Supplementary Methods

Participants: Eighteen younger and older subjects participated in this study after giving informed consent. The data on the younger subjects has been presented in a previous publication\(^1\). The data from one younger adult and two older adults were discarded due to motion or scanner-related artifacts, yielding a subject pool of 17 younger adults (9 male, mean age 23.5 years [range 19-30 years], mean education 15.7 years [range 12-19 years]), and 16 older adults (8 male, mean age 67 years [range 60-77 years], mean education 15.4 years [range 12-19 years]). All participants were screened to ensure that they were healthy, had no history of neurological, psychiatric, or vascular disease, were not depressed, and were not taking any psychotropic or hypertensive medications.

Neuropsychological testing: In order to study the impact of the normal aging process on cognition, all participants in the older age group were administered 11 neuropsychological tests of executive and memory function, and were found to be cognitively intact (within two standard deviations) relative to normative values for age-matched controls. Neuropsychological testing was performed on a separate day from fMRI scanning and included the following tests: MMSE\(^2\), Logical Memory I, Verbal Paired Associates I, and Visual Reproduction II (all from the Weschler Memory Scale--Revised\(^3\)), the Long-Delay Free Recall measure from the California Verbal Learning Test (CVLT\(^4\)), Modified Wisconsin Card Sorting Test (WCST\(^5\)), Controlled Oral Word Association Test ("FAS")\(^6\), Mental Arithmetic Test\(^3\), Mental Control Test\(^7\) and Digit Span Test\(^7\).

Task design: Grayscale images of faces and natural scenes were used as stimuli. All cue images were novel throughout the fMRI experiment. Stimuli were 225 pixels wide by 300 pixels tall, and subtended approximately 5 by 6 degrees of visual angle. Both male and female faces with neutral expressions were used, although the sex of the face stimuli used within each trial was held constant. The face stimuli were blurred along the contours of the faces, so that only the faces
themselves were visible. Data were acquired during 12 runs lasting 4.5 minutes each, with each run containing 10 trials of one task condition. Participants performed three runs of each of four task conditions (Remember Faces/Ignore Scenes, Remember Scenes/Ignore Faces, Remember Both faces and scenes, and Passively View all images), with conditions presented in a counterbalanced order. Data from the Remember Both condition are not included in the brief communication. The experimental paradigm is described in the text and is published in detail elsewhere 1.

Post-experiment recognition testing: After completion of the fMRI experiment, participants were given an unexpected memory test to assess recognition of stimuli presented during the session. Participants viewed 240 images on a computer monitor (120 novel images, 120 images that had been presented during the fMRI experiment) and indicated on a 4-point scale whether they judged each stimulus to be novel or previously viewed, as well as how confident they were with each judgment. All previously viewed stimuli used in the post-experiment recognition test had been presented only once during the course of the experiment (those that were presented as both cue and probe were omitted), and represented a balanced combination of stimuli taken from each task condition.

fMRI method and analysis: MR data were acquired with a Varian INOVA 4T scanner equipped with a TEM send-and-receive RF head coil. Functional data were obtained using a two-shot echo-planar imaging (EPI) sequence sensitive to BOLD contrast (TR = 2000 ms, TE = 28 ms, FOV = 22.4 cm2, matrix size = 64 X 64). Each functional volume consisted of eighteen 5-mm axial slices separated by a 0.5 mm inter-slice gap. Details of data collection are described in Gazzaley et al. 1. Following acquisition, data processing included slice-timing correction, realignment, correction for linear signal drift within runs, high-pass filtering (cut-off period = 128s) and spatial smoothing with a 3D Gaussian kernel (8 mm FWHM). Statistical parametric maps of BOLD activation were calculated in SPM2 (http://www.fil.ion.ucl.ac.uk/spm) using the general linear model approach 8. Regressors were defined for each stage (stimulus-presentation,
delay, and response) of each task condition and were convolved with the canonical hemodynamic response function provided by SPM2. Only trials with correct responses were incorporated in the analysis. Scene-selective ROIs were defined within the parahippocampal/anterior lingual gyrus of each subject. Each ROI was defined as the cluster of 7 contiguous voxels within each anatomical region with the highest t-value on a scene-face contrast based upon an independent ROI-localizer task consisting of 1-back matching of face and scene stimuli \(^1\). All ROIs were defined within each participant’s native brain space; normalization of each participant’s scene-selective ROI into standard MNI space yields a mean MNI coordinate of x = -25 (±3), y = -45 (±6), z = -11 (±5) mm, with standard deviations listed in parentheses. Planned comparisons were used to test significance of differences (p <.05) between responses for a priori hypotheses. Within-group analysis was accomplished with paired-sample, two-tailed t-tests and across-group comparisons of modulation indices with two-tailed t-tests (equal variance not assumed).

**Older adult sub-group analysis:** In order to assess the correspondence between behavioral performance and neural data, the older participants were divided into high-performing and low-performing groups based upon their WM accuracy. Older adults whose accuracy was within one standard deviation of the mean accuracy of the younger adults were defined as high performers (n = 6), while those whose WM accuracy fell two or more standard deviations below the mean accuracy of the younger participants were defined as low performers (n = 6). The four older adults who did not fit into either of these definitions were omitted from the sub-group analysis.
References:


