

## *Supplementary Material*

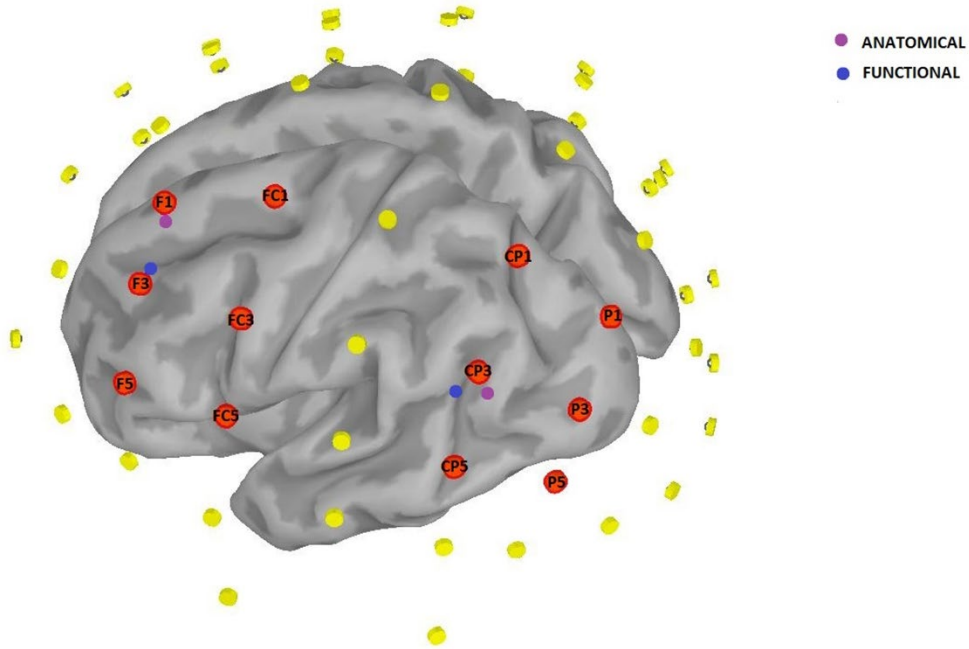
### **1 Targeting procedure**

The cohort had two different target procedures (anatomical or parcellation method) because of other objectives in the main BBHI study. In order to control the possible effect of this variable on the predictors and outcome relationship, the target method was used as a covariate in the statistical analysis.

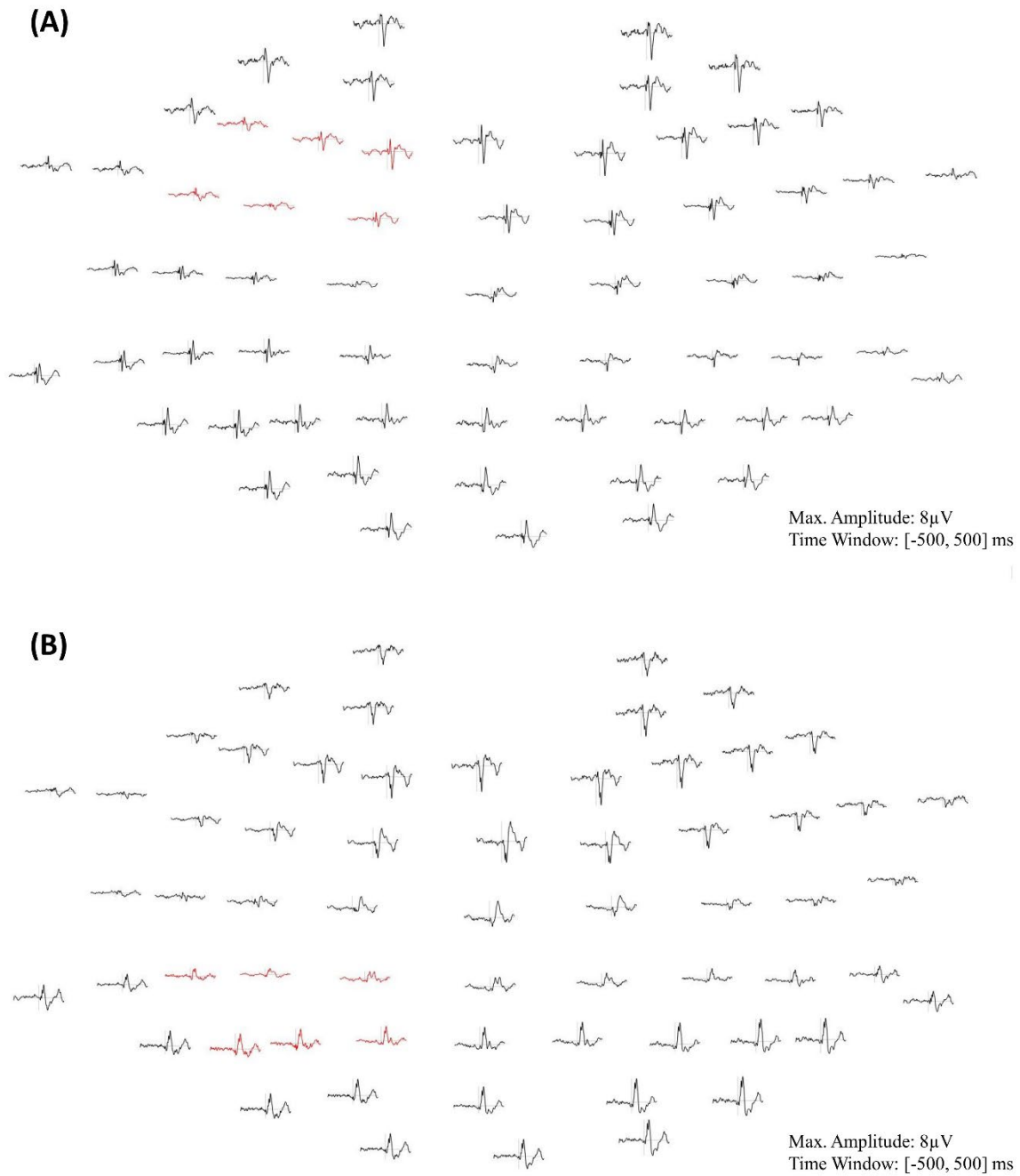
Twenty participants were included for the anatomical method, and targets were visually and anatomically defined by one investigator (TM). L-PFC stimulation was identified at the superior half of the middle frontal gyrus, approximately 3cm anterior to the precentral sulcus. L-IPL was selected at the superior edge of the angular gyrus around to intraparietal sulcus.

On the other hand, targets of 32 participants were determined based on a group-level resting-state 7 functional networks parcellation (Yeo et al., 2011). We followed the same methodology specified in Ozdemir et al., 2020 for this target procedure (Ozdemir et al., 2020). For each resting-state network, confidence maps were used, representing the confidence of each vertex belonging to its assigned network across a sample of 1000 healthy subjects (expressed as valued between -1 and 1), with larger values indicating high confidence. We used group-level functional parcellations and confidence maps on the Montreal Neurological Institute (MNI) template. We target the most consistent and reliable brain areas within the angular gyrus and the middle frontal gyrus, with the highest likelihood of occurring in the default mode network.

The mean coordinates of the anatomical targeting method were  $x=-33$ ,  $y=37$ ,  $z=52$  for PFC, and  $x=-39$ ,  $y=-69$ ,  $z=53$  for IPL. Whereas for the functional target method were  $x=-51$ ,  $y=30$ ,  $z=33$  for PFC, and  $x=-55$ ,  $y=-69$ ,  $z=30$  for IPL.



**Figure S1:** Mean L-PFC and L-IPL coordinates for the anatomical and functional targeting method. Red circles are the subset of electrodes used to calculate Local Mean-Field Power (LMFP) for each brain region. Both yellow and red circles are the electrodes used to calculate Global-Mean Field Power.



**Figure S2:** Average electroencephalographic responses from -500ms (pre-TMS) to +500ms (post-TMS) recorded from all EEG channels after PFC (A) and IPL (B) stimulation. Red responses correspond to the electrodes used to calculate LMFP.

## 2 Results

### 2.1 Descriptive statistics table

**Table S1.** Cognitive test scores divided into cognitive domains and functions (n=52)

<b>Cognitive Domain</b>	<b>Specific Cognitive Function</b>	<b>Cognitive Task</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>SD</b>
Episodic Memory	Short-term memory	RAVLT immediate recall	32	66	51.69	7.70
		Digit-Span Forward	7	18	10.94	2.79
		Corsi block tapping	8	19	14.65	2.73
	Long-term memory	RAVLT delayed recall	6	15	11.48	2.45
		RAVLT Recognition	12	15	14.56	.85
Working Memory	Verbal working memory	Digit-Span Backward	7	19	11.35	2.81
		Letter-Number Sequencing	9	18	14.33	2.47
Reasoning	Visuospatial reasoning	Matrix Reasoning WAIS-IV	8	19	14.64	2.38
		Block Design WAIS-IV	4	18	12.29	3.06
Flexibility	Alternating attention	TMT B	6	14	8.68	1.98
Processing speed	Visuomotor speed	Digit symbol task	9	19	13.71	2.55
	Visual searching	TMT A	6	18	11.21	2.80
	Visual searching and selective attention	Cancellation test	4	16	11.44	2.42

*Note:* RAVLT immediate recall= Recall a list of words immediately after hearing it of Rey Auditory Verbal Learning Test; RAVLT delayed recall = RAVLT recall after 30min; RAVLT recognition = Recognition of words from a word list of RAVLT; Digit-Span Forward = Immediate recall a series of numbers in the same order; Letter-Number Sequencing = Sequence a random order of numbers and letter; Matrix Reasoning WAIS-IV = Logical sequences and

series of Wechsler Adult Intelligence Scale-IV; Block Design WAIS-IV = Block Design of Wechsler Adult Intelligence Scale-IV; TMT B = Trail Making Test part B; TMT A = Trail Making Test part A; Digit symbol task = Digit symbol association; Cancellation test = cancellation task. All punctuations presented in this table are normalized scores except RAVLT tests that are raw scores.

## 2.2 Multivariate regression models for L-PFC and cognition (with covariates)

**Table S2.** Multivariate tests (PFC) including covariates.

Effect	Value <sup>1</sup>	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Age	.631	3.28	5	28	.019*	.369
Biological sex	.732	2.05	5	28	.102	.268
Education	.763	1.74	5	28	.157	.237
Targeting method	.848	1.01	5	28	.434	.152
NfL	.717	2.21	5	28	.081	.283
LMFP Post-TMS	.658	2.91	5	28	.031*	.342
GMFP Post-TMS	.799	1.41	5	28	.253	.201

<sup>1</sup> Wilks' Lambda

\* $p < .05$

**Table S3.** Tests of between subjects effects (PFC) including covariates.

Source	Dependent Variable	Type III sum of squares	df	Mean Square	F	Sig.	Partial Eta Square
Targeting	Episodic Memory	.49	1	.49	.05	.825	.002
Method	Reasoning	5.21	1	5.21	3.17	.084	.090
	Working Memory	1.14	1	1.14	.59	.446	.018

	Processing speed	1.51	1	1.51	.40	.531	.012
	Flexibility	.29	1	.29	.07	.787	.002
Age	Episodic Memory	8.93	1	8.93	.90	.349	.027
	Reasoning	11.10	1	11.10	6.76	.014	.174
	Working Memory	4.73	1	4.73	2.46	.127	.071
	Processing speed	14.46	1	14.46	3.85	.059	.107
	Flexibility	.93	1	.93	.24	.628	.007
Biological sex	Episodic Memory	8.34	1	8.34	.84	.366	.026
	Reasoning	9.01	1	9.01	5.48	.026	.146
	Working Memory	.15	1	.15	.08	.779	.002
	Processing speed	6.86	1	6.86	1.82	.186	.054
	Flexibility	.88	1	.88	.23	.637	.007
Education	Episodic Memory	6.06	1	6.06	.61	.440	.019
	Reasoning	.64	1	.64	.39	.536	.012
	Working Memory	8.13	1	8.13	4.22	.048	.117
	Processing speed	.27	1	.27	.07	.792	.002
	Flexibility	5.32	1	5.32	1.37	.250	.041
NfL	Episodic Memory	.44	1	.44	.05	.834	.001
	Reasoning	5.09	1	5.09	3.10	.088	.088
	Working Memory	5.54	1	5.54	2.88	.099	.083
	Processing speed	8.09	1	8.09	2.15	.152	.063
	Flexibility	3.99	1	3.99	1.03	.318	.031
GMFP	Episodic Memory	2.84	1	2.84	.29	.596	.009
Post-TMS	Reasoning	1.38	1	1.38	.84	.366	.026

	Working Memory	2.29	1	2.29	1.19	.283	.036
	Processing speed	2.02	1	2.02	.54	.469	.017
	Flexibility	9.27	1	9.27	2.39	.132	.070
Local	Episodic Memory	.87	1	.87	.09	.769	.003
Post-TMS	Reasoning	7.73	1	7.73	4.70	.038	.128
	Working Memory	9.64	1	9.64	5.01	.032	.135
	Processing speed	9.93	1	9.93	2.64	.114	.076
	Flexibility	9.75	1	9.75	2.51	.123	.073

### 2.3 Multivariate regression models for L-PFC and cognition (without covariates)

**Table S4.** Multivariate tests (PFC) without covariates.

Effect	Value <sup>1</sup>	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
LMFP Post-TMS	.91	.63	5	33	.675	.088
GMFP Post-TMS	.82	1.45	5	33	.232	.182

<sup>1</sup> Wilks' Lambda

\* $p < .05$

**Table S5.** Tests of between subjects effects (PFC) without covariates.

Source	Dependent Variable	Type III sum of squares	df	Mean Square	F	Sig.	Partial Eta Square
GMFP	Episodic Memory	.75	1	.75	.08	.777	.002
Post-TMS	Reasoning	.15	1	.15	.05	.819	.001

	Working Memory	.03	1	.03	.01	.908	.000
	Processing speed	5.68	1	5.68	1.17	.285	.031
	Flexibility	8.57	1	8.57	2.25	.142	.057
Local	Episodic Memory	6.70	1	6.70	.73	.399	.019
Post-TMS	Reasoning	.16	1	.16	.06	.813	.002
	Working Memory	13.52	1	13.52	6.47	.015	.149
	Processing speed	12.36	1	12.36	2.56	.118	.065
	Flexibility	5.13	1	5.13	1.35	.254	.035

## 2.4 Multivariate regression models for L-IPL and cognition (with covariates)

**Table S6.** Multivariate tests (IPL) including covariates.

Effect	Value <sup>1</sup>	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Age	.78	1.29	5	23	.304	.219
Biological sex	.65	2.51	5	23	.059	.353
Education	.92	.39	5	23	.850	.078
Targeting method	.66	2.37	5	23	.072	.340
NfL	.86	.74	5	23	.601	.139
LMFP Post-TMS	.93	.33	5	23	.888	.067
GMFP Post-TMS	.91	.44	5	23	.815	.088

<sup>1</sup> Wilks' Lambda

\* $p < .05$



**Table S7.** Tests of between-subjects effects (IPL) including covariates.

Source	Dependent Variable	Type III sum of squares	df	Mean Square	F	Sig.	Partial Eta Square
Targeting Method	Episodic Memory	.06	1	.056	.01	.945	.000
	Reasoning	14.90	1	14.896	6.34	.018	.190
	Working Memory	.51	1	.505	.17	.685	.006
	Processing speed	1.27	1	1.268	.30	.592	.011
	Flexibility	5.29	1	5.286	1.28	.268	.045
Age	Episodic Memory	7.44	1	7.440	.65	.428	.023
	Reasoning	12.20	1	12.196	5.19	.031	.161
	Working Memory	.03	1	.026	.01	.927	.000
	Processing speed	17.62	1	17.624	4.10	.053	.132
	Flexibility	1.71	1	1.713	.41	.525	.015
Biological sex	Episodic Memory	1.26	1	1.260	.11	.743	.004
	Reasoning	2.90	1	2.902	1.24	.276	.044
	Working Memory	11.34	1	11.340	3.77	.063	.122
	Processing speed	.21	1	.212	.05	.826	.002
	Flexibility	1.45	1	1.449	.35	.559	.013
Education	Episodic Memory	7.48	1	7.482	.65	.427	.024
	Reasoning	.31	1	.311	.13	.719	.005
	Working Memory	6.11	1	6.107	2.03	.166	.070
	Processing speed	2.54	1	2.540	.59	.449	.021
	Flexibility	5.54	1	5.536	1.34	.257	.047
NfL	Episodic Memory	8.02	1	8.015	.70	.411	.025

	Reasoning	1.02	1	1.021	.43	.516	.016
	Working Memory	2.23	1	2.228	.74	.397	.027
	Processing speed	5.22	1	5.221	1.21	.280	.043
	Flexibility	.17	1	.171	.04	.840	.002
GMFP	Episodic Memory	2.01	1	2.008	.18	.679	.006
Post-TMS	Reasoning	2.79	1	2.785	1.19	.286	.042
	Working Memory	1.35	1	1.351	.45	.509	.016
	Processing speed	.09	1	.094	.02	.883	.001
	Flexibility	.45	1	.446	.11	.745	.004
Local	Episodic Memory	3.45	1	3.446	.30	.589	.011
Post-TMS	Reasoning	1.96	1	1.957	.83	.370	.030
	Working Memory	.50	1	.504	.17	.686	.006
	Processing speed	.03	1	.032	.01	.932	.000
	Flexibility	.11	1	.113	.03	.870	.001

## 2.5 Multivariate regression models for L-IPL and cognition (without covariates)

**Table S8.** Multivariate tests (IPL) without covariates.

Effect	Value <sup>1</sup>	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
LMFP Post-TMS	.97	.19	5	28	.965	.032
GMFP Post-TMS	.94	.39	5	28	.854	.064

<sup>1</sup> Wilks' Lambda

\* $p < .05$

**Table S9.** Tests of between subjects effects (IPL) without covariates.

Source	Dependent Variable	Type III sum of squares	df	Mean Square	F	Sig.	Partial Eta Square
GMFP	Episodic Memory	.21	1	.21	.02	.889	.001
Post-TMS	Reasoning	.15	1	.15	.05	.828	.002
	Working Memory	2.81	1	2.81	.82	.373	.025
	Processing speed	1.00	1	1.00	.19	.670	.006
	Flexibility	.24	1	.24	.06	.808	.002
Local	Episodic Memory	1.07	1	1.07	.10	.749	.003
Post-TMS	Reasoning	.01	1	.01	.00	.957	.000
	Working Memory	1.31	1	1.31	.38	.542	.012
	Processing speed	.27	1	.27	.05	.824	.002
	Flexibility	.29	1	.29	.07	.788	.002

## 2.6 Neurofilaments level and cognition correlations

**Table S10.** NfL level and cognitive functions

	NfL ( <i>r</i> )
Episodic Memory	.050
Working Memory	.046
Reasoning	-.373**
Processing Speed	-.338*
Flexibility	-.293*

\* $p < .05$ . \*\* $p < .01$

**3 Supplementary material references:**

Yeo, B. T., Krienen, F. M., Sepulcre, J., Sabuncu, M. R., Lashkari, D., Hollinshead, M., et al. (2011). The organization of the human cerebral cortex estimated by intrinsic functional connectivity. *J. Neurophysiol.* 106, 1125–1165. doi:10.1152/jn.00338.2011.