

**Table S1 Neuropsychology**

	Y1 C410Y	Y2	Y3	M1 C410Y	M2	Controls ( <i>M</i> ± <i>SD</i> )	( <i>P</i> 7 / <i>P</i> 93)
<b>HAWIE-R</b>							
<i>Total IQ</i>	133	131	102	111	101	122.5 ± 10.18	104.76 / 136.53
<i>Performance IQ</i>	134	116	108	100	110	119.7 ± 11.78	100.94 / 135.53
<i>Verbal IQ</i>	126	136	96	118	94	121.1 ± 10.35	104.11 / 139.53
<b>WMS-R</b>							
<i>Index verbal memory</i>	122	102	88	79	95	113.1 ± 13.03	88.76 / 130
<i>Index visual memory</i>	91	107	98	94	105	117.9 ± 6.77	104 / 126.53
<i>Index general memory</i>	116	103	90	83	99	116.9 ± 11.66	92.35 / 131.59
<i>Index delayed memory</i>	96	112	90	68	105	117.95 ± 9.65	97.29 / 133.06
<i>Index concentration &amp; attention</i>	99	87	94	90	94	102.75 ± 12.78	84.88 / 130.12
<b>Luria Mental Rotation</b>							
<i># correct</i>	10	10	10	10	9	9.5 ± 0.69	8 / 10
<b>Kramer Card Sorting</b>							
<i># correct</i>	6	6	3	4	5	4.85 ± 1.09	3 / 6
<b>Stroop Color Interference</b>							
<i>High interference run (sec)</i>	19	20.9	21.3	27.3	29	21.29 ± 5.39	12.4 / 29.36
<b>S-Words Fluency</b>							
<i># correct</i>	32	41	9	40	25	34.45 ± 7.29	23.88 / 49.59
<b>5-Point Nonverbal Fluency</b>							
<i># correct</i>	38	44	36	30	28	40.15 ± 7.26	26.76 / 52
<b>CERAD-NAB</b>							
<i>MMSE</i>				28	29		
<i>Verbal fluency</i>				24	23		
<i>Boston naming test</i>				15	15		
<i>Wordlist learning 1</i>				5	5		
<i>Wordlist learning 2</i>				8	8		
<i>Wordlist learning 3</i>				8	10		
<i>Wordlist recall</i>				6	9		
<i>Wordlist recognition (hits)</i>				9	10		
<i>Wordlist recognition (corr. rej.)</i>				10	10		
<i>Constructive praxia</i>				11	10		
<i>Constructive praxia recall</i>				8	8		

HAWIE-R, Hamburg Wechsler Intelligence Scale Revised; WMS-R, Wechsler Memory Scale Revised; MMSE, Mini Mental State Examination; CERAD-NAB, Consortium to Establish a Registry for Alzheimer's Disease – Neuropsychological Assessment Battery; sec, seconds; corr. rej., correct rejections.

**Table S2** Brain activation differences between Y1 C410Y and the control group during the memory tasks

MNI coordinates (mm)								MNI coordinates (mm)							
Brain region	Left/Right	x	y	z	BA	kE	t	Brain region	Left/Right	x	y	z	BA	kE	t
Two sample T-Test															
Y1 C410Y > Controls								Controls > Y1 C410Y							
Associative learning								Associative learning							
Hippocampus	L	-38	-34	-6		7	3.44 <sup>a</sup>	no significant differences							
Fusiform gyrus	L	-22	-78	-18	19	147	7.31								
Fusiform gyrus	L	-34	-46	-22	37	210	6.02								
Superior frontal gyrus	L	-12	30	58	8	20	6.3								
Middle frontal gyrus	L	-50	16	42	8	112	5.92								
Middle frontal gyrus	L	-34	56	4	10	61	5.02								
Middle frontal gyrus	L	-30	42	16	46	47	4.68								
Middle temporal gyrus	L	-60	-58	16	37	210	5.78								
Supramarginal gyrus	L	-38	-60	38	40	57	4.44								
Precuneus	L	-6	-60	44	7	265	5.98								
Single face learning								Single face learning							
Middle frontal gyrus	L	-44	50	4	10	113	6.24	no significant differences							
Middle frontal gyrus	L	-50	16	42	8	103	5.92								
Fusiform gyrus	L	-18	-80	-18	19	204	5.95								
Associative retrieval								Associative retrieval							
Middle frontal gyrus	L	-38	56	8	10	49	6.08	no significant differences							
Middle frontal gyrus	R	40	52	-10	10	47	5.23								
Inferior frontal gyrus	L	-50	16	42	9	23	3.95								
Inferior frontal gyrus	L	-38	24	-2	47	19	4.22								
Fusiform gyrus	L	-22	-78	-20	19	35	4.41								
Supramarginal gyrus	R	40	-64	40	40	61	6.08								
Supramarginal gyrus	R	50	-64	32	40	18	3.91								
Inferior parietal lobule	L	-38	-46	44	40	36	4.34								
Inferior parietal lobule	L	-38	-60	40	40	41	4.24								
Face recognition								Face recognition							
no significant differences								no significant differences							
Novel face detection								Novel face detection							
Middle frontal gyrus	L	-38	56	6	10	25	4.72	no significant differences							
Supramarginal gyrus	R	40	-66	40	40	44	6.19								
Supramarginal gyrus	L	-40	-62	38	40	46	4.23								
Superior parietal lobule	R	14	-58	50	7	33	4.64								
Precuneus	L	-10	-56	46	7	28	4.46								
Working memory								Working memory							
Inferior frontal gyrus	L	-48	26	4	45	78	4.98	Superior frontal gyrus	R	4	56	24	9	355	6.9
Middle frontal gyrus	L	-44	20	40	8	182	9.76	Cingulate gyrus	R	4	-46	32	31	27	5.04
Middle frontal gyrus	L	-42	36	32	9	23	4.52	Superior temporal gyrus	R	48	-8	-4	22	61	5.39
Middle frontal gyrus	R	42	34	40	8	75	6.37	Superior temporal gyrus	L	-50	-62	24	39	96	5.19
Superior frontal gyrus	R	28	-4	50	6	43	5.21								
Inferior parietal lobule	L	-50	-32	32	40	157	8.4								
Superior parietal lobule	L	-12	-52	70	7	533	5.54								
Superior parietal lobule	L	-24	-74	54	7	24	5.05								
Superior parietal lobule	R	8	-52	70	7	206	6.74								
Superior parietal lobule	R	34	-80	40	7	17	4.42								
Cingulate gyrus	L	-8	18	32	24	19	6.12								
Superior temporal gyrus	L	-54	-44	14	22	59	4.64								
Cerebellum	L	-2	-50	-30		223	8.23								
Cerebellum	R	10	-78	-28		18	4.06								

t, value of peak within significantly activated cluster of voxels; kE, cluster size (in voxels); BA, Brodmann area; a,  $p < 0.005$ ; L, left; R, right.

**Table S3** Brain activation differences between Y2 and the control group during the memory tasks

MNI coordinates (mm)								MNI coordinates (mm)							
Brain region	Left/Right	x	y	z	BA	kE	t	Brain region	Left/Right	x	y	z	BA	kE	t
Two sample T-Test															
Y2 > Controls								Controls > Y2							
Associative learning								Associative learning							
Superior temporal gyrus	R	52	16	-12	38	20	3.8	no significant differences							
Insula	R	40	-14	2		16	4.12								
Single face learning								Single face learning							
Middle frontal gyrus	L	-44	44	6	46	33	4.73	no significant differences							
Associative retrieval								Associative retrieval							
Inferior frontal gyrus	R	44	34	-6	47	44	5.6	Superior frontal gyrus	L	-2	64	16	9	33	4.62
								Cingulate gyrus	L	-8	-58	26	31	37	4.6
								Cingulate gyrus	L	-6	46	6	32	43	4.49
Face recognition								Face recognition							
no significant differences								no significant differences							
Novel face detection								Novel face detection							
Inferior frontal gyrus	R	44	36	-6	47	18	4.93	Middle temporal gyrus	R	46	6	-28	21	43	3.88
Working memory								Working memory							
Inferior frontal gyrus	R	32	18	-16	47	36	6.04	no significant differences							
Superior frontal gyrus	R	30	-10	64	6	29	5.03								
Insula	L	-32	10	12		16	5.18								
Cerebellum	L	-4	-84	-32		15	4.71								
Cerebellum	R	26	-32	-32		28	4.22								

t, value of peak within significantly activated cluster of voxels; kE, cluster size (in voxels); BA, Brodmann area; a, p < 0.005; L, left; R, right.

**Table S4** Brain activation differences between Y3 and the control group during the memory tasks

MNI coordinates (mm)								MNI coordinates (mm)							
Brain region	Left/Right	x	y	z	BA	kE	t	Brain region	Left/Right	x	y	z	BA	kE	t
<b>Two sample T-Test</b>															
<b>Y3 &gt; Controls</b>								<b>Controls &gt; Y3</b>							
<b>Associative learning</b>								<b>Associative learning</b>							
Fusiform gyrus	R	40	-50	-20	37	19	4.69	Superior temporal gyrus	L	-58	-24	10	22	18	4.13
Fusiform gyrus	L	-46	-48	-30	37	19	4.66								
<b>Single face learning</b>								<b>Single face learning</b>							
Superior frontal gyrus	L	-14	62	24	9	115	5.96	Superior temporal gyrus	L	-60	-24	10	22/42	114	6.41
Fusiform gyrus	R	42	-52	-22	37	41	4.95								
<b>Associative retrieval</b>								<b>Associative retrieval</b>							
Fusiform gyrus	R	40	-52	-24	37	76	7.11	Parahippocampal gyrus	L	-12	-36	-2		15	4.21
Fusiform gyrus	R	34	-70	-20	19	36	4.28	Rhinal cortex	L	-22	-6	-32		15	5.02
Fusiform gyrus	L	-44	-48	-26	37	17	4.72	Medial frontal gyrus	R	2	58	-10	10	15	5.02
								Retrosplenial cortex	L/R	-8	-48	10	29	147	5.11
<b>Face recognition</b>								<b>Face recognition</b>							
Fusiform gyrus	R	40	-50	-24	37	208	8.09	Medial frontal gyrus	R	2	58	-10	10	74	4.72
Fusiform gyrus	L	-44	-48	-26	37	49	5.18								
Inferior occipital gyrus	L	-40	-84	-12	19	53	5.69								
<b>Novel face detection</b>								<b>Novel face detection</b>							
Fusiform gyrus	R	42	-50	-22	37	271	8.62	Entorhinal cortex	L	-22	-16	-30		8	3.31 <sup>a</sup>
Fusiform gyrus	L	-44	-48	-26	37	97	5.82	Medial frontal gyrus	R	2	58	-12	10	17	4.23
<b>Working memory</b>								<b>Working memory</b>							
Middle frontal gyrus	R	44	52	6	10	367	7.83	no significant differences							
Middle frontal gyrus	R	34	10	44	6	96	5.6								
Superior parietal lobule	R	26	-54	52	7	232	7.76								
Superior parietal lobule	L	-40	-56	54	7	228	6.18								
Inferior temporal gyrus	L	-56	-64	-16	37	179	5.78								
Inferior temporal gyrus	R	54	-60	-16	37	187	5.31								
Cerebellum	L	-14	-84	-26		380	7.74								
Cerebellum	R	10	-86	-30		112	5.4								

t, value of peak within significantly activated cluster of voxels; kE, cluster size (in voxels); BA, Brodmann area; a,  $p < 0.005$ ; L, left; R, right.

**Table S5** Brain activation differences between M1 C410Y and the control group during the memory tasks

MNI coordinates (mm)								MNI coordinates (mm)							
Brain region	Left/Right	x	y	z	BA	kE	t	Brain region	Left/Right	x	y	z	BA	kE	t
Two sample T-Test															
M1 C410Y > Controls								Controls > M1 C410Y							
Associative learning								Associative learning							
no significant differences								Hippocampus	R	26	-10	-22		17	4.56
								Hippocampus	R	26	-30	-6		5	3.98
								Amygdala	L	-32	-8	-26		11	4.74
								Middle frontal gyrus	L	-24	60	-2	10	72	7.45
								Middle frontal gyrus	R	24	60	8	10	31	4.92
								Superior temporal gyrus	L	-56	-2	-4	22	101	6.16
								Superior temporal gyrus	L	-50	-20	4	22	92	6.1
								Superior temporal gyrus	R	52	-8	-4	22	38	4.29
								Cingulate gyrus	R	2	38	6	24	35	3.58
								Fusiform gyrus	L	-32	-36	-30	36	26	4.65
Single face learning								Single face learning							
Middle frontal gyrus	R	26	52	-10	11	24	5.77	Inferior frontal gyrus	R	44	38	-10	47	41	4.78
								Middle frontal gyrus	L	-20	60	-2	10	123	8.11
								Middle frontal gyrus	R	18	62	2	10	127	5.04
								Medial frontal gyrus	L	-10	48	-6	10	29	5.17
								Orbital gyrus	L	-28	46	-14	11	190	9.29
								Superior temporal gyrus	L	-36	8	-28	38	257	7.74
								Superior temporal gyrus	L	-56	0	-4	22	113	5.73
								Superior temporal gyrus	L	-58	-10	4	22	196	5.57
Associative retrieval								Associative retrieval							
Orbital gyrus	R	18	54	-10	11	22	6.07	Hippocampus	L	-22	-30	-10		10	4.07
								Hippocampus	R	24	-10	-20		2	3.68
								Parahippocampal gyrus	R	30	-32	-14		6	3.81
								Perirhinal cortex	L	-16	-4	-32		19	5.43
								Superior temporal gyrus	L	-52	-2	-6	22	51	5.38
								Superior temporal gyrus	R	62	-8	4	22	18	4.36
Face recognition								Face recognition							
no significant differences								Hippocampus	R	20	-30	-12		28	4.86
								Middle frontal gyrus	L	-22	60	-2	10	16	5.62
Novel face detection								Novel face detection							
no significant differences								Superior temporal gyrus	L	-54	0	-6	22	197	6.08
								Superior temporal gyrus	L	-58	-10	8	22	43	4.82
								Medial frontal gyrus	R	8	-14	64	6	48	5.13
								Cerebellum	L	-32	-46	-32		46	4.28
Working memory								Working memory							
Inferior frontal gyrus	R	24	48	-12	11	65	6.43	no significant differences							
Inferior parietal lobule	R	54	-44	36	40	83	5.82								
Superior parietal lobule	R	32	-78	42	7	69	6.03								

t, value of peak within significantly activated cluster of voxels; kE, cluster size (in voxels); BA, Brodmann area; a,  $p < 0.005$ ; L, left; R, right.

**Table S6** Brain activation differences between M2 and the control group during the memory tasks

MNI coordinates (mm)								MNI coordinates (mm)							
Brain region	Left/Right	x	y	z	BA	kE	t	Brain region	Left/Right	x	y	z	BA	kE	t
<b>Two sample T-Test</b>															
<b>M2 &gt; Controls</b>								<b>Controls &gt; M2</b>							
<b>Associative learning</b>								<b>Associative learning</b>							
Superior frontal gyrus	L	-18	-14	60	6	33	4.69	Hippocampus	R	36	-28	-14		48	5.8
Superior temporal sulcus	R	46	-28	4		44	5.36	Hippocampus	R	22	-28	-12		5	4.33
Fusiform gyrus	L	-20	-74	-8	19	32	5.43	Parahippocampal gyrus	L	-14	-44	-4	30	624	7.77
								Superior temporal sulcus	R	44	2	-24		23	5.2
<b>Single face learning</b>								<b>Single face learning</b>							
no significant differences								no significant differences							
<b>Associative retrieval</b>								<b>Associative retrieval</b>							
no significant differences								Hippocampus	R	34	-30	-12		95	5.17
								Hippocampus	L	-26	-34	-8		14	4.24
								Middle frontal gyrus	L	-40	10	54	6	71	4.93
								Superior temporal gyrus	R	48	10	-26	38	74	5.27
								Retrosplenial cortex	L	-6	-46	14	29	17	5.03
<b>Face recognition</b>								<b>Face recognition</b>							
no significant differences								Middle frontal gyrus	R	34	28	26	46	16	4.59
								Inferior parietal lobule	R	48	-54	44	40	16	4.21
<b>Novel face detection</b>								<b>Novel face detection</b>							
no significant differences								Hippocampus	R	34	-30	-12		14	3.64 <sup>a</sup>
								Inferior frontal gyrus	L	-56	12	30	9	52	5.79
<b>Working memory</b>								<b>Working memory</b>							
Middle frontal gyrus	R	34	54	-14	11	50	5.55	no significant differences							
Supramarginal gyrus	R	52	-58	40	40	144	5.89								
Middle temporal gyrus	R	56	-64	2	37	19	4.4								
Insula	R	40	12	-2		18	4.07								

t, value of peak within significantly activated cluster of voxels; kE, cluster size (in voxels); BA, Brodmann area; a,  $p < 0.005$ ; L, left; R, right.

Table S7 Contrast estimates (ROI analysis)

	Y1 C410Y	Y2	Y3	M1 C410Y	M2	R1	R2	R3	R4	R5	Controls	
											(M ± SD)	(P7 / P93)
Associative learning												
Left hippocampus	0.84	0.38	0.18	-0.38	-0.06	0.16	-0.15	0.39	-0.02	0.44	0.26 ± 0.71	-1.03 / 1.58
Left ant. hippocampus	0.74	0.85	0.03	0.02	0.18	0.19	-0.19	0.24	0.04	0.27	0.28 ± 1.13	-1.52 / 2.54
Left mid. hippocampus	1.28**	0.17	0.42	-0.98	-0.05	0.07	0.04	0.5	-0.33	0.63	0.28 ± 0.68	-1.22 / 1.20
Left post. hippocampus	0.34	0.06	0.12	-0.46*	-0.51*	0.25	-0.32*	0.56	0.68	0.43	0.44 ± 0.35	-0.29 / 0.96
Right hippocampus	0.50	0.42	0.16	0.03	0.62	0.18	0.16	0.38	0.18	0.4	0.32 ± 0.56	-0.42 / 1.49
Right ant. hippocampus	0.48	0.29	-0.03	0.25	1.31	0.34	0.24	0.11	0.02	0.32	0.37 ± 0.95	-0.48 / 2.42
Right mid. hippocampus	0.52	0.45	0.29	-0.12	0.09	0.08	-0.03	0.49	0.37	0.60	0.35 ± 0.63	-0.79 / 1.54
Right post. hippocampus	0.52	0.59	0.26	-0.23	0.24	0.20	0.30	0.58	0.02	0.32	0.32 ± 0.3	-0.03 / 0.9
Single face learning												
Left hippocampus	0.54	0.74	-0.02	-0.17	0.17	0.22	0.16	0.38	0.25	0.53	0.4 ± 0.66	-0.48 / 1.81
Left ant. hippocampus	0.63	1.63	-0.20	0.25	0.68	0.49	-0.08	0.36	-0.12	0.40	0.41 ± 0.91	-0.63 / 2.35
Left mid. hippocampus	0.71	0.34	0.23	-0.82*	-0.09	0.15	0.29	0.48	0.38	0.71	0.53 ± 0.62	-0.57 / 1.78
Left post. hippocampus	0.05	0.11	-0.06*	-0.21*	-0.34*	0.04	0.41	0.22	0.56	0.44	0.35 ± 0.35	0 / 1.13
Right hippocampus	0.35	0.33	-0.40	0.23	-0.03	0.19	0.27	0.4	0.45	0.64	0.44 ± 0.61	-0.11 / 1.87
Right ant. hippocampus	0.44	0.30	-0.15	0.69	-0.04	0.26	0.33	0.32	0.11	0.56	0.41 ± 0.63	-0.22 / 1.83
Right mid. hippocampus	0.27	0.28	0.07	-0.13	0.05	0.27	0.24	0.47	0.62	0.78	0.6 ± 0.71	-0.22 / 2.33
Right post. hippocampus	0.25	0.49	-0.03	-0.18*	-0.14	-0.03	0.18	0.41	0.56	0.62	0.37 ± 0.55	-0.15 / 1.56
Associative retrieval												
Left hippocampus	0.23	-0.43	-1.11*	-0.52	0.09	-0.23	0.24	0.7	0.01	0.23	0.11 ± 0.55	-0.97 / 1.05
Left ant. hippocampus	0.17	-0.24	-1.86*	-0.04	0.62	-0.04	0.14	0.59	-0.02	0.20	0.02 ± 0.58	-1.18 / 0.88
Left mid. hippocampus	0.30	-0.35	-0.53	-1.17*	-0.04	-0.62	0.62	0.78	-0.22	0.27	0.15 ± 0.7	-1.13 / 1.33
Left post. hippocampus	0.27	-0.75*	-0.59*	-0.67*	-0.65*	0.06	-0.05	0.83	0.76	0.2	0.44 ± 0.45	-0.29 / 1.3
Right hippocampus	0.24	0.02	-0.17	-0.11	0.80	-0.11	0.32	0.52	0.20	0.15	0.17 ± 0.44	-0.46 / 1.02
Right ant. hippocampus	0.37	0.58	-0.42	0.11	0.42	0.14	0.30	0.52	0.19	0.14	0.18 ± 0.57	-0.61 / 1.43
Right mid. hippocampus	0.15	-0.67	0.10	-0.16	-0.11	-0.41	0.34	0.47	0.20	0.11	0.17 ± 0.59	-0.85 / 1.19
Right post. hippocampus	0.05	0.20	-0.17	-0.48*	-0.22	0.19	0.33	0.63	0.22	0.24	0.19 ± 0.35	-0.33 / 0.82
Face recognition												
Left hippocampus	0.56	0.76	-0.74	-0.77	0.11	-0.13	0.19	0.74	-0.10	0.34	0.34 ± 0.59	-0.8 / 1.45
Left ant. hippocampus	0.58	1.50**	-0.78*	-0.45	0.57	0.35	0.11	0.64	0.05	0.43	0.3 ± 0.56	-0.57 / 1.38
Left mid. hippocampus	0.65	0.69	-0.87*	-1.21*	0.09	-0.55	0.73	0.91	-0.45	0.38	0.43 ± 0.75	-0.85 / 1.7
Left post. hippocampus	0.34	-0.04	-0.49*	-0.88*	-0.67*	-0.08	-0.38*	0.68	0.57	0.07	0.56 ± 0.54	-0.24 / 1.44
Right hippocampus	0.39	0.80	-0.34	-0.27	0.04	-0.05	0.32	0.62	-0.04	0.31	0.31 ± 0.44	-0.48 / 1.14
Right ant. hippocampus	0.52	1.15	-0.69*	-0.34*	0.40	0.14	0.38	0.68	-0.13	0.28	0.36 ± 0.47	-0.15 / 1.26
Right mid. hippocampus	0.36	0.54	-0.19	-0.06	-0.22	-0.37	0.24	0.51	-0.20	0.30	0.32 ± 0.61	-0.71 / 1.64
Right post. hippocampus	0.12	0.62	-0.08	-0.50*	-0.18	0.34	0.31	0.74	0.35	0.40	0.34 ± 0.42	-0.26 / 1.04
Novel face detection												
Left hippocampus	0.49	0.26	-0.31	-0.91*	0.22	-0.18	0.37	0.63	-0.23	0.23	0.31 ± 0.64	-0.83 / 1.38
Left ant. hippocampus	0.52	0.77	-0.50	-0.35	0.77	0.20	0.21	0.56	0.25	0.20	0.31 ± 0.6	-0.85 / 1.23
Left mid. hippocampus	0.62	0.06	-0.35	-1.65*	0.08	-0.55	0.83	0.77	-0.57	0.37	0.40 ± 0.80	-1 / 1.56
Left post. hippocampus	0.23	-0.11	0.08	-1.15*	-0.57*	-0.1	0.06	0.55	-0.16	0.03	0.43 ± 0.57	-0.28 / 1.5
Right hippocampus	0.58	0.51	0.07	-0.24	0.33	-0.07	0.57	0.51	-0.06	0.29	0.28 ± 0.44	-0.48 / 0.94
Right ant. hippocampus	0.66	0.96	-0.47	-0.21	0.86	-0.02	0.64	0.45	0.05	0.29	0.33 ± 0.53	-0.51 / 1.39
Right mid. hippocampus	0.59	0.04	0.38	-0.24	0.01	-0.15	0.53	0.48	-0.25	0.34	0.28 ± 0.57	-0.83 / 1.22
Right post. hippocampus	0.39	0.52	0.38	-0.30	-0.08	0.04	0.48	0.66	0.13	0.25	0.32 ± 0.46	-0.53 / 1.02

\*, contrast estimates (CE) values that are below the control group's P7; \*\*, CE values that are above the control group's P93; ant., anterior; mid., middle; post., posterior.