**Supplementary Methods 2**

**Preprocessing of Structural MRI and Spatial Normalization**

 MRI preprocessing was performed using Statistical Parametric Mapping (SPM) 12 (Wellcome Trust Centre for Neuroimaging, UCL, London, UK). Initially, all subjects’ T1-weighted MPRAGE images were segmented into probabilistic gray matter (GM), white matter (WM), and cerebrospinal fluid (CSF) maps via SPM’s new segment option [1]. Using SPM’s DARTEL toolbox, we estimated high-dimensional non-linear spatial normalization parameters to warp individual GM maps to a group specific GM template, which was defined in an iterative procedure, as implemented in the DARTEL toolbox [2]. We subsequently affine registered this group specific GM template to a T1-MNI standard-space template. Finally, the non-linear DARTEL flow-fields plus the affine transformation parameters were jointly applied to each subjects GM map to achieve MNI normalization. The spatially normalized GM maps of all subjects were subsequently averaged and binarized at a voxel value > 0.3 in order to create a GM mask to restrict later fMRI analyses to voxels falling within the GM.

**Hippocampal Volume Assessment**

 As a surrogate for neuronal loss in aged cohorts that is highly related to memory performance we assessed hippocampus volume using a previously established protocol. This approach yields results highly similar to manual hippocampal segmentation but has the advantage of being fully automated [3]. Using the DARTEL flow-fields that were created during spatial normalization, we normalized each subject's grey matter map to MNI space and smoothed it with an 8 mm full width at half maximum Gaussian kernel. During spatial normalization, modulation was applied to preserve the volume (i.e. local concentrations of grey matter) of the images, which were subsequently masked with a bilateral hippocampus mask selected from the Automatic Anatomic Labeling atlas [4]. These masked images were then used to extract the bilateral hippocampal volume [5, 6].

**Preprocessing of fMRI Data**

 In a first step, all EPI images were corrected for slice-timing, motion, and inhomogeneities of the magnetic field using the gradient-echo fieldmaps. None of the subjects’ motion parameters exceeded 2 mm translations or 2° rotations. Next, all EPI images were registered to the high-resolution T1-weighted images and subsequently normalized to MNI space by applying the combined non-linear DARTEL flow-fields and the affine transformation parameters. To minimize spatial bias, all EPIs were smoothed using an 8 mm full width at half maximum Gaussian kernel.

**REFERENCES**

[1] Ashburner J, Friston KJ (2005) Unified segmentation. *Neuroimage* **26**, 839-851.

[2] Ashburner J (2007) A fast diffeomorphic image registration algorithm. *Neuroimage* **38**, 95-113.

[3] Mak HK, Zhang Z, Yau KK, Zhang L, Chan Q, Chu LW (2011) Efficacy of voxel-based morphometry with DARTEL and standard registration as imaging biomarkers in Alzheimer's disease patients and cognitively normal older adults at 3.0 Tesla MR imaging. *J Alzheimers Dis* **23**, 655-664.

[4] Tzourio-Mazoyer N, Landeau B, Papathanassiou D, Crivello F, Etard O, Delcroix N, Mazoyer B, Joliot M (2002) Automated anatomical labeling of activations in SPM using a macroscopic anatomical parcellation of the MNI MRI single-subject brain. *Neuroimage* **15**, 273-289.

[5] Petersen RC, Jack CR Jr, Xu YC, Waring SC, O'Brien PC, Smith GE, Ivnik RJ, Tangalos EG, Boeve BF, Kokmen E (2000) Memory and MRI-based hippocampal volumes in aging and AD. *Neurology* **54**, 581-587.

[6] Jack CR Jr, Petersen RC, Xu Y, O'Brien PC, Smith GE, Ivnik RJ, Boeve BF, Tangalos EG, Kokmen E (2000) Rates of hippocampal atrophy correlate with change in clinical status in aging and AD. *Neurology* **55**, 484-489.