

Supplementary Material

Primary school education may be sufficient to moderate a memory-hippocampal relationship

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1 The participants from the community-based study

The participants from the community-based study was a subsample of the Pietà study (Caramelli et al. 2011) which had a total of 639 participants, which corresponded to 51.1% of a city's population aged 75+ years-old. The subsample was composed by the participants who had MRI scans (n=189) excluded the ones for whom the interval MRI-cognitive test was more than one year (n=53).

2 The Brief Cognitive Battery test (BCB)

The episodic memory test consists of presenting to the participant a paper with 10 simple drawings that have to be identified and named. Immediately after naming the drawings, the participant is asked to recall them (incidental encoding). The drawings are shown again and the participant is instructed to memorize the drawings for 30 seconds and recall them (immediate memory). This latter procedure is repeated once (learning). The BCB's learning phase is composed by the sum of the incidental encoding, immediate memory and learning scores. Five minutes after recalling the drawings for the last time, after doing the clock drawing and the animals-fluency/minute tests, the participant is asked to freely recall the drawings (episodic memory). Finally, the participant is confronted with another paper containing the 10 previously presented drawings along with 10 distractors and is asked to recognize the initial ones (recognition). The recognition score is calculated by subtracting the number of drawings correctly recognized by the number of false recognitions.

3 Neuroimaging acquisition parameters

3D-T1 acquisition parameters: sagittal plane acquisition with spin-echo echoplanar sequences (TR/TE=16/4ms, matrix=240x240, slice thickness=1.0mm, 1.0mm gap between slices) and flip angle of 8°.

Fluid-attenuated inversion recovery images acquisition parameters: axial plane acquisition with a single-shot, spin-echo echoplanar sequences in the axial plane (TR/TE=10000/140ms, Inversion time:2800ms, Echo train length=27mm, FO=240mm, matrix=352x212 (reconstructed 512x512), slice thickness=5.0 mm, 6.0mm gap between slices).

Supplementary tables:

Table 1: Univariate regression models showing the association between the hippocampal volumes and the scores on episodic memory tests

Univariate Regression models							
	Beta coefficient	Confidence Interval	p value		Beta coefficient	Confidence Interval	p value
Left hippocampus	5.5	61.6;893.1	<0.001	Right hippocampus	4.1	17.3;239.0	<0.001
Total intracranial volume	-0.0	0.9;0.9	<0.001	Total intracranial volume	-0.0	0.9;0.9	<0.001

Table 2: Multivariate regression models showing the association between the hippocampal volumes and the scores on episodic memory tests

Multivariate regression models							
	Beta coefficient	Confidence Interval	p value		Beta coefficient	Confidence Interval	p value
Left hippocampus	1.0	0.8;9.6	0.111	Right hippocampus	-0.1	0.3;2.7	0.827
Education	-0.0	0.9;1.0	0.367	Education	-0.0	0.9;1.0	0.213
Age	-0.0	0.9;1.0	0.547	Age	-0.0	0.9;1.0	0.360
Sex (Male)	-0.1	0.6;1.6	0.836	Sex (Male)	-0.1	0.5;1.5	0.694
Diagnosis (Cognitively healthy)	-0.1	0.5;1.8	0.790	Diagnosis (Cognitively healthy)	0.1	0.5;2.0	0.904
Diagnosis (Dementia)	-1.3	0.1;0.5	<0.001	Diagnosis (Dementia)	-1.4	0.1;0.5	<0.001
BCB learning	0.3	1.3;1.4	<0.001	BCB learning	0.3	1.3;1.4	<0.001
MMSE	0.1	1.0;1.2	0.036	MMSE	0.1	1.0;1.2	0.038
Total intracranial volume	0.0	0.9;1.0	0.435	Total intracranial volume	0.0	0.9;1.0	0.233
Volume of white matter lesions	-0.0	0.9;1.0	0.972	Volume of white matter lesions	-0.0	0.9;1.0	0.920
Sum of other cortical regions	-0.0	0.9, 1.0	0.295	Sum of other cortical regions	-0.0	0.9;1.0	0.765

Table 3: Model with the interaction term (hippocampal volume x years of education) suggesting the moderator effect of years of education on the association between the hippocampal volumes and the scores on the episodic memory tests

Multivariate regression models							
	Beta coefficient	Confidence Interval	p value		Beta coefficient	Confidence Interval	p value
Left hippocampus	0.1	0.2;4.9	0.920	Right hippocampus	-0.1	0.1;2.1	0.405
Interaction: Left hippocampus x education	0.2	1.0;1.4	0.043	Interaction: Right hippocampus x education	0.1	0.9;1.3	0.218
Education	-0.0	0.5;0.9	0.031	Education	-0.0	0.5;1.1	0.152
Age	-0.0	0.9;1.0	0.634	Age	-0.0	0.9;1.0	0.381
Sex (Male)	-0.1	0.6;1.6	0.850	Sex (Male)	-0.1	0.5;1.5	0.717
Diagnosis (Cognitively healthy)	-0.0	0.5;1.9	0.962	Diagnosis (Cognitively healthy)	0.1	0.5;2.2	0.780
Diagnosis (Dementia)	-1.1	0.2;0.7	0.005	Diagnosis (Dementia)	-1.3	0.1;0.6	0.001
BCB learning	0.3	1.3;1.4	<0.001	BCB learning	0.3	1.3;1.4	<0.001
MMSE	0.1	1.0;1.2	0.020	MMSE	0.1	1.0;1.2	0.037
Total intracranial volume	0.0	0.9;1.0	0.359	Total intracranial volume	0.0	0.9;1.0	0.209
Volume of white matter lesions	-0.0	0.9;1.0	0.872	Volume of white matter lesions	-0.0	0.9;1.0	0.795
Sum of other cortical regions	-0.0	0.9, 1.0	0.200	Sum of other cortical regions	-0.0	0.9;1.0	0.613

References

- Caramelli, Paulo, Maira Tonidandel Barbosa, Emilia Sakurai, Etelvina Lucas dos Santos, Rogerio Gomes Beato, Joao Carlos Barbosa Machado, Henrique Cerqueira Guimarães, and Antonio Lucio Teixeira. 2011. "The Pietà study. Epidemiological investigation on successful brain aging in Caeté (MG), Brazil. Methods and baseline cohort characteristics." *Arq Neuropsiquiatr.* 69 (4):579-584. doi: 10.1590/S0004-282X2011000500002.