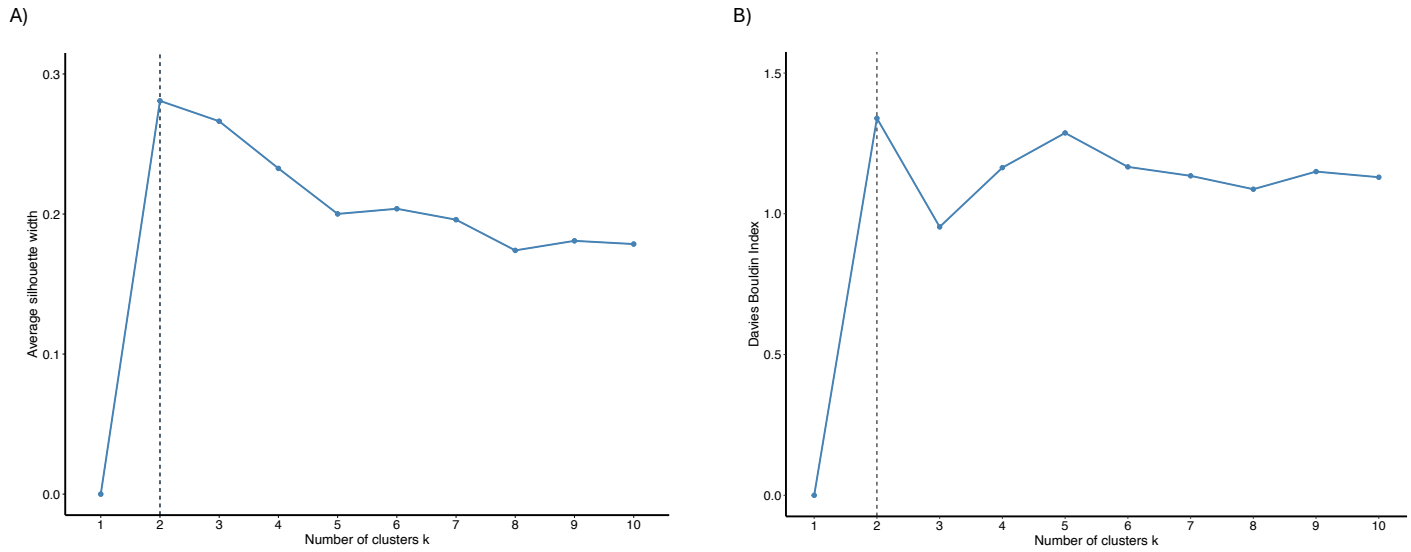


Supplementary Material

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Supplementary Figure 1. Optimal number of clusters.



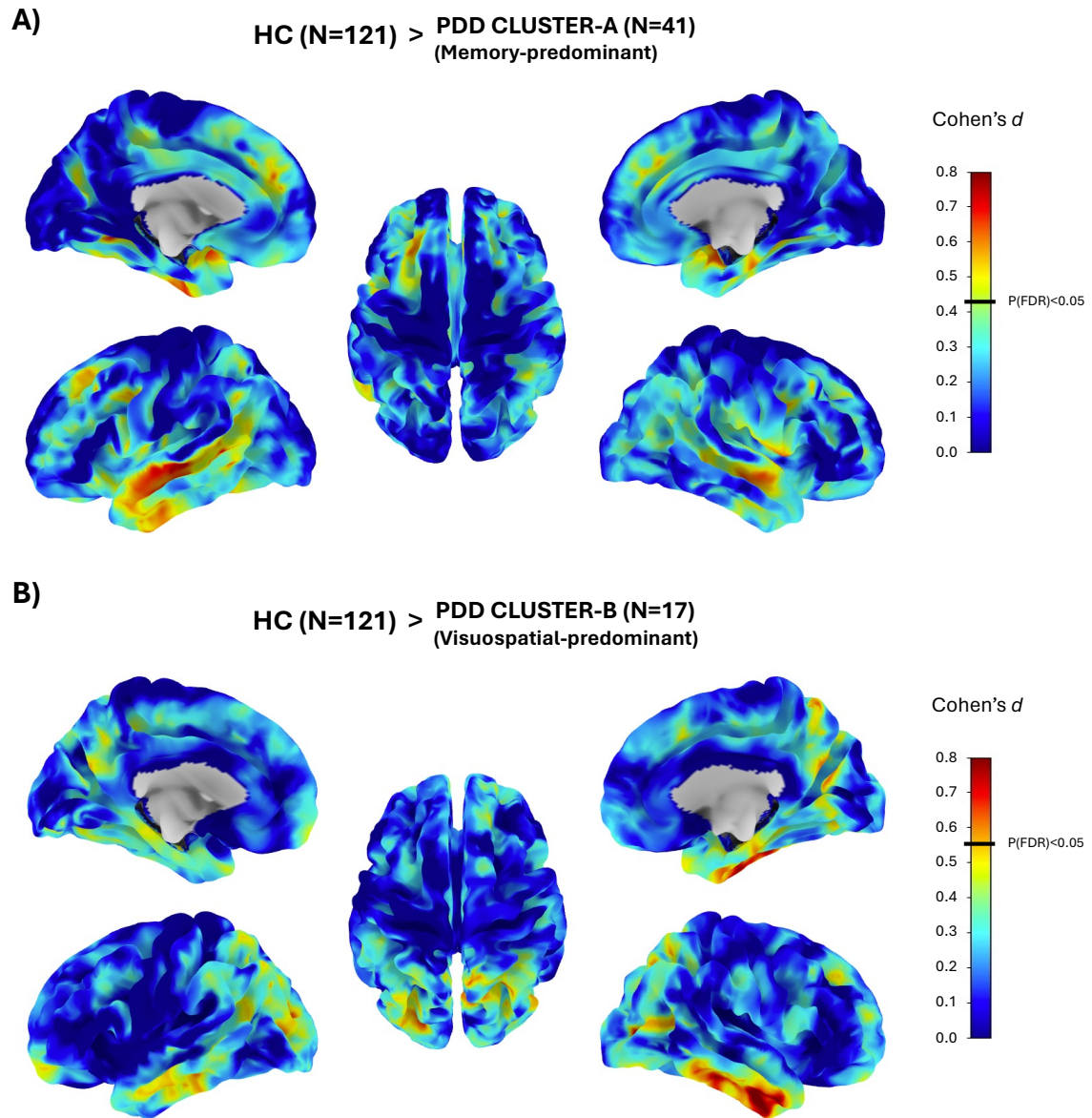
Line plots depict the average Silhouette width index (a) and Davies Bouldin index (b) for each number of clusters k . Both indices indicate an optimal number of two clusters. The two-cluster solution also showed a high agglomerative coefficient of 0.91.

Supplementary Table 1. Proportions of patients in each PDD cluster with impaired cognition in the different cognitive tests.

Cognitive domain test	PDD Cluster-A (Memory-predominant)		PDD Cluster-B (Visuospatial-predominant)		Statistical values
	No	Yes	No	Yes	
Impaired cognition (w-score>1)	No	Yes	No	Yes	
Delayed recall	5 (10%)	45 (90%)	21 (84%)	4 (16%)	OR = 0.02 (p<0.001)
Immediate recall	14 (28%)	36 (72%)	19 (76%)	6 (24%)	OR = 0.13 (p<0.001)
Judgment of Line Orientation	36 (73%)	13 (27%)	0 (0%)	25 (100%)	OR > 14.02* (p<0.001)
Letter Number Sequencing	34 (68%)	16 (32%)	15 (60%)	10 (40%)	OR = 1.40 (p=0.608)
Symbol Digit Modalities	14 (29%)	34 (71%)	3 (12%)	22 (88%)	OR = 2.97 (p=0.146)
Semantic Fluency	31 (62%)	19 (38%)	21 (84%)	4 (16%)	OR = 0.32 (p=0.065)

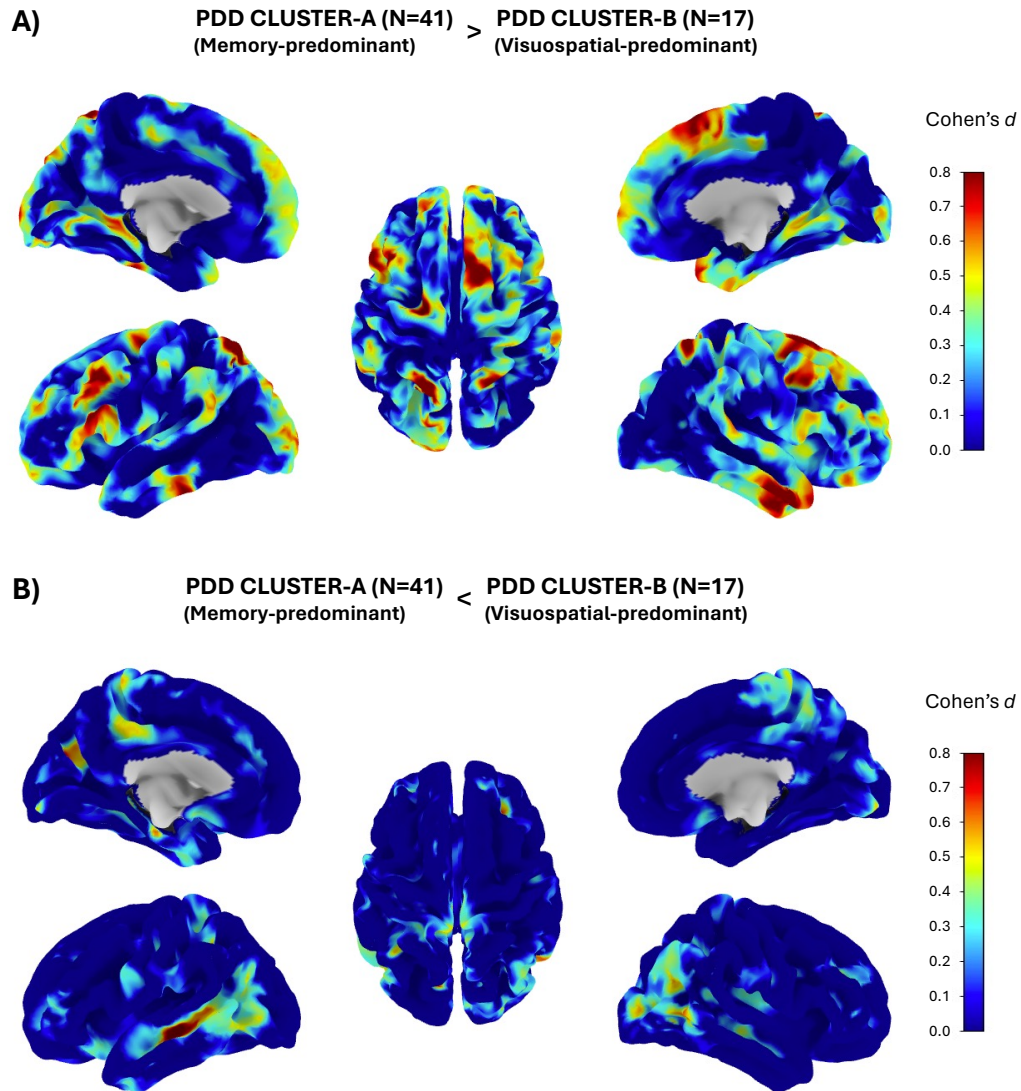
The descriptive values presented are numbers (percentages) of patients in each PDD cluster that have impaired cognition in the different cognitive tests. Individual test scores are classified as impaired if their w-score is greater than 1, meaning that they differ more than 1 standard deviation from the mean of healthy individuals, after adjusting for age, sex, and education (note that for each test score the w-scores have been calculated such that higher values always reflect lower performance compared to the healthy control group). A global chi-squared test showed a significantly different distribution of domain-specific cognitive impairments across the two PDD subgroups ($\chi^2=43.9$, $p<0.001$). Statistical values in the Table correspond to odds ratios (OR) and p-values from pair-wise Fisher's exact tests for each cognitive test, and significant differences between PDD subgroups are highlighted in bold font. ***Note:** the OR is infinite due to the absence of events in one group, which prevents the calculation of a finite upper limit for the OR value.

Supplementary Figure 2. Brain-wide MRI atrophy patterns of PDD subtypes.



The figure depicts effect sizes for complementary voxel-wise comparisons between PDD clusters and healthy controls. Both PDD clusters showed similar patterns of temporo-parietal and frontal atrophy compared to healthy controls, which was slightly more pronounced in the visuospatial-predominant cluster-B. Vertical line in colorbar denotes the effect size corresponding to a statistical threshold of FDR-corrected $p < 0.05$.

Supplementary Figure 3. Effect size maps of voxel-wise differences between PDD subtypes.



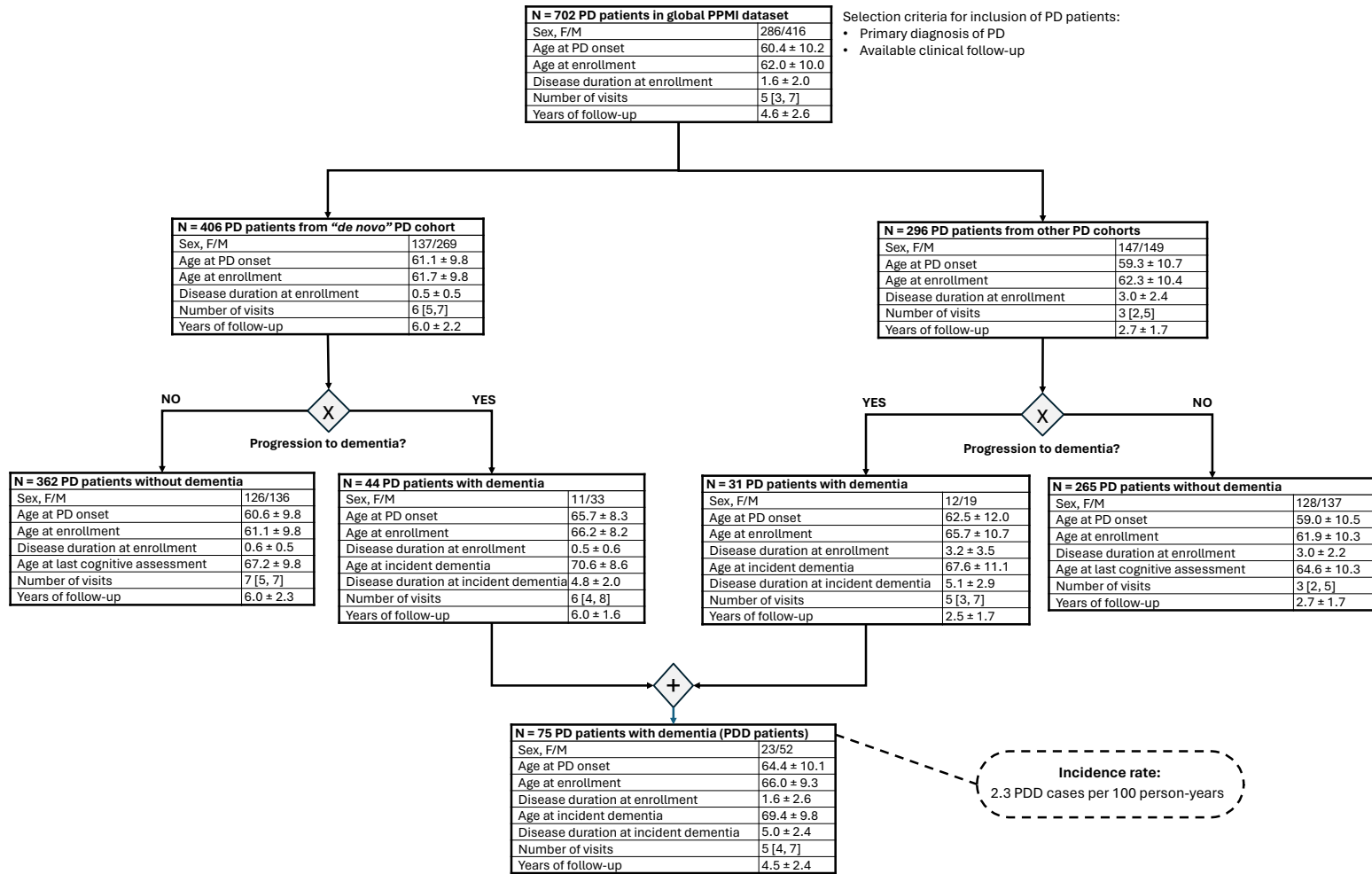
The figure depicts effect sizes for direct voxel-wise comparisons between the memory-predominant (cluster-A) and visuospatial-predominant (cluster-B) PDD subtypes. Note that none of these voxel-wise differences between the two groups reached statistical significance ($p < 0.05$, FDR-corrected).

Supplementary Table 2. Neuropsychological profile of GBA-carriers and -noncarriers within the visuospatial-predominant PDD subtype (Cluster-B).

Visuospatial-predominant PDD subtype (Cluster-B, n=25)			
Cognitive test	GBA-noncarriers	GBA-carriers	Two-sample t-test
N	15	10	
MOCA	20 (5.2)	20.1 (4.8)	t = -0.05 (p = 0.96)
Delayed recall	5.5 (3.1)	7 (2.7)	t = -1.32 (p = 0.20)
Immediate recall	16.9 (6.5)	19.4 (3.8)	t = -1.23 (p = 0.23)
Judgment of Line Orientation	5.5 (2.5)	7.5 (2.3)	t = -2.09 (p = 0.05)
Letter number sequencing	5.3 (3.3)	5.2 (2.9)	t = 0.11 (p = 0.92)
Symbol Digit Modalities	15.3 (10.3)	14.7 (11.1)	t = 0.14 (p = 0.89)
Semantic Fluency	30.5 (12.7)	33.9 (8.6)	t = -0.79 (p = 0.44)
Hallucinations, No (%) / Yes (%)	7 (47%) / 8 (53%)	4 (40%) / 6 (60%)	OR=1.30 (p=0.99)

The descriptive values presented are mean (standard deviation) for numerical variables and counts (percentages) for categorical variables. Statistical values correspond to two-sample t tests. Abbreviations: OR = odds ratio.

Supplementary Figure 4. Flowchart of patient selection.



The descriptive values presented are number of patients for each sex; median (IQR) for number of visits; and mean ± standard deviation for all other continuous variables (disease duration and age are indicated in years).