>12</sub> \* tHcy achieved  $\beta = -0.260$  (p-value = 0.036).

Differences in vitamin B<sub>12</sub> serum levels between HE ( $468.87 \pm 154.44$  pg/mL) and MCI ( $380.12 \pm 138.02$  pg/mL) attained  $p = 0.017$  ( $F_{(1,60)} = 6.081$ ). Group comparisons for tHcy, folate, vitamin B<sub>12</sub> \* folate, vitamin B<sub>12</sub> \* tHcy and folate \* tHcy did not reach the statistical significance level (respectively:  $F_{(1,60)} = 0.143$ , p-value = 0.707;  $F_{(1,60)} = 0.022$ , p-value = 0.881;  $F_{(1,60)} = 0.189$ , p-value = 0.665;  $F_{(1,60)} = 1.003$ , p-value = 0.321;  $F_{(1,60)} = 0.399$ , p-value = 0.530).

fMRI Task Accuracy. There was no significant difference ( $F_{(1,60)} = 0.531$ , p-value = 0.469) in accuracy between HE ( $80.70\% \pm 9\%$ ) and MCI subjects ( $80.15\% \pm 8\%$ ).

GLM analysis investigating associations between subjects' performance at the fMRI visuo-spatial attention task and blood biochemistry, age, years of education and MMSE scores, revealed two significant results: subjects' performance was positively associated to the vitamin B<sub>12</sub> \* tHcy interaction scores ( $\beta = 0.335$ ; p-value = 0.006) and negatively associated to age ( $\beta = -0.305$ ; p-value = 0.014). No other significant results were found (accuracy ~ tHcy:  $\beta = 0.141$ , p-value = 0.263; accuracy ~ folate:  $\beta = 0.116$ , p-value = 0.356; accuracy ~ vitamin B<sub>12</sub>:  $\beta = -0.164$ , p-value = 0.191; accuracy ~ vitamin B<sub>12</sub> \* folate:  $\beta = 0.152$ , p-value = 0.227; accuracy ~ tHcy \* folate:

$\beta = -0.126$ ,  $p\text{-value} = 0.316$ ; accuracy  $\sim$  years of education:  $\beta = 0.224$ ,  $p\text{-value} = 0.073$ ; accuracy  $\sim$  MMSE scores:  $\beta = 0.189$ ,  $p\text{-value} = 0.133$ ).

*Relationship between task-negative brain regions, blood biochemistry and cognitive profiles.* Two ROIs pertaining to the task-negative network and located within the ventromedial prefrontal cortex (vmPFC) were found to negatively correlate with biochemical markers interactions: right vmPFC with B<sub>12</sub> \* folate ( $\beta = -0.686$ ; Supplemental Figure 3A; Supplemental Figure 4B), and bilateral vmPFC with tHcy \* folate ( $\beta = -0.579$ ; Supplemental Figure 3B; Supplemental Figure 5B). Activity of the right vmPFC was able to predict subjects' cognitive state as expressed by the 12<sup>th</sup> PC (Supplemental Table 4 and Supplemental Figure 4B). Nonetheless, it should be noted that B<sub>12</sub> \* folate levels per se were already sufficient to explain this cognitive profile (Table 1 and Supplemental Figure 4A). Lastly, hemodynamic of the bilateral vmPFC cluster did not correlate with any of the PCs (Supplemental Table 4 and Supplemental Figure 5B). Both these regions overlap the anterior component of the Default Mode Network (14), and their activity is generally negative (i.e., below baseline) during externally focused attention tasks (15). Of these two clusters, we found that only the right vmPFC significantly predicted subjects' cognitive profile: elders demonstrating higher visual working memory abilities (and lower verbal fluency) have a reduced deactivation during task execution, lower folate concentrations and a valuable imbalance between B<sub>12</sub> and folate serum levels. Nevertheless, this cognitive profile can be explained simply by looking at vitamin-related compounds (Table 1), thus indicating that there is no valuable role of vmPFC as an intermediate phenotype in the prediction of elders' mental abilities (Supplemental Figure 4). This is also corroborated by the results of a control analysis: the inclusion of B<sub>12</sub> \* folate values as confound in the correlation analysis between right vmPFC and cognitive profile

determined a drop in their association ( $\beta = 0.284$ , raw p-value = 0.0298; Bonferroni corrected p-value = 0.507; Supplemental Table 6). Hence, vitamin-related compounds and vmPFC share similar predictive power in explaining elders' cognitive state.

## Appendix

### Train the Brain Consortium

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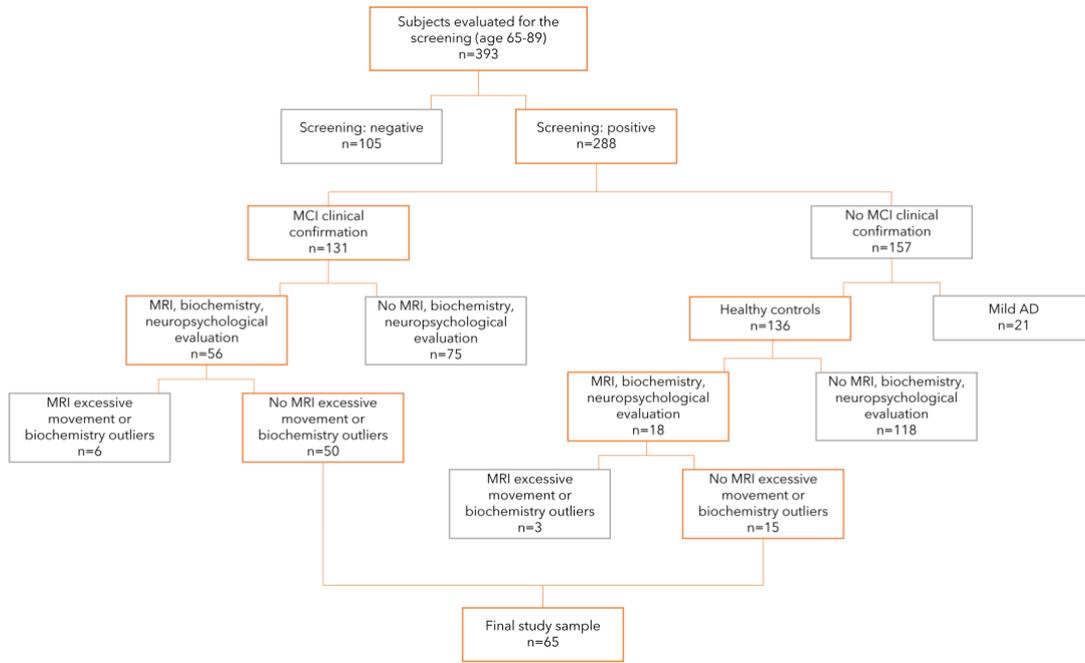
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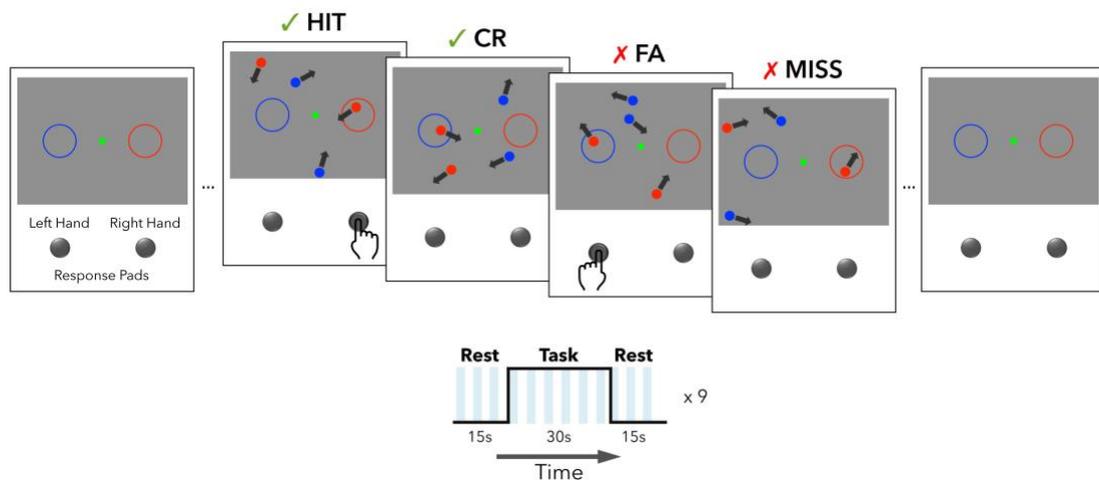
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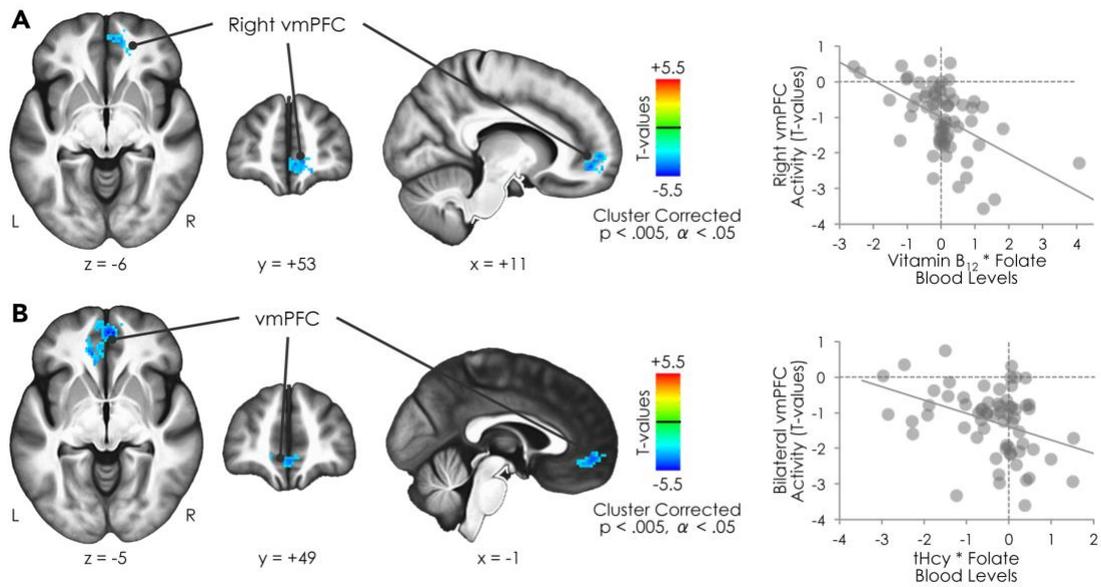
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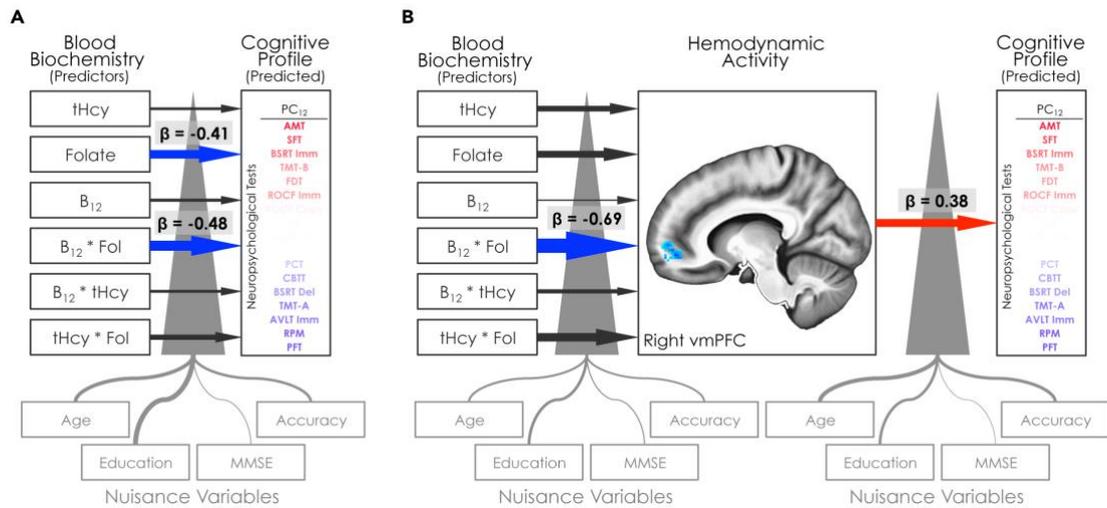
Supplemental Figure 1 **Participants flowchart**. Flowchart representation of the enrolling procedure adopted to reach our final sample of 65 subjects.



Supplemental Figure 2 **Visuo-spatial attention task**. Schematic representation of the visuo-spatial attention task performed by 65 non-demented elders during fMRI acquisition. Subjects were asked to covertly track four stimuli (i.e., two red and two blue dots) while gazing a central fixation point. The four dots were moving randomly at a constant speed of 6 deg/s. Two near-peripheral (i.e., 7.5 deg of eccentricity) coloured targets were located to the right (i.e., red target) and to the left (i.e., blue target) of the fixation point. Participants had to press the correct response button whenever one stimulus hit the target of the same colour and their performance was recorded in real-time. During rest periods, only the two static targets were presented and subjects were instructed to simply gaze the central fixation point.



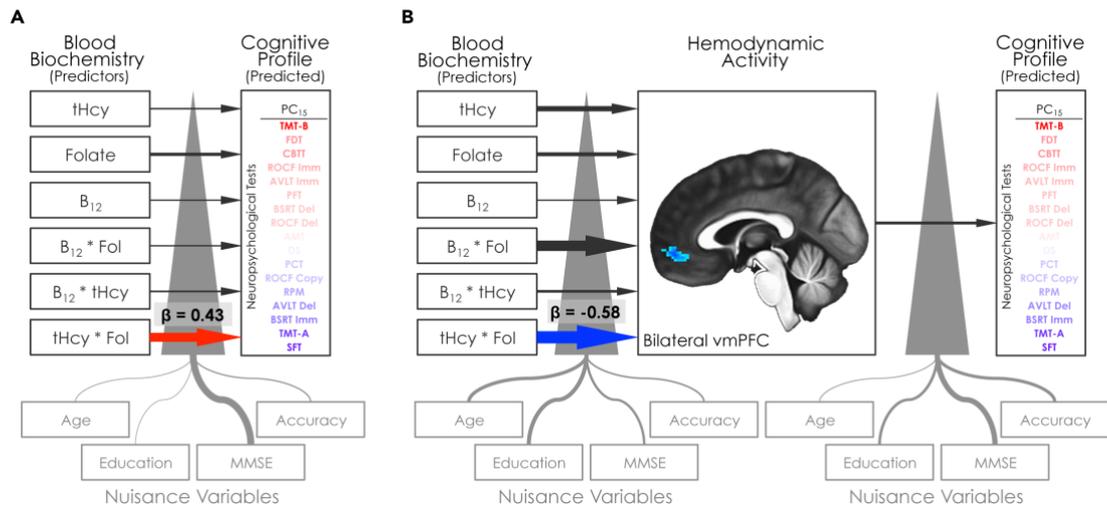
Supplemental Figure 3 **Brain activity results.** (A) Results for the relationship between blood biochemistry and task-evoked brain activity. The hemodynamic activity of the right ventromedial prefrontal cortex (vmPFC), located within the task-negative network, was found to be significantly associated with B<sub>12</sub> \* folate interaction (two-tailed p-value < 0.005 for the cluster-forming threshold and  $\alpha$  < 0.05 for cluster significance). (B) Results for the relationship between blood biochemistry and task-evoked brain activity. The hemodynamic activity of the bilateral vmPFC was found to be significantly associated with homocysteine (tHcy) \* folate interaction (two-tailed p-value < 0.005 for the cluster-forming threshold and  $\alpha$  < 0.05 for cluster significance).



Supplemental Figure 4 **Resulting model for the relationship between blood biochemistry, right vmPFC activity and cognitive profiles.** (A) Scheme depicting the significant role of folate ( $\beta = -0.41$ ) and B<sub>12</sub> by folate interaction ( $\beta = -0.48$ ) as direct predictors of the cognitive profile expressed by the 12<sup>th</sup> component (PC; i.e., visual working memory abilities). Loadings of each neuropsychological test for this component are colour-coded: the more intense the red is, the more positive is the loading of a test; vice-versa, the more intense the blue is, the more negative the loading. Age, years of education, Mini Mental State Examination scores and fMRI task accuracy are included in the model as nuisance variables. (B) Hemodynamic activity of the right ventromedial prefrontal cortex (vmPFC) correlated with B<sub>12</sub> \* folate interaction ( $\beta = -0.69$ ) and predicted subjects' cognitive status expressed by the 12<sup>th</sup> component ( $\beta = 0.38$ ). In both panels, arrows thickness represents the strength of the association between variables. Significant correlations are marked with coloured arrows (positive relationships red, negative blue). The same nuisance variables are included in the model at both steps of analysis. Please note that although the right vmPFC was significantly associated to cognitive profile expressed by the 12<sup>th</sup> PC, hemodynamic activity of this region did not add a relevant contribution to the prediction of subjects' working-memory abilities, since the latter could be already explained by considering blood biochemistry only.

RPM: Raven's Progressive Matrices, AVLT: Rey Auditory Verbal Learning Test, BSRT: Babcock Story Recall Test, DS: Forward Digit Span, AMT: Attentional Matrices Test, TMT-: Trail Making Test, ROCF: Rey–Osterrieth complex figure, CBTT: Corsi Block-Tapping Test, FDT: Freehand Drawing Test, PCT: Planned Copy Test, PFT: Phonemic Fluency Test, SFT: Semantic Fluency Test. Imm: immediate

recall, Del: delayed recall. tHcy: homocysteine, Fol: folate, MMSE: Mini-Mental State Examination.



Supplemental Figure 5 **Resulting model for the relationship between blood biochemistry, bilateral vmPFC activity and cognitive profiles.** (A) Scheme depicting the significant role of homocysteine by folate interaction ( $\beta = 0.43$ ), as direct predictor of the cognitive profile expressed by the 15<sup>th</sup> component (PC; i.e., task switching and attention abilities). Loadings of each neuropsychological test for this component are colour-coded: the more intense the red is, the more positive is the loading of a test; vice-versa, the more intense the blue is, the more negative the loading. Age, years of education, Mini Mental State Examination scores and fMRI task accuracy are included in the model as nuisance variables. (B) Hemodynamic activity of the bilateral ventromedial prefrontal cortex (vmPFC) correlated with tHcy \* folate interaction ( $\beta = -0.58$ ), yet it failed to predict subjects' cognitive status expressed by the 15<sup>th</sup> component. In both panels, arrows thickness represents the strength of the association between variables. Significant correlations are marked with coloured arrows (positive relationships red, negative blue). The same nuisance variables are included in the model at both steps of analysis.

RPM: Raven's Progressive Matrices, AVLT: Rey Auditory Verbal Learning Test, BSRT: Babcock Story Recall Test, DS: Forward Digit Span, AMT: Attentional Matrices Test, TMT-: Trail Making Test, ROCF: Rey–Osterrieth complex figure, CBTT: Corsi Block-Tapping Test, FDT: Freehand Drawing Test, PCT: Planned Copy Test, PFT: Phonemic Fluency Test, SFT: Semantic Fluency Test. Imm: immediate recall, Del: delayed recall. tHcy: homocysteine, Fol: folate, MMSE: Mini-Mental State Examination.

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**Supplemental Table 1: Demographic data and neuropsychological scores**

Subject ID	Gender	Condition	Age	Score	Zscore	Education	Score	Zscore	MMSE	Score	Zscore	AVLT	Score	Zscore	AVLT-Del	Score	Zscore	DS	Score	Zscore	AMI	Score	Zscore	TMTA*	Score	Zscore	TMTB*	Score	Zscore	ROCF Copy	Score	Zscore	ROCF Imm	Score	Zscore	ROCF Del	Score	Zscore	BSRT Imm	Score	Zscore	BSRT Del	Score	Zscore	FDI	Score	Zscore	PCT	Score	Zscore	RPM	Score	Zscore	PFT	Score	Zscore	SFT	Score	Zscore	CBT	Score	Zscore
sub-0001	M	aMCI	79	0.97	15	1.08	26.3	0.20	34.6	0.19	4.4	-0.27	6.75	1.24	55.50	0.92	47	-0.05	92	0.53	29.7	-0.08	7.4	-0.85	7.0	-0.81	0.5	-2.10	0.5	-1.37	9.7	-0.58	69.1	0.47	26.8	-0.52	22.3	-1.04	19	-2.10	4.5	-0.23																				
sub-0002	F	aMCI	72	-0.40	13	0.64	24.7	-0.58	15.2	-1.90	1.9	-1.09	58.75	0.25	58.75	1.38	15	0.95	128	0.15	37.2	1.15	7.3	-0.91	5.4	-1.06	1.5	-1.56	0.5	-1.37	12.4	1.57	69.3	0.54	34.8	1.10	32.5	-0.10	25	-1.36	4.3	-0.60																				
sub-0003	M	aMCI	75	0.19	8	-0.45	24.0	-0.93	22.9	-1.07	2.6	-0.86	4.25	-1.23	45.00	-0.57	24	0.67	116	0.27	35.0	0.79	11.9	-0.12	4.3	-1.24	4.0	-2.15	0.7	-1.28	9.8	-0.50	69.3	0.54	32.3	0.59	26.7	-0.63	31	-0.63	4.3	-0.60																				
sub-0004	M	aMCI	70	-0.80	13	0.64	23.7	-1.07	28.1	-0.51	1.2	-1.32	4.75	-0.74	51.75	0.39	84	-1.60	144	-0.03	18.4	-1.91	4.0	-1.47	4.7	-1.17	3.5	-0.48	3.2	-0.20	6.9	-2.81	64.0	-1.27	25.1	-0.48	10.6	-2.10	36	-0.01	4.0	-0.96																				
sub-0005	M	aMCI	69	-0.99	5	-1.11	28.3	1.18	22.0	-1.17	3.4	-0.60	6.50	0.00	44.00	-0.71	36	0.29	134	0.08	30.8	0.10	9.4	-0.55	14.7	0.40	1.2	-1.72	2.7	-0.42	11.2	0.62	67.3	-0.14	34.5	1.03	35.6	0.18	40	0.48	4.5	-0.23																				
sub-0006	F	aMCI	73	-0.21	8	-0.45	26.4	0.25	39.9	0.76	6.6	0.44	5.25	0.75	57.50	1.21	52	-0.21	113	0.31	36.0	0.96	10.1	-0.43	11.7	-0.07	2.5	-1.02	3.9	0.10	9.8	-0.50	71.3	1.22	30.3	0.18	29.7	-0.36	33	-0.38	5.5	1.22																				
sub-0007	M	aMCI	73	-0.21	13	0.64	26.7	0.40	35.1	0.25	4.9	-0.11	5.75	0.25	39.25	-1.39	20	0.79	83	0.63	33.7	0.58	9.1	-0.60	9.1	-0.48	3.7	-0.37	3.8	0.06	11.4	0.78	69.3	0.54	31.8	0.49	27.5	-0.56	31	-0.63	5.0	0.49																				
sub-0008	F	aMCI	81	1.37	8	-0.45	23.7	-1.07	21.1	-1.27	3.3	-0.63	4.25	-1.23	45.00	-0.57	134	-2.76	283	-1.52	22.7	-1.23	10.0	-0.44	9.8	-0.37	3.8	-0.31	4.0	0.14	10.9	0.38	69.7	0.68	26.4	-0.61	31.7	-0.18	20	-1.98	2.3	-3.50																				
sub-0009	M	aMCI	77	0.58	13	0.64	26.3	0.20	35.4	0.28	5.6	0.12	7.00	1.49	58.50	1.35	21	0.76	50	0.98	33.9	0.61	7.5	-0.87	6.9	-0.83	3.8	-0.31	2.9	-0.33	10.4	-0.02	70.7	1.02	27.5	-0.38	43.5	0.90	37	0.11	5.3	0.86																				
sub-0010	F	aMCI	67	-1.39	5	-1.11	21.9	-1.95	22.0	-1.17	5.8	0.18	4.50	-0.99	50.50	0.21	113	-2.10	283	-1.52	31.8	0.27	11.0	-0.27	10.7	-0.23	0.2	-2.26	0.7	-1.28	10.2	-0.18	66.7	-0.35	25.5	-0.79	32.6	-0.10	41	0.60	4.3	-0.60																				
sub-0011	M	aMCI	69	-0.99	8	-0.45	27.0	0.54	36.9	0.44	3.9	-0.44	7.25	1.73	55.50	0.92	2	1.35	0	1.52	35.4	0.86	23.4	1.85	24.1	1.87	3.5	-0.48	2.5	-0.50	11.6	0.94	67.0	-0.25	34.6	1.06	46.9	1.21	49	1.58	4.3	-0.60																				
sub-0012	F	HE	69	-0.99	5	-1.11	27.9	0.98	44.1	1.22	8.8	1.16	5.50	0.00	51.75	0.39	29	0.51	59	0.89	39.3	1.50	24.7	2.07	25.8	2.14	6.4	1.09	7.9	1.82	11.1	0.54	71.5	1.29	29.9	0.10	35.9	0.21	50	1.70	5.5	1.22																				
sub-0013	M	aMCI	74	-0.01	5	-1.11	24.7	-0.58	28.0	-0.52	4.1	-0.37	3.50	-1.97	39.25	-1.39	66	-0.64	283	-1.52	37.4	1.19	19.0	1.10	17.3	0.80	5.4	0.55	5.9	0.96	10.3	-0.10	65.1	-0.90	29.2	-0.04	23.4	-0.94	35	-0.14	4.5	-0.23																				
sub-0014	F	aMCI	73	-0.21	5	-1.11	22.3	-1.76	25.0	-0.85	0.0	-1.71	5.50	0.00	40.75	-1.17	42	0.11	283	-1.52	28.4	-0.30	0.0	-2.16	0.0	-1.91	3.4	-0.53	0.9	-1.19	10.3	-0.10	66.1	-0.55	21.2	-1.66	24.4	-0.84	20	-1.98	4.8	0.13																				
sub-0015	F	HE	71	-0.60	18	1.74	23.7	-1.07	40.3	0.81	6.8	0.51	6.50	0.99	57.75	1.24	45	0.01	175	-0.36	28.6	-0.26	8.8	-0.65	7.8	-0.69	3.5	-0.48	4.3	0.27	8.4	-1.61	66.3	-0.49	23.4	-1.21	29.5	-0.38	36	-0.01	4.0	-0.96																				
sub-0016	M	HE	68	-1.19	13	0.64	27.2	0.64	33.1	0.03	5.2	-0.01	6.50	-0.99	55.75	0.96	29	0.51	46	1.03	32.6	0.40	18.7	1.05	12.2	0.00	7.0	1.42	3.2	-0.20	11.9	1.18	68.0	0.10	36.1	1.36	70.6	3.37	54	2.20	5.0	0.49																				
sub-0017	F	HE	78	0.78	8	-0.45	27.0	0.54	36.1	0.35	9.3	1.33	5.25	-0.24	38.00	-1.56	11	1.07	159	-1.19	27.2	-0.49	9.4	-0.55	16.0	0.60	4.8	0.23	5.3	0.70	9.9	-0.42	66.7	-0.35	26.4	-0.61	29.7	-0.36	31	-0.63	4.5	-0.23																				
sub-0018	F	aMCI	74	-0.01	13	0.64	27.7	0.88	42.2	1.01	10.9	1.85	3.75	-1.73	48.75	-0.04	36	0.29	148	-0.07	26.2	-0.66	15.3	0.46	14.4	0.35	4.8	0.23	9.4	-0.82	68.3	0.20	30.8	0.29	40.5	0.63	38	0.23	4.3	-0.60																						
sub-0019	M	aMCI	83	1.76	5	-1.11	27.4	0.74	27.2	-0.61	6.8	0.51	5.75	0.25	41.25	-1.10	129	2.61	283	-1.52	34.1	0.84	23.9	1.94	20.9	1.37	2.6	-0.96	4.4	0.32	11.5	0.86	71.5	1.29	30.0	0.12	27.4	-0.57	35	-0.14	5.8	1.58																				
sub-0020	F	aMCI	81	1.37	5	-1.11	29.4	1.72	39.2	0.69	7.8	0.84	5.50	0.00	50.25	0.18	38	0.23	128	0.15	35.1	0.81	13.6	0.17	13.8	0.26	2.5	-1.02	3.1	-0.24	10.5	0.06	66.5	-0.42	32.0	0.53	48.4	1.35	31	-0.63	4.8	0.13																				
sub-0021	M	HE	73	-0.21	8	-0.45	25.4	-0.24	39.9	0.76	7.6	0.77	4.25	-0.24	45.00	-0.57	22	0.73	132	0.10	31.0	0.13	11.4	-0.20	14.8	0.41	3.4	-0.53	5.9	0.96	11.8	1.10	70.3	0.88	29.3	-0.02	41.7	0.73	45	1.09	5.3	0.86																				
sub-0022	F	aMCI	71	-0.60	8	-0.45	23.4	-1.22	32.0	-0.09	3.4	-0.60	9.25	3.71	43.50	-0.78	57	-0.36	170	-0.31	36.8	1.09	12.5	-0.01	10.2	-0.31	3.2	-0.64	0.5	-1.37	8.6	-1.45	64.0	-1.27	24.6	-0.97	37.6	-0.36	35	-0.14	4.5	-0.23																				
sub-0023	F	HE	80	1.17	14	0.86	26.3	0.20	40.7	0.85	10.3	1.65	6.00	0.50	52.00	0.42	20	0.79	37	1.12	34.9	0.78	19.2	1.13	17.9	0.90	5.3	0.50	5.4	0.75	12.4	1.57	70.3	0.88	35.5	1.24	50.5	1.54	48	1.46	4.5	-0.23																				
sub-0024	M	aMCI	69	-0.99	5	-1.11	24.3	-0.78	21.0	-1.28	2.4	-0.93	4.50	-0.99	53.00	-0.57	27	0.57	35	1.14	34.8	0.76	3.4	-1.57	3.7	-1.33	5.2	0.44	0.7	-1.28	12.2	1.42	70.7	1.02	36.5	1.44	18.6	-1.37	20	-1.98	5.5	1.22																				
sub-0025	M	aMCI	74	-0.01	18	1.74	25.7	-0.09	32.3	-0.06	1.4	-1.25	5.50	0.00	44.25	-0.68	70	-0.77	122	0.21	32.0	0.30	3.7	-1.52	3.9	-1.30	4.5	0.06	0.3	-1.45	10.6	0.14	66.1	-0.55	23.1	-1.27	41.3	0.70	40	0.48	3.8	-1.32																				
sub-0026	F	HE	76	0.38	8	-0.45	27.0	0.54	30.9	1.95	8.6	1.10	4.25	-1.23	55.00	0.85	18	0.85	13	1.38	35.0	0.79	16.6	0.69	17.7	0.87	6.0	0.87	6.3	1.13	10.8	0.30	70.3	0.88	27.3	-0.42	47.7	1.28	45	1.09	4.5	-0.23																				
sub-0027	F	HE	73	-0.21	5	-1.11	29.3	1.67	58.0	0.56	8.1	0.93	6.00	0.99	51.75	0.39	31	0.45	112	0.32	34.4	0.69	26.6	2.40	30.8	2.92	7.0	1.42	7.2	1.52	12.3	1.50	70.1	0.81	38.2	1.78	35.4	1.16	42	0.72	4.8	0.13																				
sub-0028	M	aMCI	64	-1.98	13	0.64	27.2	0.64	23.0	-1.06	2.6	-0.86	4.25	-1.23	56.25	1.03	39	0.20	60	0.88	35.1	0.81	15.7	0.53	7.8	-0.69	3.1	-0.69	0.0	-1.58	10.8	0.30	65.7	-0.69	33.4	0.81	16.9	-1.53	42	0.72	4.0	-0.96																				
sub-0029	F	naMCI	82	1.56	17	1.52	27.1	1.52	27.1	1.52	3.0	-0.01	4.75	-0.74	34.00	-1.13	156	-3.45	283	-1.52	11.2	-3.13	6.8	-0.99	6.4	-0.91	6.1	0.93	6.1	1.05	9.7	-0.58	63.1	-1.58	14.8	-2.95	17.3	-1.49	24	-1.49	4.3	-0.60																				
sub-0030	F	aMCI	84	1.96	5	-1.11	22.4	-1.71	19.2	-1.47	4.8	-1.14	6.75	1.24	45.75	-0.46	35	-0.32	283	-1.52	26.1	-0.67	13.6	0.17	13.4	0.19	4.7	0.17	4.5	0.36	9.5	-0.74	66.5	-0.42	31.0	-0.33	28.4	-0.48	28	-0.99	4.8	0.13																				
sub-0031	M	HE	74	-0.01	17	1.52	22.7	-1.56	44.3	1.24	8.8	1.16	5.50	0.00	43.75	-0.75	53	-0.24	104	0.40	35.4	0.86	15.4	0.48	15.6	0.54	5.9	0.82	5.7	0.88	11.4	0.78	69.3	0.54	28.4	-0.20	29.5	-0.38	41	0.60	3.8	-1.32																				
sub-0032	M	naMCI	66	-1.58	17	1.52	27.2	0.64	31.5	-0.14	5.1	-0.05	5.50	0.00	44.25	-0.68	40	0.17	114	0.30	31.9	0.28	14.8	0.38	15.4	0.51	7.8																																			

**Supplemental Table 2: Predictive power of biochemical markers on cognitive profiles**

	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
tHcy	.011	.9322	<b>.312</b>	<b>.0192</b>	.082	.5487	-.111	.4192	-.088	.5191	<b>-.296</b>	<b>.0293</b>	-.068	.6180	<b>-.281</b>	<b>.0371</b>	.228	.0925	-.003	.9865	<b>.262</b>	<b>.0452</b>	-.138	.3098	.062	.6478	-.032	.8183	-.076	.5790	.046	.7356	-.074	.5872
Folate	-.080	.5563	.088	.5215	-.026	.8420	.013	.9234	.103	.4495	<b>-.301</b>	<b>.0242</b>	.021	.8841	.100	.4678	.123	.3677	-.072	.5948	-.114	.4073	<b>-.409</b>	<b>.0021</b>	.044	.7490	.046	.7325	.154	.2616	.064	.6403	-.259	.0536
B <sub>12</sub>	.222	.1034	-.064	.6390	.053	.7040	-.078	.5676	-.023	.8654	.075	.5795	-.171	.2071	.015	.9119	-.079	.5616	-.165	.2252	.244	.0707	-.147	.2746	.092	.4984	.065	.6317	.007	.9567	-.014	.9225	-.005	.9769
B <sub>12</sub> * Folate	.189	.1629	.156	.2513	-.050	.7140	.029	.8331	-.223	.0996	.078	.5718	-.117	.3926	-.038	.7781	-.024	.8622	-.016	.9106	-.147	.2837	<b>-.480</b>	<b>.0002</b>	-.012	.9286	.043	.7481	.012	.9254	-.070	.6036	-.005	.9666
B <sub>12</sub> * tHcy	.037	.7844	-.130	.3354	-.024	.8590	.097	.4747	-.116	.3934	-.047	.7305	.066	.6272	-.036	.7900	.179	.1889	-.154	.2566	.089	.5164	-.139	.3076	-.058	.6689	.073	.5905	-.081	.5522	.036	.7917	.174	.1999
tHcy * Folate	.149	.2689	.173	.2082	-.020	.8788	-.105	.4390	.112	.4170	.134	.3274	.007	.9604	-.071	.6027	.018	.8876	.172	.2015	-.165	.2257	-.253	.0618	.058	.6682	-.228	.0914	<b>.428</b>	<b>.0011</b>	-.031	.8190	.034	.8035
Age	-.154	.2596	<b>.321</b>	<b>.0162</b>	-.065	.6344	-.053	.7025	.241	.0742	.245	.0697	<b>.431</b>	<b>.0009</b>	.119	.3797	-.121	.3740	.192	.1575	.096	.4859	-.175	.2004	.071	.6060	.020	.8925	.038	.7802	-.156	.2487	-.100	.4655
Education	.101	.4625	.120	.3810	.007	.9632	<b>.333</b>	<b>.0125</b>	-.206	.1297	.200	.1441	<b>.346</b>	<b>.0027</b>	-.255	.0586	-.145	.2828	-.100	.4707	.040	.7681	.233	.0840	<b>-.300</b>	<b>.0253</b>	.121	.3733	.031	.8185	.013	.9224	-.096	.4799
MMSE Scores	<b>.553</b>	<b>.0000</b>	.092	.4999	.072	.6025	.031	.8248	.208	.1285	-.140	.3042	-.042	.7674	.118	.3829	-.084	.5335	.084	.5347	.057	.6785	-.042	.7621	-.145	.2893	-.071	.5973	<b>.325</b>	<b>.0164</b>	-.150	.2683	.247	.0674
fMRI Task Accuracy	.037	.7912	-.011	.9396	<b>-.293</b>	<b>.0290</b>	.020	.8865	.075	.5848	<b>.340</b>	<b>.0114</b>	-.029	.8342	.144	.2909	.090	.5153	.014	.9126	-.019	.8964	.126	.3566	.128	.3443	-.066	.6226	-.060	.6629	-.115	.3991	-.044	.7454

Model: PC<sub>j</sub> = α + β tHcy + β Folate + β B<sub>12</sub> + β B<sub>12</sub>\*Folate + β B<sub>12</sub>\*tHcy + β tHcy\*Folate + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

tHcy = homocysteine; MMSE = mini-mental state examination; PC = principal component

**Supplemental Table 3: Predictive power of right dACC activity on cognitive profiles**

	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
Right dACC	.188	.1467	-.091	.4885	.009	.9404	.120	.3541	-.188	.1484	.065	.6136	.210	.1049	.000	.9907	-.100	.4449	-.048	.7118	<b>.388</b>	<b>.0023</b>	-.082	.5253	-.051	.6965	-.071	.5929	.025	.8487	-.059	.6534	.052	.6842
Age	-.233	.0713	<b>.300</b>	<b>.0192</b>	-.059	.6519	-.030	.8231	<b>.267</b>	<b>.0384</b>	.135	.2945	<b>.446</b>	<b>.0003</b>	.100	.4377	-.025	.8428	.167	.1986	.142	.2737	-.123	.3442	.057	.6638	.027	.8299	.008	.9541	-.116	.3723	-.094	.4723
Education	.104	.4276	.125	.3387	-.012	.9297	<b>.310</b>	<b>.0151</b>	-.179	.1683	.202	.1166	<b>.356</b>	<b>.0047</b>	-.211	.1034	-.166	.2030	-.076	.5603	-.023	.8642	.152	.2405	<b>-.302</b>	<b>.0186</b>	.095	.4629	.117	.3649	.007	.9600	-.137	.2872
MMSE Scores	<b>.565</b>	<b>.0000</b>	.114	.3824	.079	.5430	.050	.7044	.148	.2554	-.136	.2913	-.055	.6728	.117	.3704	-.145	.2696	.092	.4854	.113	.3870	-.019	.8836	-.154	.2365	-.058	.6575	<b>.259</b>	<b>.0431</b>	.127	.3287	.211	.1056
fMRI Task Accuracy	-.001	.9918	-.022	.8649	<b>-.300</b>	<b>.0197</b>	.059	.6549	.020	.8758	<b>.263</b>	<b>.0419</b>	-.045	.7291	.130	.3137	.153	.2399	-.027	.8437	.007	.9592	.098	.4504	.099	.4540	-.025	.8533	-.140	.2820	-.099	.4462	-.036	.7876

Model:  $PC_j = \alpha + \beta \text{ Right dACC} + \beta \text{ Age} + \beta \text{ Education} + \beta \text{ MMSE} + \beta \text{ fMRI task accuracy}$ ; Underlined values represent  $p < 0.05$  uncorrected; **Bold values** represent  $p < 0.05$  Bonferroni corrected  
dACC = dorsal anterior cingulate cortex; MMSE = mini-mental state examination; PC = principal component

**Supplemental Table 4: Predictive power of right vmPFC activity on cognitive profiles**

Nuisance Variables	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
Right vmPFC	-.007	.9604	-.025	.8451	-.052	.6892	-.022	.8620	.031	.8062	.062	.6341	.149	.2508	.040	.7611	.096	.4595	.009	.9406	.103	.4298	<b>.380</b>	<b>.0028</b>	.053	.6816	.038	.7747	-.077	.5516	-.122	.3448	-.037	.7742
Age	-.232	.0702	<b>.304</b>	<b>.0162</b>	-.050	.7041	-.034	.7977	<b>.261</b>	<b>.0423</b>	.125	.3374	<b>.420</b>	<b>.0009</b>	.093	.4754	-.041	.7506	.166	.2021	.124	.3362	-.189	.1425	.048	.7169	.021	.8691	.022	.8624	-.095	.4639	-.088	.5021
Education	.088	.4979	.135	.2998	-.009	.9451	<b>.292</b>	<b>.0200</b>	-.165	.2020	.192	.1394	<b>.328</b>	<b>.0025</b>	-.214	.0998	-.164	.2060	-.073	.5772	-.064	.6220	.132	.3106	<b>.301</b>	<b>.0187</b>	.099	.4490	.121	.3499	.021	.8719	-.138	.2878
MMSE Scores	<b>.535</b>	<b>.0000</b>	.128	.3270	.077	.5514	-.031	.8160	.179	.1698	-.146	.2661	-.086	.5121	.117	.3671	-.127	.3303	.100	.4448	.053	.6830	.001	.9933	-.145	.2654	-.047	.7239	<b>.254</b>	<b>.0484</b>	.135	.3015	.202	.1204
fMRI Task Accuracy	-.009	.9473	-.022	.8670	<b>.308</b>	<b>.0165</b>	.057	.6628	.031	.8165	<b>.269</b>	<b>.0362</b>	-.032	.8043	.136	.2976	.170	.1888	-.024	.8547	.007	.9600	.151	.2407	.108	.4091	-.017	.8988	-.151	.2447	-.114	.3856	-.043	.7453

Model: PC<sub>i</sub> = α + β Right vmPFC + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

**Supplemental Table 4: Predictive power of bilateral vmPFC activity on cognitive profiles**

Nuisance Variables	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
Bilateral vmPFC	-.058	.6585	-.093	.4777	-.047	.7171	-.057	.6620	.031	.8171	-.037	.7756	-.009	.9498	.074	.5690	-.024	.8591	.017	.8903	.096	.4650	<b>.295</b>	<b>.0215</b>	-.071	.5812	.070	.5971	-.140	.2855	-.083	.5246	-.160	.2153
Age	-.220	.0885	<b>.321</b>	<b>.0110</b>	-.048	.7178	-.043	.7471	<b>.260</b>	<b>.0425</b>	.144	.2699	<b>.444</b>	<b>.0005</b>	.083	.5209	-.019	.8874	.163	.2063	.119	.3572	-.192	.1382	.073	.5761	.011	.9305	.041	.7560	-.097	.4599	-.057	.6658
Education	.095	.4723	.145	.2639	-.007	.9600	<b>.293</b>	<b>.0233</b>	-.167	.1987	.202	.1193	<b>.337</b>	<b>.0081</b>	-.220	.0859	-.154	.2344	-.074	.5679	-.069	.5981	.121	.3528	<b>.288</b>	<b>.0250</b>	.092	.4804	.133	.3039	.023	.8608	-.120	.3566
MMSE Scores	<b>.533</b>	<b>.0000</b>	.125	.3307	.076	.5682	-.033	.8026	.179	.1697	-.148	.2558	-.088	.4949	.120	.3594	-.130	.3167	.100	.4440	.055	.6725	.006	.9677	-.149	.2578	-.044	.7398	.250	.0535	.133	.3034	.197	.1276
fMRI Task Accuracy	-.011	.9300	-.024	.8560	<b>.303</b>	<b>.0178</b>	.057	.6597	.028	.8289	<b>.259</b>	<b>.0422</b>	-.052	.6904	.134	.2988	.156	.2340	-.024	.8540	-.002	.9847	.116	.3724	.097	.4600	-.018	.8902	-.148	.2549	-.102	.4362	-.046	.7274

Model: PC<sub>i</sub> = α + β Bilateral vmPFC + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

vmPFC = ventromedial prefrontal cortex; MMSE = mini-mental state examination; PC = principal component

**Supplemental Table 5: Predictive power of right dACC activity on cognitive profiles, controlling for vitamin B<sub>12</sub>**

	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
	Right dACC	.101	.4393	-.017	.8942	-.007	.9574	-.109	.4055	-.238	.0672	.014	.9118	.147	.2644	-.055	.6795	-.078	.5595	.080	.5450	<b>.392</b>	<b>.0022</b>	.015	.9065	-.118	.3729	-.164	.2102	.027	.8416	-.072	.5835	.052
B <sub>12</sub>	.169	.1970	-.143	.2771	.031	.8136	.021	.8742	.097	.4600	.099	.4610	.123	.3512	.105	.4241	-.043	.7461	-.247	.0579	-.008	.9550	-.188	.1510	.130	.3224	.182	.1643	-.004	.9746	.025	.8494	.000	.9932
Nuisance variables																																		
Age	-.210	.1081	<b>.280</b>	<b>.0228</b>	-.055	.6761	-.027	.8346	<b>.280</b>	<b>.0322</b>	.149	.2564	<b>.463</b>	<b>.0001</b>	.114	.3860	-.031	.8168	.134	.3085	.141	.2822	-.149	.2595	.074	.5732	.052	.6959	.008	.9535	-.113	.3956	-.095	.4716
Education	.108	.4107	.121	.3526	-.011	.9339	<b>.311</b>	<b>.0157</b>	-.176	.1793	.205	.1183	<b>.352</b>	<b>.0042</b>	-.208	.1104	-.167	.2032	-.083	.5247	-.023	.8665	.147	.2598	<b>-.298</b>	<b>.0122</b>	.100	.4443	.117	.3771	.008	.9538	-.137	.2968
MMSE Scores	<b>.559</b>	<b>.0000</b>	.119	.3630	.078	.5571	-.049	.7108	.145	.2707	-.140	.2830	-.060	.6491	.113	.3915	-.143	.2745	.101	.4437	.114	.3871	-.012	.9324	-.159	.2269	-.065	.6242	<b>.252</b>	<b>.0465</b>	.126	.3376	.211	.1040
fMRI Task Accuracy	.021	.8685	-.041	.7543	<b>-.226</b>	<b>.0213</b>	.061	.6353	.033	.8094	<b>.276</b>	<b>.0331</b>	-.028	.8283	.144	.2755	.148	.2574	-.059	.6508	.006	.9649	.073	.5831	.116	.3793	-.001	.9948	-.141	.2821	-.096	.4667	-.036	.7865

Model: PC<sub>i</sub> = α + β Right dACC + β B<sub>12</sub> + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected  
dACC = dorsal anterior cingulate cortex; MMSE = mini-mental state examination; PC = principal component

**Supplemental Table 6: Predictive power of right vmPFC activity on cognitive profiles, controlling for B<sub>12</sub> \* Folate interaction**

Nuisance variables	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
	Right vmPFC	.085	.5201	.074	.5741	-.087	.5077	-.041	.7529	-.094	.4762	.130	.3208	.104	.4293	.037	.7768	.062	.6338	.017	.9039	.060	.6461	<b>.284</b>	<b>.0228</b>	.069	.6090	.090	.4981	-.146	.2634	-.211	.1050	-.091
B <sub>12</sub> * Folate	.191	.1418	.208	.1108	-.073	.5738	.040	.7599	<b>-.260</b>	<b>.0470</b>	.142	.2769	-.095	.4695	-.006	.9622	-.072	.5897	.016	.9006	-.090	.4941	-.201	.1231	.032	.8106	.110	.4012	-.144	.2738	-.185	.1594	-.112	.3931
Age	-.202	.1210	<b>.337</b>	<b>.0092</b>	-.061	.6428	-.028	.8348	.221	.0900	.147	.2663	<b>.405</b>	<b>.0015</b>	.092	.4752	-.053	.6898	.168	.2000	.110	.4052	-.221	.0917	.053	.6866	.038	.7727	-.001	.9965	-.124	.3457	-.106	.4182
Education	.076	.5740	.121	.3529	-.004	.9786	<b>.226</b>	<b>.0208</b>	-.148	.2572	.183	.1602	<b>.334</b>	<b>.0089</b>	-.213	.1025	-.160	.2223	-.074	.5739	-.058	.6566	.145	.2700	<b>-.303</b>	<b>.0189</b>	.092	.4832	.130	.3210	.033	.8060	-.131	.3172
MMSE Scores	<b>.510</b>	<b>.0001</b>	.101	.4421	.086	.5088	-.026	.8471	.213	.1017	-.164	.2090	-.074	.5766	.118	.3705	-.118	.3725	.098	.4593	.065	.6212	.027	.8366	-.149	.2518	-.061	.6464	<b>.273</b>	<b>.0347</b>	.159	.2240	.217	.0950
fMRI Task Accuracy	-.006	.9577	-.020	.8773	<b>-.309</b>	<b>.0171</b>	.058	.6597	.027	.8329	<b>.271</b>	<b>.0359</b>	-.033	.8025	.136	.3009	.169	.2012	-.024	.8634	.006	.9616	.149	.2581	.108	.4078	-.016	.9081	-.153	.2435	-.116	.3756	-.044	.7373

Model: PC<sub>i</sub> = α + β Right vmPFC + β B<sub>12</sub>\*Folate + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

**Supplemental Table 6: Predictive power of bilateral vmPFC activity on cognitive profiles, controlling for tHcy \* Folate interaction**

Nuisance variables	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
	Bilateral vmPFC	-.010	.9373	-.086	.5107	-.069	.6006	-.012	.9267	.107	.4130	.053	.6914	-.037	.7781	.066	.6137	-.022	.8628	-.102	.4453	.046	.7290	<b>.316</b>	<b>.0143</b>	-.071	.5898	-.031	.8186	.032	.8106	-.113	.3920	-.133
tHcy * Folate	.114	.3817	.016	.9079	-.052	.6973	-.106	.4170	.183	.1629	.213	.1012	.067	.6090	-.017	.8917	.003	.9787	.202	.1245	-.119	.3737	.049	.7110	.001	.9875	-.240	.0653	<b>.409</b>	<b>.0015</b>	-.070	.5949	.065	.6223
Age	-.227	.0833	<b>.320</b>	<b>.0119</b>	-.045	.7345	-.037	.7815	.248	.0574	.131	.3210	<b>.439</b>	<b>.0003</b>	.084	.5244	-.019	.8803	.151	.2482	.127	.3378	-.195	.1344	.073	.5804	.026	.8477	.016	.9129	-.093	.4826	-.061	.6435
Education	.078	.5578	.143	.2814	.001	.9920	<b>.309</b>	<b>.0168</b>	-.195	.1359	.169	.1990	<b>.327</b>	<b>.0108</b>	-.218	.0941	-.155	.2342	-.106	.4189	-.050	.7034	.113	.3899	<b>-.288</b>	<b>.0254</b>	.130	.3241	.070	.5944	.034	.7990	-.130	.3180
MMSE Scores	<b>.556</b>	<b>.0000</b>	.128	.3293	.065	.6221	.011	.9396	.217	.0938	-.104	.4270	-.074	.5741	.116	.3793	-.129	.3257	.142	.2786	.031	.8175	.016	.9014	-.148	.2559	-.094	.4735	<b>.334</b>	<b>.0098</b>	.119	.3636	.210	.1078
fMRI Task Accuracy	.010	.9345	-.021	.8823	<b>-.313</b>	<b>.0153</b>	.038	.7744	.062	.6377	<b>.298</b>	<b>.0210</b>	-.039	.7711	.131	.3193	.156	.2335	.013	.9227	-.024	.8610	.125	.3432	.097	.4626	-.062	.6379	-.074	.5790	-.114	.3815	-.034	.7993

Model: PC<sub>i</sub> = α + β Bilateral vmPFC + β tHcy\*Folate + β Age + β Education + β MMSE + β fMRI task accuracy; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

tHcy = homocysteine; vmPFC = ventromedial prefrontal cortex; MMSE = mini-mental state examination; PC = principal component

**Supplemental Table 7: Predictive power of fMRI task accuracy on cognitive profiles**

	PC <sub>1</sub>		PC <sub>2</sub>		PC <sub>3</sub>		PC <sub>4</sub>		PC <sub>5</sub>		PC <sub>6</sub>		PC <sub>7</sub>		PC <sub>8</sub>		PC <sub>9</sub>		PC <sub>10</sub>		PC <sub>11</sub>		PC <sub>12</sub>		PC <sub>13</sub>		PC <sub>14</sub>		PC <sub>15</sub>		PC <sub>16</sub>		PC <sub>17</sub>	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p	β	p		
fMRI Task Accuracy	-.008	.9547	-.019	.8794	<b><u>-.301</u></b>	<b><u>.0177</u></b>	.054	.6735	.027	.8410	<b><u>.261</u></b>	<b><u>.0406</u></b>	-.052	.6860	.130	.3116	.157	.2243	-.025	.8543	-.007	.9601	.101	.4394	.101	.4308	-.022	.8639	-.141	.2766	-.097	.4540	-.038	.7710
Age	-.233	.0677	<b><u>.300</u></b>	<b><u>.0189</u></b>	-.059	.6485	-.030	.8164	<b><u>.267</u></b>	<b><u>.0367</u></b>	.135	.2958	<b><u>.446</u></b>	<b><u>.0003</u></b>	.100	.4355	-.025	.8508	.167	.1998	.142	.2754	-.123	.3366	.057	.6591	.027	.8332	.008	.9506	-.116	.3695	-.095	.4650
Education	.088	.5040	.133	.3080	-.013	.9190	<b><u>.300</u></b>	<b><u>.0177</u></b>	-.163	.2057	.197	.1261	<b><u>.338</u></b>	<b><u>.0067</u></b>	-.211	.0993	-.157	.2234	-.072	.5768	-.056	.6627	.159	.2164	<b><u>-.297</u></b>	<b><u>.0190</u></b>	.102	.4295	.115	.3739	.012	.9262	-.141	.2752
MMSE Scores	<b><u>.535</u></b>	<b><u>.0000</u></b>	.129	.3178	.077	.5486	.031	.8073	.178	.1660	-.147	.2587	-.089	.4880	.117	.3681	-.129	.3175	.100	.4389	.051	.6886	-.006	.9662	-.146	.2585	-.047	.7201	<b><u>.255</u></b>	<b><u>.0446</u></b>	.137	.2931	.203	.1165

Model: PC<sub>i</sub> = α + β fMRI task accuracy + β Age + β Education + β MMSE; Underlined values represent p < 0.05 uncorrected; **Bold values** represent p < 0.05 Bonferroni corrected

MMSE = mini-mental state examination; PC = principal component