Effects of cognitive aging on recognition of implicitly and explicitly memorized words: an fMRI study

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One of the more robust effects of cognitive aging is a decline in memory functions. We used functional magnetic resonance imaging (fMRI) to gain more insight in the underlying mechanism of this decline. Two age-groups; young (23-27 and elderly (63-67) men. Participants performed two types of word encoding tasks. In the first task, participants had to determine whether the presented words represented something living or non-living (implicit). In the second task, participants performed the same task, but with the additional instruction to memorize the words (explicit). After a short delay, participants had to perform a recognition task. Three categories of words were presented in this task; new words, words presented previously in the explicit condition and words presented previously in the implicit condition. Elderly participants were slower in the recognition task and showed a more conservative response strategy. This resulted in comparable levels of performance for new words, but significantly worse performance for previously presented words. Imaging data were acquired on a 1.5 Tesla scanner and analysed with SPM99. Successful retrieval (correctly recognized previously presented words vs. correctly categorized new words) was accompanied by activation in both the left and right inferior frontal cortex (BA 47) and adjacent anterior insula. In this contrast, elderly participants showed additional activity in the medial wall of the prefrontal cortex (superior frontal cortex, BA 6/8). Brain activation did not differ between successfully recognized words from the implicit and explicit condition, and the brain activation did not differ for the two groups in this contrast. A possible explanation for the additional activation in the elderly group is that participants tried to compensate for deteriorating performance by recruiting additional brain areas. However, if this is true, this compensation was only partly successful, because performance in the recognition task is still far worse for this age-group.

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