

Table S1 Baseline demographic and clinical data of the PD patients

Parameters	Values
Age (years)	65 [26, 84]
>60 years	5.78±1.47
≤60 years	5.03±1.73
Gender (male)	148 (57.6)
BMI (kg/m ²)	24.16±3.26
Disease duration (years)	5 [0.2, 25]
Education level (years)	11 [0, 21]
H-Y stage	3 [1, 5]
UPDRS-III	39 [9, 89]
MoCA	24 [3, 30]
MMSE	25.63±4.73
Hcy (μmol/L)	16.55±8.29
Folate (ng/mL)	8.19±5.13
VitB12 (pg/mL)	453.65±326.82
Ferritin (ng/mL)	132.87±116.32
V3 width (mm)	5.55±1.61

Data are presented as mean ± standard deviation, median [IQR], or n (%). BMI, body mass index; H-Y, Hoehn and Yahr; Hcy, homocysteine; IQR, interquartile range; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; PD, Parkinson's disease; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.

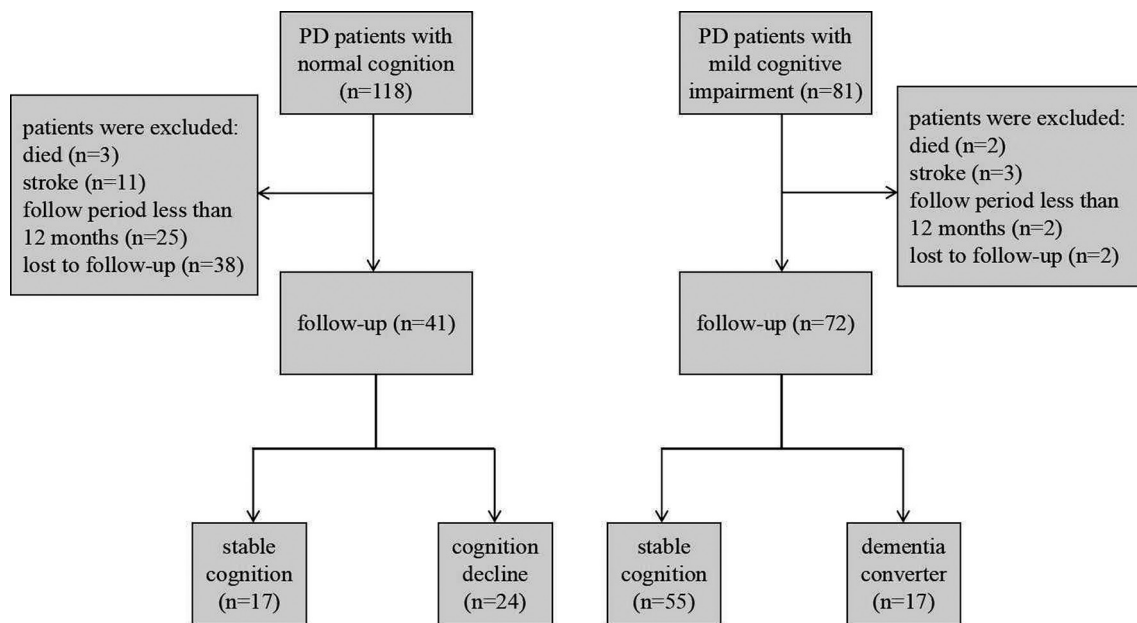


Figure S1 Patient selection flow diagram. PD, Parkinson's disease.

Table S2 Gender differences in each variable

Parameters	Gender		P value
	Male (n=148)	Female (n=109)	
Age (years)	65 [26, 84]	66 [30, 81]	0.288 ^b
BMI (kg/m ²)	24.48±3.06	23.95±3.46	0.238 ^a
Disease duration (years)	5 [0.2, 18]	5 [0.4, 20]	0.603 ^b
Education level (years)	12 [0, 21]	9 [0, 21]	0.072 ^b
H-Y stage	3 [1, 5]	3 [1, 5]	0.331 ^b
UPDRS-III	38.5 [9, 85]	39 [9, 89]	0.401 ^b
MoCA	25 [6, 30]	24 [3, 30]	0.431 ^b
MMSE	25.95±4.33	25.19±5.21	0.203 ^a
Hcy (μmol/L)	17.28±9.17	14.19±5.87	0.046 ^a
Folate (ng/mL)	7.80±5.28	8.79±4.57	0.127 ^a
VitB12 (pg/mL)	471.73±308.13	437.34±318.08	0.357 ^a
Ferritin (ng/mL)	150.42±129.51	115.69±85.23	0.002 ^a
V3 width (mm)	5.59±1.61	5.24±1.54	0.876 ^a

Data are presented as mean ± standard deviation, median [IQR], or n (%). ^a, unpaired independent *t*-test. ^b, Mann-Whitney *U* test. BMI, body mass index; H-Y, Hoehn and Yahr; Hcy, homocysteine; IQR, interquartile range; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.

Table S3 Spearman correlation analysis of age and disease duration and other variables

Parameters	Education level	H-Y stage	UPDRS-III	MoCA	Hcy	Folate	VitB12	Ferritin	V3 width
Age									
Correlation	-0.026	0.182	0.165	0.182	-0.001	-0.045	-0.005	0.025	0.230
P value	0.676	0.003	0.008	0.003	0.982	0.471	0.934	0.685	<0.001
Disease duration									
Correlation	-0.027	0.426	0.333	-0.188	0.217	0.022	-0.131	-0.049	0.201
P value	0.670	<0.001	<0.001	0.002	<0.001	0.727	0.036	0.432	0.001

H-Y, Hoehn and Yahr; Hcy, homocysteine; MoCA, Montreal Cognitive Assessment; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.

Table S4 Spearman partial correlation analysis after adjusted for age and disease duration

Parameters	H-Y stage	UPDRS-III	Hcy	MoCA	V3 width
H-Y stage					
Correlation		0.414	0.059	-0.306	0.290
P value		<0.001	0.346	<0.001	<0.001
UPDRS-III					
Correlation	0.414		0.154	-0.349	0.304
P value	<0.001		0.014	<0.001	<0.001
Hcy					
Correlation	0.059	0.154		-0.187	0.140
P value	0.346	0.014		0.013	0.026
MoCA					
Correlation	-0.306	-0.349	-0.187		-0.358
P value	<0.001	<0.001	0.013		<0.001
V3 width					
Correlation	0.290	0.304	0.140	-0.358	
P value	<0.001	<0.001	0.026	<0.001	

H-Y, Hoehn and Yahr; Hcy, homocysteine; MoCA, Montreal Cognitive Assessment; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle.

Table S5 Baseline demographic and clinical characteristics of PD patients with follow-up and those without follow-up

Parameters	PD follow-up (n=113)	PD without follow-up (n=144)	P value
Age (years)	66 [26, 84]	64.5 [30, 83]	0.418 ^c
Gender (male)	69 (61.1)	79 (54.9)	0.318 ^b
BMI (kg/m ²)	24.36±3.14	24.00±3.36	0.382 ^a
Disease duration (years)	5 [0.5, 20]	5 [0.2, 25]	0.210 ^c
Education level (years)	12 [0, 21]	12 [0, 21]	0.865 ^c
H-Y stage	2.5 [1, 5]	3 [1, 5]	0.008 ^c
UPDRS-III	33 [9, 85]	41 [9, 89]	0.001 ^c
MoCA	23 [8, 30]	26 [3, 30]	0.824 ^c
MMSE	26.99±2.57	24.56±5.68	<0.001 ^a
Hcy (μmol/L)	16.63±9.01	16.76±7.43	0.899 ^a
Folate (ng/mL)	8.58±5.45	7.85±4.84	0.263 ^a
VitB12 (pg/mL)	498.78±357.31	418.87±297.85	0.053 ^a
Ferritin (ng/mL)	151.45±139.49	118.55±92.68	0.025 ^a
V3 width (mm)	5.48±1.24	5.60±1.82	0.549 ^a

Data are presented as mean ± standard deviation, median [IQR], or n (%). ^a, unpaired independent *t*-test. ^b, χ^2 test. ^c, Mann-Whitney *U* test. BMI, body mass index; H-Y, Hoehn and Yahr; Hcy, homocysteine; IQR, interquartile range; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; PD, Parkinson's disease; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.

Table S6 Baseline demographic and clinical characteristics of normal cognition and cognition decline subgroups in PD-NC follow-up patients

Parameters	Normal cognition (n=17)	Cognition decline (n=24)	P value
Age (years)	64 [38, 79]	66 [43, 77]	0.615 ^c
Gender (male)	11 (64.7)	15 (62.5)	0.885 ^b
BMI (kg/m ²)	23.90±2.79	23.94±3.24	0.971 ^a
Disease duration (years)	6 [1, 12]	6 [1, 12]	0.622 ^c
Education level (years)	12 [6, 20]	12 [6, 19]	0.331 ^c
H-Y stage	2 [1, 3]	2 [1, 4]	0.470 ^c
UPDRS-III	25 [9, 57]	28 [9, 69]	0.128 ^c
MoCA	27 [26, 30]	27 [26, 30]	0.923 ^c
MMSE	29.18±0.88	28.83±1.37	0.363 ^a
Hcy (μmol/L)	13.11±2.62	14.80±3.54	0.104 ^a
Folate (ng/mL)	9.61±5.71	7.67±3.31	0.184 ^a
VitB12 (pg/mL)	571.37±350.51	427.09±328.59	0.195 ^a
Ferritin (ng/ml)	202.50±220.65	128.25±74.16	0.140 ^a
V3 width (mm)	4.40±0.64	5.91±0.71	<0.001 ^a

Data are presented as mean ± standard deviation, median [IQR], or n (%). ^a, unpaired independent *t*-test. ^b, χ^2 test. ^c, Mann-Whitney *U* test. BMI, body mass index; H-Y, Hoehn and Yahr; Hcy, homocysteine; IQR, interquartile range; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; PD-NC, Parkinson's disease with normal cognition; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.

Table S7 Baseline demographic and clinical characteristics of MCI stable and converter subgroups in PD-MCI follow-up patients

Parameters	MCI stable (n=55)	Dementia converter (n=17)	P value
Age (years)	66 [26, 84]	68 [52, 77]	0.493 ^c
Gender (male)	33 (60.0)	10 (58.8)	0.931 ^b
BMI (kg/m ²)	25.08±3.26	23.06±2.45	0.021 ^a
Disease duration (years)	5 [0.5, 16]	6 [0.9, 20]	0.199 ^c
Education level (years)	10.5 [0, 19]	12 [0, 21]	0.415 ^c
H-Y stage	3 [1, 5]	3 [1, 5]	0.125 ^c
UPDRS-III	38 [10,70]	37 [9, 85]	0.454 ^c
MoCA	21 [9, 26]	19 [8, 26]	0.278 ^c
MMSE	26.00±2.43	25.47±2.63	0.444 ^a
Hcy (μmol/L)	17.86±12.25	18.65±2.30	0.793 ^a
Folate (ng/mL)	8.94±6.22	7.71±4.97	0.463 ^a
VitB12 (pg/mL)	491.61±331.73	559.65±475.44	0.511 ^a
Ferritin (ng/mL)	144.73±132.64	153.12±124.72	0.813 ^a
V3 width (mm)	5.18±1.28	6.93±0.38	<0.001 ^a

Data are presented as mean ± standard deviation, median [IQR], or n (%). ^a, unpaired independent *t*-test. ^b, χ^2 test. ^c, Mann-Whitney *U* test. BMI, body mass index; H-Y, Hoehn and Yahr; Hcy, homocysteine; IQR, interquartile range; MCI, mild cognitive impairment; MMSE, Mini-Mental State Examination; MoCA, Montreal Cognitive Assessment; PD-MCI, Parkinson's disease with mild cognitive impairment; UPDRS-III, Unified Parkinson's Disease Rating Scale Part III; V3, third ventricle; VitB12, vitamin B12.