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Supplementary Information for

Diffusion MRI-Guided Theta Burst Stimulation Enhances Memory and Functional Connectivity along Inferior Longitudinal Fasciculus in Mild Cognitive Impairment

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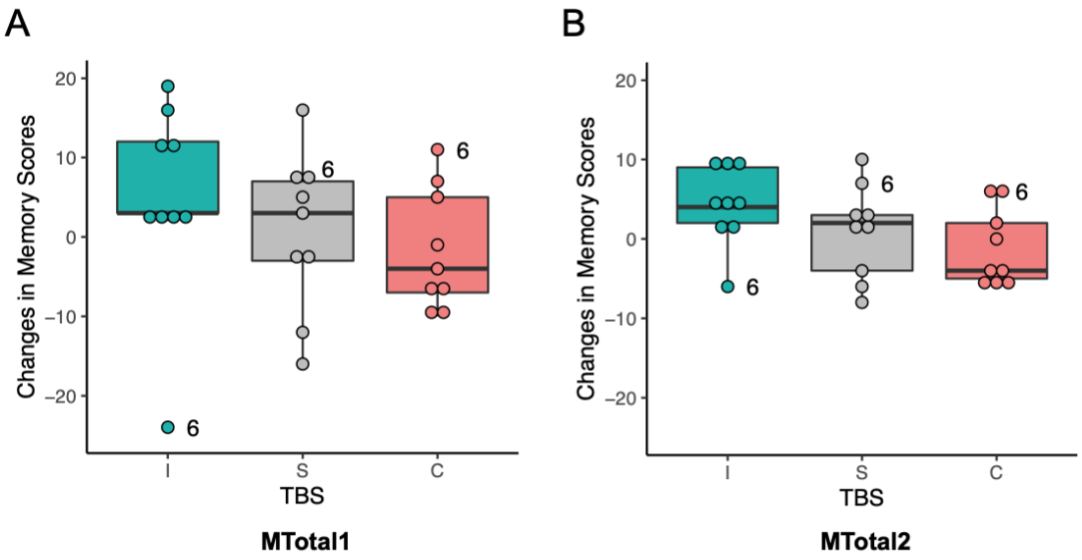

Fig S1. The boxplots with participant 6 did not reveal significant TBS effects on associative memory MTotal1 scores [$F(2, 16) = 0.8$, $p = 0.48$] and MTotal2 scores [$F(2, 16) = 2.1$, $p = 0.15$]. TBS = theta burst stimulation; I = intermittent TBS; C = continuous TBS; S = sham TBS.

Table S1. Correlations of changes in associative memory scores following TBS (including iTBS, cTBS and sham TBS) (*N*=9)

	MTotal1	MTotal2	Immediate Retrieval	Delayed Retrieval
MTotal1	1			
MTotal2	$r = 0.91$ $p < 0.0001$	1		
Immediate Retrieval	$r = 0.83$ $p < 0.0001$	$r = 0.90$ $p < 0.0001$	1	
Delayed Retrieval	$r = 0.83$ $p < 0.0001$	$r = 0.91$ $p < 0.0001$	$r = 0.64$ $p < 0.0001$	1

Table S2. Changes in memory scores following TBS (*N*=9, including data from participant 6): Results of repeated measures ANOVA with multiple comparisons corrected by FDR

Changes in Memory Scores (Post -Pre)	**ANOVA (F, *p*)**	**iTBS (*M* ± *S*)**	**cTBS (*M* ± *S*)**	**Sham TBS (*M* ± *S*)**	**I vs. S (*p and effsize*)**	**C vs. S (*p and effsize*)**	**I vs. C (*p and effsize*)**
Total memory score 1 (MTotal1)	0.8, 0.48	5.0 ± 12.6	-1.6 ± 7.6	0.7 ± 10.1	0.51, 0.38	0.51, -0.25	0.51, 0.63
Total memory score 2 (MTotal2)	2.1, 0.15	4.2 ± 5.0	-1.1 ± 4.8	0.9 ± 5.9	0.33, 0.61	0.33, -0.37	0.33, 1.09
Immediate Retrieval	2.6, 0.11	2.2 ± 2.5	-0.7 ± 2.8	-0.2 ± 2.9	0.17, 0.90	0.72, -0.16	0.17, 1.09
Delayed Retrieval	1.3 0.31	2.0 ± 2.9	-0.4 ± 2.5	1.1 ± 3.8	0.64, 0.26	0.27, -0.48	0.27, 0.90

Note 1. effsize = effect size; TBS = theta burst stimulation; cTBS = continuous TBS; iTBS = intermittent TBS; C = cTBS; I = iTBS; S = Sham TBS.

Table S3. Changes in functional connectivity between each participant's superficial stimulation site and other brain regions following TBS (*N*=9, including data from participant 6): Results of repeated measures ANOVA with multiple comparisons corrected by FDR

Connected regions	ANOVA (F, *p*)	iTBS (*M* ± *S*)	cTBS (*M* ± *S*)	Sham TBS (*M* ± *S*)	I vs. S (*p and effsize*)	C vs. S (*p and effsize*)	I vs. C (*p and effsize*)
R putamen	8.5, 0.003**	0.19 ± 0.23	-0.03 ± 0.17	-0.13 ± 0.14	0.024*, 1.69	0.15, 0.61	0.043, 1.12
L occipital fusiform gyrus (occipital FG)	7.7, 0.005**	0.07 ± 0.27	-0.06 ± 0.10	-0.28 ± 0.24	0.017*, 1.41	0.045*, 1.22	0.20, 0.66
R posterior parahippocampal gyrus (pPHG)	7.4, 0.005**	0.12 ± 0.16	0.00 ± 0.18	-0.18 ± 0.20	0.012*, 1.70	0.11, 0.98	0.13, 0.68
L insular cortex (IC)	6.2, 0.01*	0.11 ± 0.21	-0.09 ± 0.23	-0.28 ± 0.26	0.027*, 1.61	0.14, 0.75	0.13, 0.89
R occipital fusiform gyrus (OFG)	5.8, 0.013*	0.09 ± 0.19	-0.02 ± 0.23	-0.25 ± 0.32	0.014*, 1.29	0.15, 0.83	0.26, 0.51
R frontal orbital cortex (OFC)	5.0, 0.02*	0.04 ± 0.21	0.05 ± 0.29	-0.20 ± 0.19	0.014*, 1.16	0.048*, 1.02	0.90, -0.05
L frontal orbital cortex (OFC)	5.0, 0.02*	0.04 ± 0.23	0.11 ± 0.30	-0.17 ± 0.22	0.002**, 0.94	0.03*, 1.07	0.57, -0.27
R posterior inferior temporal gyrus (pITG)	5.0, 0.02*	-0.03 ± 0.28	0.20 ± 0.25	-0.13 ± 0.28	0.43, 0.35	0.038*, 1.23	0.038*, -0.85
R posterior middle temporal gyrus (pMTG)	4.4, 0.03*	0.09 ± 0.22	0.08 ± 0.21	-0.14 ± 0.23	0.044*, 0.99	0.08, 0.98	0.92, 0.04
R temporal pole (TP)	4.2, 0.035*	0.09 ± 0.32	-0.05 ± 0.19	-0.21 ± 0.40	0.035*, 0.85	0.23, 0.50	0.23, 0.57
L lingual gyrus (LG)	4.1, 0.036*	0.13 ± 0.25	-0.07 ± 0.29	-0.21 ± 0.25	0.046*, 1.38	0.24, 0.55	0.24, 0.73

L CA1	3.3, 0.063	0.19 ± 0.21	0.00 ± 0.20	-0.05 ± 0.23	0.024*, 1.06	0.66, 0.22	0.20, 0.90

Note 1. CA1 = Cornu Ammonis 1; effsize = effect size; TBS = theta burst stimulation; cTBS = continuous TBS; iTBS = intermittent TBS; C = cTBS; I = iTBS; S = Sham TBS.
Note 2. *$p < 0.05$, **$p < 0.01$.
Note 3. The brain regions were defined by the Harvard-Oxford cortical and subcortical structural atlases. The hippocampal subfields were defined by Freesurfer v6.0 segmentations.

Table S4. Results of neuropsychological measurements of the Uniform Data Set version 3 (UDS3) neuropsychological battery and the Rey Auditory Verbal Learning Test (AVLT), adjusted for age, sex, and education (z-scores)

		SUB								
Domains	**Task**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
General	MoCA total score	-1.1	-0.9	0.9	-1.6	0.6	-0.6	-0.4	-0.9	-1.0
Memory	Immediate craft story recall (verbatim scoring)	-2.7	0.3	2.5	0.1	0.1	1.5	-2.5	-0.4	-3.3
	Immediate craft story recall (paraphrase scoring)	-2.9	-0.1	1.9	0.3	0.2	1.1	-2.0	-0.2	-3.9
	Delayed craft story recall (verbatim scoring)	-2.5	0.4	1.5	-0.8	0.5	1.4	-1.7	-0.5	-2.8
	Delayed craft story recall (paraphrase scoring)	-2.8	-0.1	1.4	0.0	0.2	0.9	-1.4	-0.7	-3.5
Memory/ Visuospatial	Total Score for copy of Benson figure	0.4	-1.2	0.2	-0.6	0.1	0.4	0.4	-2.1	-0.3
	Total score for delayed drawing of Benson figure	0.1	-1.8	-1.7	-0.5	0.5	-0.6	1.0	-0.7	-2.6
Memory	AVLT: Learning Efficiency Sum	-2.2	-1.9	1.5	0.5	1.1	0.9	-0.9	-0.1	-1.3
	AVLT: Delayed Recall Sum	-1.2	-1.8	1.0	-0.8	0.8	2.3	-1.4	-2.3	-1.9
	AVLT: Percent Retention Sum	-0.1	-1.3	1.0	-1.1	0.1	1.9	-1.6	-2.3	-2.2
Attention/ Working Memory	Forward number span test (correct trials)	0.3	-0.9	1.9	0.2	-0.5	-1.2	-0.4	-0.4	1.0
	Forward number span test (longest span)	0.3	-1.2	1.6	0.2	-0.9	-1.1	-0.3	0.0	1.3
	Backward number span test (correct trials)	-1.4	-1.4	1.1	-0.7	0.0	0.1	0.5	-0.8	0.6

	Backward number span test (longest span)	-1.6	-1.6	0.5	-1.0	-0.5	0.1	0.1	-1.2	0.2
Language	Multilingual naming test (MINT)	-0.1	1.2	0.5	0.9	-0.2	0.9	0.3	-0.1	-0.1
	Number of correct F-words generated	-0.9	-0.8	1.0	-1.8	-2.3	-1.2	-1.2	0.0	-1.6
	Number of correct L-words generated	-1.0	-1.1	2.0	-1.2	-1.1	-2.2	-0.6	0.6	-0.6
	Number of correct F-words and L-words	-1.0	-1.0	1.6	-1.6	-1.8	-1.8	-1.0	0.3	-1.1
	Category fluency (animals)	-1.8	-1.6	1.9	-0.7	-0.5	-0.4	-1.5	-0.4	-0.9
	Category fluency (vegetables)	-1.3	-1.0	1.5	0.3	-2.5	-0.6	-1.4	-1.6	-0.8
Attention/ Executive	Trail making test Part A	-1.1	-1.2	0.3	-1.1	-1.7	-2.2	0.4	-0.7	-1.0
	Trail Making Test Part B	-1.0	0.6	0.8	-1.6	-0.3	-0.6	0.4	-0.8	-5.0

Note 1. AVLT = The Rey Auditory-Verbal Learning Test; MoCA = The Montreal Cognitive Assessment