

Table S1. Differences in the prevalence of individual neuropsychiatric symptoms (other than apathy) between patient groups (*Chi-square* test). All values are frequencies (proportions).

| Symptom | AP-PT (<i>n</i> = 61) | NA-PT (<i>n</i> = 61) | F | <i>p</i> |
|---------------------------|------------------------|------------------------|----------------|----------|
| Delusions | 6 (9.8%) | 1 (1.6%) | – ^a | 0.114 |
| Hallucinations | 1 (1.6%) | 0 (0.0 %) | – ^a | 1.000 |
| Agitation | 27 (44.3%) | 12 (19.7%) | 8.48 | 0.004 |
| Depression | 37 (60.6%) | 11 (18.0%) | 23.22 | <0.001 |
| Anxiety | 21 (34.4%) | 9 (14.7%) | 6.36 | 0.012 |
| Euphoria | 6 (9.8%) | 1 (1.6%) | – ^a | 0.114 |
| Disinhibition | 16 (26.2%) | 1 (1.6%) | 15.38 | <0.001 |
| Irritability | 37 (60.6%) | 10 (16.4%) | 25.23 | <0.001 |
| Aberrant motor behaviours | 10 (16.4%) | 0 (0.0 %) | 10.89 | <0.001 |
| Night-time behaviours | 23 (37.7%) | 15 (24.6%) | 2.45 | 0.118 |
| Appetite | 16 (26.2%) | 6 (9.8%) | 5.54 | 0.019 |

^a *Fisher's Exact Test*

Table S2. Differences in the prevalence of health issues in the medical history of participant groups (*Chi-square* test). All values are frequencies (proportions).

| Comorbid health conditions | AP-PT (<i>n</i> = 61) | NA-PT (<i>n</i> = 61) | CU (<i>n</i> = 61) | F | <i>p</i> |
|-----------------------------|------------------------|------------------------|---------------------|-------|----------|
| Psychiatric | 34 (55.7%)* | 20 (32.8%) | 12 (19.7%) | 17.63 | <0.001 |
| Neurologic (other than AD) | 12 (19.7%) | 13 (21.3%) | 13 (21.3%) | 0.07 | 0.967 |
| Head, eyes, nose and throat | 34 (55.7%) | 42 (68.9%) | 37 (60.7%) | 2.27 | 0.322 |
| Cardiovascular | 46 (75.4%) | 42 (68.9%) | 44 (72.1%) | 0.65 | 0.722 |
| Respiratory | 17 (27.9%) | 14 (23.0%) | 7 (11.5%) | 5.24 | 0.073 |
| Hepatic | 2 (3.3%) | 2 (3.3%) | 1 (1.6%) | 0.41 | 0.814 |
| Dermatologic | 22 (36.1%) | 16 (26.2%) | 18 (29.5%) | 1.44 | 0.487 |
| Musculoskeletal | 40 (65.6%) | 38 (62.3%) | 42 (68.9%) | 0.58 | 0.748 |
| Endocrine-Metabolic | 32 (52.5%) | 26 (42.6%) | 34 (55.7%) | 2.27 | 0.321 |
| Gastrointestinal | 22 (36.1%) | 30 49.2%) | 28 (45.9%) | 2.31 | 0.315 |
| Hematopoietic-Lymphatic | 4 (6.6%) | 5 (8.2%) | 7 (11.5%) | 0.96 | 0.619 |
| Renal-Genitourinary | 18 (29.5%) | 25 (41.5%) | 20 (32.8%) | 1.89 | 0.389 |
| Allergies-Drug sensitivity | 24 (39.3%) | 30 49.2%) | 26 (42.6%) | 1.24 | 0.537 |
| Alcohol abuse | 2 (3.3%) | 0 (0.0%) | 1 (1.6%) | 2.03 | 0.362 |
| Drug abuse | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0.00 | 1.000 |
| Smoking | 25 (41.5%) | 26 (42.6%) | 28 (45.9%) | 0.31 | 0.856 |
| Malignancy | 20 (32.8%) | 14 (23.0%) | 18 (29.5%) | 1.50 | 0.471 |

| | | | | | |
|---------------------------|------------|------------|------------|------|-------|
| Major Surgical procedures | 46 (75.4%) | 43 (70.5%) | 42 (68.9%) | 0.70 | 0.705 |
|---------------------------|------------|------------|------------|------|-------|

AD: Alzheimer's disease

* Patient group significantly different from the CU group in pairwise *post hoc* comparisons

In bold, significant difference between patient groups in pairwise *post hoc* comparisons

Table S3. Differences in the prevalence of mental health problems in the medical history of participant groups (*Chi-square* test). All values are frequencies (proportions).

| Symptoms | AP-PT (<i>n</i> = 61) | NA-PT (<i>n</i> = 61) | CU (<i>n</i> = 61) | F | <i>p</i> |
|-----------------------------|------------------------|------------------------|---------------------|-------------------|----------|
| Depression | 28 (45.9%)* | 18 (29.5%)* | 8 (13.1%) | 15.76 | <0.001 |
| Insomnia | 4 (6.6%) | 4 (6.6%) | 1 (1.6%) | 2.51 ^a | 0.285 |
| Nervous breakdown | 1 (1.6%) | 0 (0.0%) | 0 (0.0%) | 2.21 ^a | 0.332 |
| Anxiety | 5 (8.2%) | 3 (4.9%) | 2 (3.3%) | 1.46 ^a | 0.482 |
| Irritability | 1 (1.6%) | 1 (1.6%) | 0 (0.0%) | 1.63 ^a | 0.442 |
| Seasonal affective disorder | 0 (0.0%) | 0 (0.0%) | 1 (1.6%) | 2.21 | 0.332 |

^a Likelihood ratio

* Patient groups significantly different from the CU group in pairwise *post hoc* comparisons

Table S4. Differences in the prevalence of medications with a potential impact on apathy across participant groups (*Chi-square* test). All values are frequencies (proportions).

| Treatment | AP-PT (<i>n</i> = 61) | NA-PT (<i>n</i> = 61) | CU (<i>n</i> = 61) | F | <i>p</i> |
|-------------------------------|------------------------|------------------------|---------------------|-------------------|----------|
| AChEI | 33 (54.1%)* | 25 (41.0%)* | 0 (0.0 %) | 44.88 | <0.001 |
| Memantine | 17 (27.9%)* | 8 (13.1%)* | 0 (0.0 %) | 20.11 | <0.001 |
| Antidepressants | 23 (37.7%)* | 12 (19.7%)* | 3 (4.8%) | 19.99 | <0.001 |
| Other behavioural medications | 2 (3.2%) | 0 (0.0 %) | 1 (1.6%) | 2.81 ^a | 0.246 |

AChEI: Acetylcholinesterase inhibitors

^a Likelihood ratio

* Patient groups significantly different from the CU group in pairwise *post hoc* comparisons

In bold, significant difference between patient groups in pairwise *post hoc* comparisons

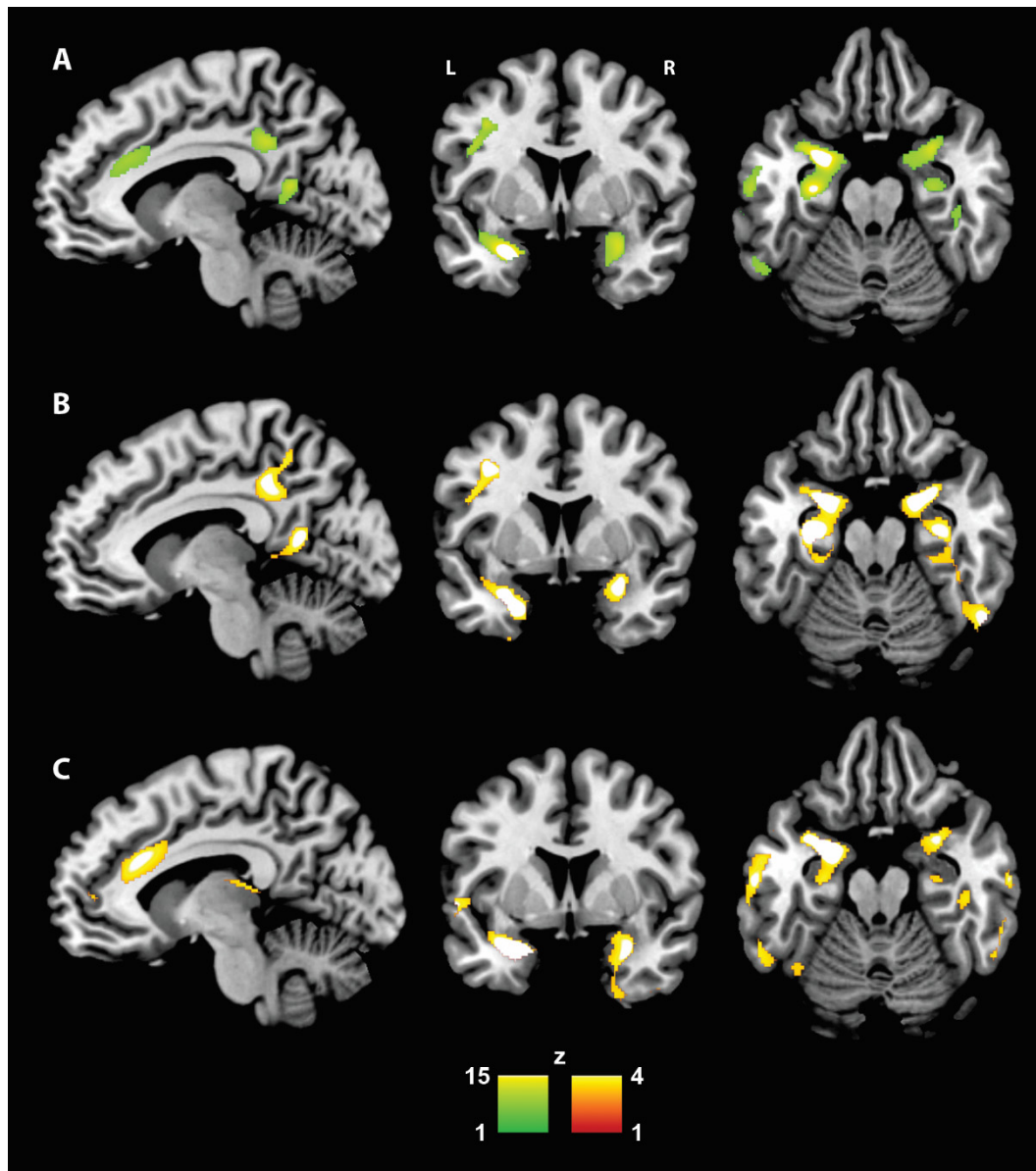


Figure S1. Significant regional GM volume differences (FWE-corrected at cluster level): A. *ANCOVA*; B. NA-PT < CU group; C. AP-PT < CU group.

Abbreviation list.

A β : Amyloid beta, ACC: Anterior cingulate cortex, AChEI: Acetylcholinesterase inhibitors, AD: Alzheimer's disease, ADNI: Alzheimer's Disease Neuroimaging Initiative, ANCOVA: Analysis of covariance, ANOVA: Analysis of variance, AP-PT: Apathetic patients, ATR: Anterior thalamic radiations, AVLT: Auditory Verbal Learning Test, AxD: Axial diffusivity, BNT: Boston Naming Test, CDR: Clinical Dementia Rating, CDT: Clock Drawing Test, CFT-A: Category Fluency Test - animals, CSF: Cerebrospinal fluid, CU: Cognitively unimpaired, DR: Delayed recall, DTI: Diffusion tensor imaging, FA: Fractional anisotropy, FLAIR: Fluid-attenuated inversion recovery, FSL: Functional magnetic resonance imaging of the brain Software Library, FWE: Family-wise error, GM: Gray matter, GMV: Gray matter volume, ICBM: International Consortium for Brain Mapping, IFL: Inferior longitudinal fasciculus, IFOF: Inferior fronto-occipital fasciculus, IR: Immediate recall, LMT: Logical Memory Test, LST: Lesion Segmentation Toolbox, MCI: Mild cognitive impairment, MD: Mean diffusivity, MMSE: Mini Mental State Examination, MNI: Montreal Neurological Institute, NA-PT: Non-apathetic patients, NPI-Q: Neuropsychiatric Inventory Questionnaire, OFC: Orbitofrontal cortex, p-tau: Phosphorylated tau, PET: Positron emission tomography, PFC: Prefrontal cortex, RD: Radial diffusivity, SLF: Superior longitudinal fasciculus, SPM: Statistical Parametric Mapping, TBSS: Tract-based spatial statistics, TFCE: Threshold-free cluster enhanced, TIV: Total intracranial volume, TMT – A/B: Trail Making Test – part A/part B, VBM: Voxel-based morphometry, WM: White matter, WMH: White matter hyperintensity, WMHV: White matter hyperintensity volume, WMV: White matter volume