**The Role of Cortical Thickness in Memory and Strategy Use in Older Adults**

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**Objective:** To examine whether strategy use facilitates long-delayed free recall in cognitively normal elderly.

*Abstract*

**Background:** The California Verbal Learning Test (CVLT) is a standardized measure that assesses learning over repeated trials, immediate recall, and delayed recall. This test consists of 16 items from four different categories. The CVLT also measures the memory strategy of "semantic clustering"– one's ability to organize information to be learned into their superordinate categories to facilitate recall.

**Methods:** 42 cognitively normal elderly (NC) subjects underwent detailed cognitive testing including the CVLT and were scanned with T1-weighted magnetic resonance imaging (MRI). A three-dimensional cortical pattern matching technique was applied and segmented gray matter maps were used to calculate cortical thickness at each surface point. In terms of memory, linear regression models were used to examine the associations between learning (i.e., total number of items recalled over learning trials 1-5), short-delayed free recall, long-delayed free recall, and cortical thickness. In regard to strategy use, linear regression models evaluated the relationships between clustering at learning, clustering at the short delay, clustering at the long delay and cortical thickness. We controlled for multiple comparisons with permutation analysis, using a threshold of $p<0.01$.

**Results:** We found significant positive associations between cortical thickness and all CVLT-II indices except for semantic clustering at learning. Cortical thickness associations with long-delayed free recall (left $p_{corrected}=0.013$, right $p_{corrected}=0.015$) and semantic clustering at the long-delayed free recall (left $p_{corrected}=0.014$, right $p_{corrected}=0.014$) were stronger than those with short-delayed free recall (left $p_{corrected}=0.016$, right $p_{corrected}=0.04$) and semantic clustering at the short-delayed free recall (left $p_{corrected}=0.02$, right $p_{corrected}=0.058$; Figure 1, 2nd and 3rd row).

**Conclusions:** Our data suggests that long-delayed free recall in normal elderly individuals is highly correlated with cortical thickness in the expected direction. The almost identical pattern of associations between long-delayed free recall and semantic

clustering at the long-delayed free recall and cortical thickness suggests that strategy use greatly facilitates successful long-delayed free recall in cognitively normal elderly.

**Figure:** Statistical maps of the association between cortical thickness and CVLT-II learning and semantic clustering at learning (top row), short-delay free recall and semantic clustering at short-delay free recall (middle row) and long-delay free recall and semantic clustering at long-delay free recall (bottom row).

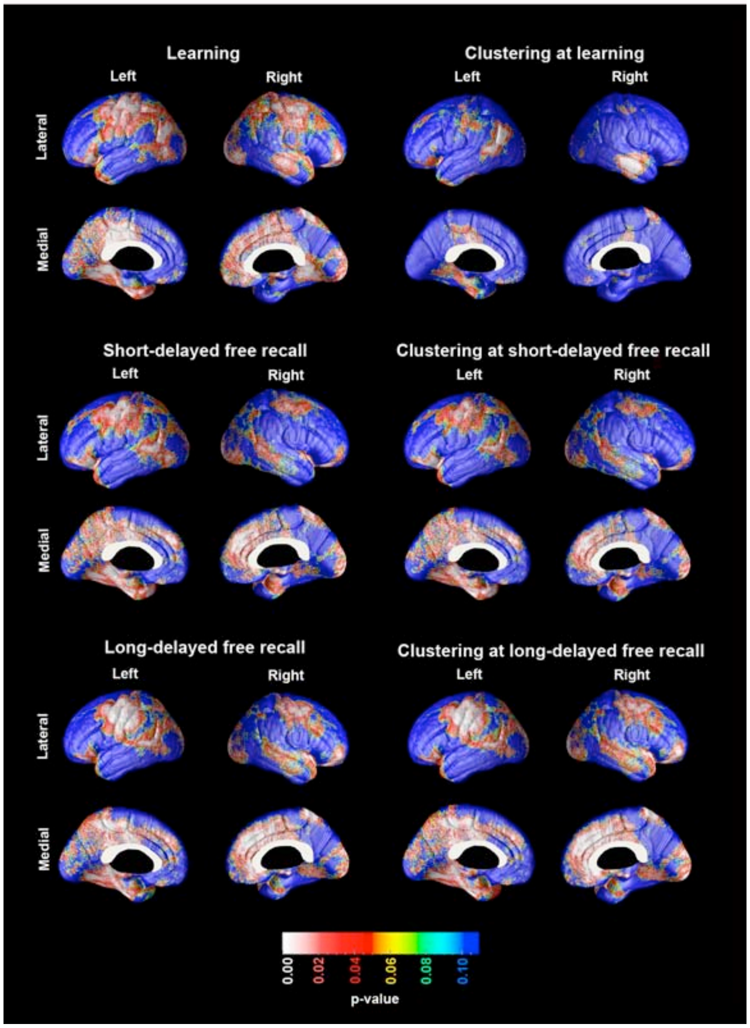


**Figure:** Statistical maps of the association between cortical thickness and CVLT-II learning and semantic clustering at learning (top row), short-delay free recall and semantic clustering at the short-delay free recall (middle row) and long-delay free recall and semantic clustering at the long-delay free recall (bottom row).