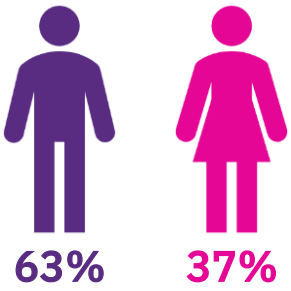
AMyloid imaging for Phenotyping LEwy body dementia (AMPLE)

Nine healthy controls (HC), eight PD with no cognitive impairment (PD-noCI), nine PD with mild cognitive impairment (PD-MCI), six dementia with Lewy bodies (DLB) and fifteen PD with dementia (PDD) patients underwent [11C]-PIB PET imaging, clinical examination, and cognitive testing. The binding potential (BP) of PIB for predefined regions and the mean cortical BP (MCBP) were calculated for each participant. Annual longitudinal follow-up and post-mortem examinations were performed on a subset of participants.

Background

Participants with Lewy body disorders (n = 40) were recruited from the Movement Disorders Centre at Washington University School of Medicine and the community, and healthy control participants (HC; n = 10) were recruited through patient participants and the community. Eligibility criteria included age at least 55 years, no major neurological or psychiatric diseases other than PD or DLB, ability to lie still for 90 minutes, no contraindications to MRI, and consent to brain donation. Patients were diagnosed with idiopathic PD based on modified United Kingdom Parkinson's Disease Society Brain Bank clinical diagnostic criteria16 or DLB according to McKeith criteria4. All DLB patients in this study had parkinsonian motor manifestations and onset of dementia either before or within one year of the onset of these motor manifestations. HC participants were required to have no family history of PD, normal neurologic examination and a Clinical Dementia Rating scale (CDR)17 score of 0. Participants underwent structural MRI, PIB PET imaging, clinical interview, neurological examination and neuropsychological testing.

Group	Number
Healthy Controls (HC)	8
Parkinson's Disease – no cognitive impairment (PD-noCI)	9
Parkinson's Disease – mild cognitive impairment (PD-MCI)	9
Dementia with Lewy Bodies (DLB)	6
Parkinson's Disease with dementia (PDD)	15
Total	**47**



	HC	PD-noCI	PD-MCI	PDD	DLB
MMSE	28.2	28.6	27.6	23.2	21.0
EDUCATION	13.9	14.8	14.8	14.5	14.5

Clinical & Cognitive Assessments

	Assessment Name	Assessment Description
Motor Evaluation	Unified Parkinson's Disease Rating Scale Part III (UPDRS)	Unified Parkinson's Disease Rating Scale (UPDRS) is a rating tool used to gauge the severity and progression of Parkinson's disease in patients. The UPDRS scale consists of: 1) Mentation, Behaviour, and Mood, 2) ADL, 3) Motor sections, 4) Complications of Therapy (in the past week) 5) Modified Hoehn and Yahr Scale, and 6) Schwab and England ADL scale.
	Levodopa Equivalent Daily Dose (LEDD)	Calculated using the following corrections: levodopa with a COMT-inhibitor*1.3; sustained release levodopa*0.75; pramipexole or pergolide*100; ropinirole*20; selegiline*10.
	CDR	Used to assess the presence and severity of cognitive impairment. The "sum of boxes" score (CDR-SB) is the sum of the category ratings. The global CDR score is the weighted average of the category ratings, where CDR 0 indicates no dementia and CDR 1, 2, and 3 indicate mild, moderate, and severe dementia, respectively. A global CDR score of 0.5 indicated PD-MCI if cognitive impairment did not interfere with activities of daily living (ADL) or very mild dementia if cognitive impairment interfered with ADL.
Clinical	Mayo fluctuations screen	The Mayo Fluctuations Scale, originally developed with 19 items, is a four-item questionnaire assessing the common symptoms of cognitive fluctuation shown to significantly differentiate DLB from AD. These four items are daytime drowsiness, daytime sleepiness, disorganised thought and staring spell.
	Geriatric Depression Scale (GDS)	Designed for the assessment of depressive symptomatology in elderly people
	Neuropsychiatric Inventory (NPIQ)	A validated informant-based interview that assesses neuropsychiatric symptoms over the previous month.
	Mini-Mental State Examination (MMSE)	30-point questionnaire that is used to measure cognitive impairment. The MMSE test includes simple questions and problems in a number of areas: the time and place of the test, repeating lists of words, arithmetic such as the serial sevens, language use and comprehension, and basic motor skills.
	Logical Memory	Provides information on a range of memory components, namely, auditory memory, immediate memory, delayed memory, visual memory, and visual working memory.
Neuropsychological Evaluation	California Verbal Learning Test II (CVLT)	California Verbal Learning Test, Second Edition (CVLT-II UK) is a comprehensive, detailed assessment of verbal learning and memory deficits in older adolescents and adults
	Boston Naming Test (BNT)	A widely used neuropsychological assessment tool to measure confrontational word retrieval. The BNT contains 60 line drawings graded in difficulty, items are rank ordered in terms of their ability to be named, which is correlated with their frequency.
	Digit Span	Digit Span tests the individual's ability to remember a sequence of numbers that appear on the screen, one at a time.
	Spatial Relations Test	Designed to determine an individual's ability to manipulate 2D and 3D objects, visualize movements, and spot patterns between shapes.
	Category Fluency	Used to assess the integrity of semantic memory in individuals with brain damage.

Neuropsychological and initial motor evaluations were completed off antiparkinsonian medications overnight (mean = 13.2 hours), with repeat motor evaluation following medication (mean time on meds = 1.0 hour).

Six participants (one PD-MCI, four PDD, and one DLB) did not complete neuropsychological testing due to difficulties remaining off antiparkinsonian medication or severity of dementia.

Imaging

MRI Acquisition Details

	T1	T2	FLAIR	DWI	SWI	FMRI
Sequence Name	T1TFE	TSE	TIR	DwiSE	FFE	FEEPI
Repetition Time	0.008283	6.419802	11	6.123356	1.545335	2.072
Phase Encoding Direction	J	J	I	J	I	J
Echo Time	0.0046	0.019	0.125	0.07004	0.01611	0.03
Slice Thickness	1	2	3	2.11	3	3
Flip Angle	8	90	90	90	18	90

Data Structure

BIDS Format

BIDS formatting is used to structure the folders and files of the imaging data. The data is split across scan types for each subject, with all scans being in NIFTI format and having an accompanying JSON sidecar containing metadata. The structure of the data is set out below, using subject 01 as an example:

Ample Dataset/

sub-01/

anat/

sub-01_acq-defaced_T1w.nii.gz
sub-01_acq-FFE_T1w.nii.gz
sub-01_acq-FFE_T1w.json
sub-01_acq-cor1_T2w.nii.gz
sub-01_ acq-cor1_T2w.json
sub-01_FLAIR.nii.gz
sub-01_FLAIR.json

func/

sub-01_task-rest_bold.nii.gz
sub-01_task-rest_bold.json

dwi/

sub-01_dir-AP_dwi.nii.gz
sub-01_dir-AP_dwi.bvals
sub-01_dir-AP_dwi.bvecs
sub-01_dir-AP_dwi.json
sub-01_dir-PA_dwi.nii.gz
sub-01_dir-PA_dwi.json

swi/

sub-01_part-mag_swi.nii.gz
sub-01_part-phase_swi.nii.gz
sub-01 _swi.json

ct/

sub-01_acq-2CT_ct.nii.gz
sub-01_acq-3ACCT_ct.nii.gz
sub-01_acq-4CTSupAD1mm_ct.nii.gz