Supplementary Table S1. Descriptions of significantly different brain regions in dynamic Reho between PD and HC groups

Brain regions (AAL)	Peak MNI coordinates (mm)			Peak T value	Cluster size (mm^3)
	X	Y	Z		
PD > HC					
Right middle temporal gyrus	24	15	-36	7.11	77
Left rectus gyrus	-12	18	-27	6.39	354
Left middle temporal gyrus	-60	9	-18	7.52	99
Left middle occipital gyrus	-39	-69	24	5.58	79
Left precuneus	0	-57	36	5.36	156
PD < HC					
Left putamen	-21	15	3	-5.34	191
Right putamen	27	9	3	−5.43	132
Right supplementary motor area	6	-3	60	-5.32	59

These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of P = 0.001 and a corrected cluster significance of $P < 0.05$).

Abbreviations: Reho, regional homogeneity; AAL, automated anatomical labeling; MNI, Montreal Neurological Institute; PD, Parkinson's disease; HC, healthy control

Supplementary Table S2. Descriptions of statistically different brain regions in static Reho between PD and HC groups

Brain regions (AAL)	Peak MNI coordinates (mm)			Peak T value	Cluster size (mm^3)
	X	Y	Z		
PD > HC					
Right inferior temporal gyrus	-15	21	-27	6.66	1267
Left superior frontal gyrus	6	42	-3	4.15	96
PD < HC					
Bilateral lingual gyrus	-12	-63	-9	-6.34	1384
Right postcentral gyrus	66	-6	18	-4.93	186
Left postcentral gyrus	-45	-18	39	-5.36	236

These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of P = 0.001 and a corrected cluster significance of $P < 0.05$).

Abbreviations: Reho, regional homogeneity; AAL, automated anatomical labeling; MNI, Montreal Neurological Institute; PD, Parkinson's disease; HC, healthy control

Supplementary Table S3. Automated anatomical labeling information for region-based neurovascular coupling analysis

Labels	Regions
17	Left rolandic operculum
18	Right rolandic operculum
20	Right supplementary motor area
43	Left calcarine fissure
44	Right calcarine fissure
47	Left lingual gyrus
48	Right lingual gyrus
51	Left middle occipital gyrus
53	Left inferior occipital gyrus
57	Left postcentral gyrus
71	Left caudate nucleus
72	Right caudate nucleus
73	Left putamen
74	Right putamen
77	Left thalamus
79	Left heschl gyrus
80	Right heschl gyrus
81	Left superior temporal gyrus
82	Right superior temporal gyrus
85	Left middle temporal gyrus
88	Right temporal pole: middle temporal gyrus

Supplementary Table S4. Descriptions of statistically different brain regions in CBF/dReho ratio between PD and HC groups

Brain regions (AAL)	Peak MNI coordinates (mm)			Peak T value	Cluster size (mm^3)
	X	Y	Z		
PD > HC					
Right putamen	36	-9	12	6.47	650
Left putamen	-24	18	3	6.44	637
Left postcentral gyrus	-57	-15	21	4.88	196
Right supplementary motor area	9	-3	57	5.57	105
Left paracentral lobule	-3	-27	69	4.41	82
Right postcentral gyrus	66	-6	18	4.78	52
PD < HC					
Bilateral precuneus	0	-66	33	-6.09	419
Left middle temporal gyrus	-66	-24	-9	−5.43	169
Left superior temporal gyrus	-21	9	-27	-5.44	141
Left angular gyrus	-39	-66	27	-5.49	133
Right angular gyrus	45	-66	30	-5.31	93

These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of P = 0.001 and a corrected cluster significance of $P < 0.05$).

Abbreviations: CBF, cerebral blood flow; dReho, dynamic regional homogeneity; AAL, automated anatomical labeling; MNI, Montreal Neurological Institute; PD, Parkinson's disease; HC, healthy control

Supplementary Table S5. Descriptions of statistically different brain regions in CBF/sReho ratio between PD and HC groups

Brain regions (AAL)	Peak MNI coordinates (mm)			Peak T value	Cluster size (mm³)
	X	Y	Z		
PD > HC					
Left lingual gyrus	-21	-51	-9	5.56	251
Right lingual gyrus	15	-54	-6	5.37	441
Right putamen	18	-18	12	5.87	420
Left putamen	-24	24	-9	5.43	393
Left postcentral gyrus	-45	-18	39	6.69	726
Right postcentral gyrus	45	-18	36	5.95	357
Right supplementary motor area	-6	-27	66	5.02	259
PD < HC					
Left superior temporal gyrus	-21	3	-24	-5.87	610
Left middle temporal gyrus	-66	-39	-15	−5.40	194
Right middle temporal gyrus	63	-42	-9	-5.54	111
Left angular gyrus	-39	-69	30	-4.54	68

These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of $P = 0.001$ and a corrected cluster significance of $P < 0.05$).

Abbreviations: CBF, cerebral blood flow; sReho, static regional homogeneity; AAL, automated anatomical labeling; MNI, Montreal Neurological Institute; PD, Parkinson's disease; HC, healthy control

Supplementary Table S6. Descriptions of statistically different brain regions in CBF between PD and HC groups

Brain regions	Peak MNI coordinates (mm)			Peak T value	Cluster size (mm^3)
	X	Y	Z		
PD > HC					
Right putamen	33	-3	6	4.94	320
Left postcentral gyrus	-57	-15	21	5.86	509
Right thalamus	15	-18	9	7.12	91
Left paracentral lobule/ Right supplementary motor area	-3	-27	66	5.45	223
PD < HC					
Right insula	48	12	-6	-5.25	151
Left superior frontal gyrus	0	60	-6	−5.16	201
Left superior temporal gyrus	-39	21	-21	-5.20	114

These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of P = 0.001 and a corrected cluster significance of $P < 0.05$).

Abbreviations: CBF, cerebral blood flow; AAL, automated anatomical labeling; MNI, Montreal Neurological Institute; PD, Parkinson's disease; HC, healthy control
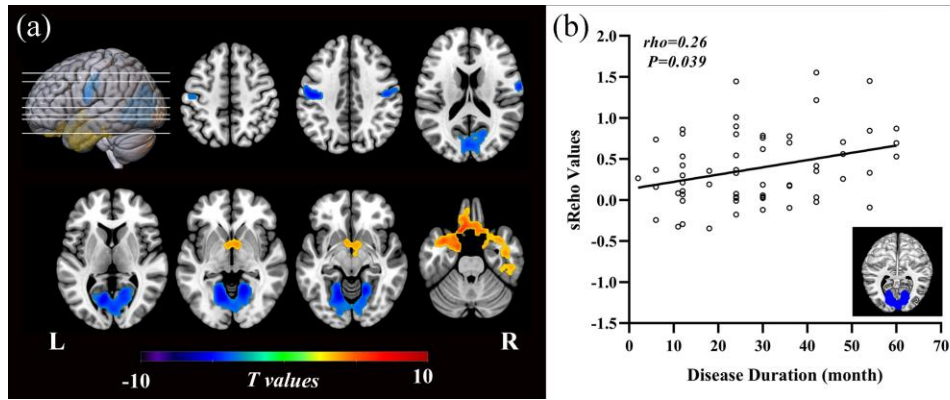
Supplementary Figure S1: The distribution of brain regions with significant intergroup differences in static ReHo and correlations to clinical assessments. Voxel-based analysis demonstrates the survived clusters between PD and HC groups (a). These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of $P = 0.001$ and a corrected cluster significance of $P < 0.05$). Significantly increased value in the group is shown with warm color, while significantly decreased value in the group is shown with cold color. For PD group: correlations (b) between the disease duration (X-axis) and dReHo values in right putamen (Y-axis).
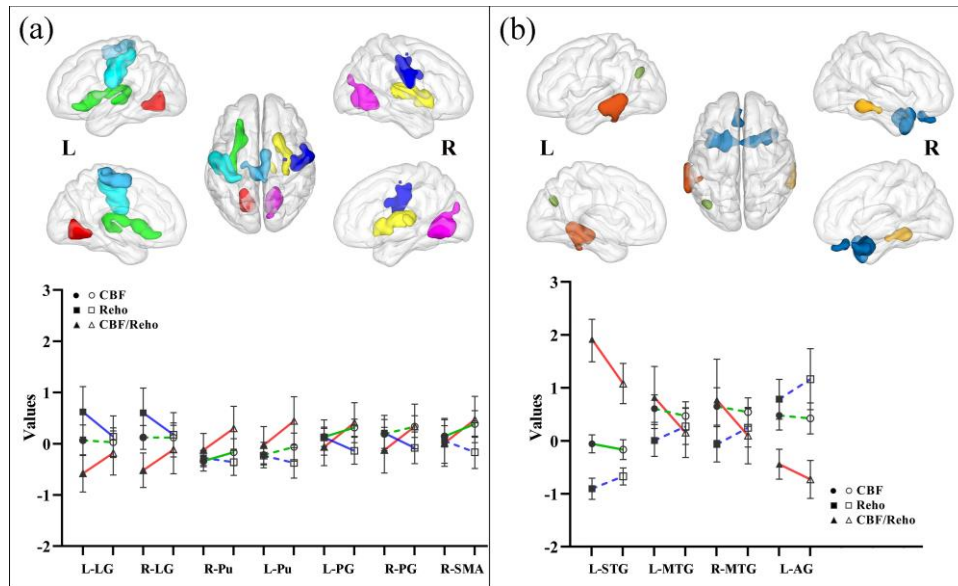
Abbreviations: sReHo, static regional homogeneity; PD, Parkinson disease; HC, healthy control; FWE, familywise error; R, right; L, left
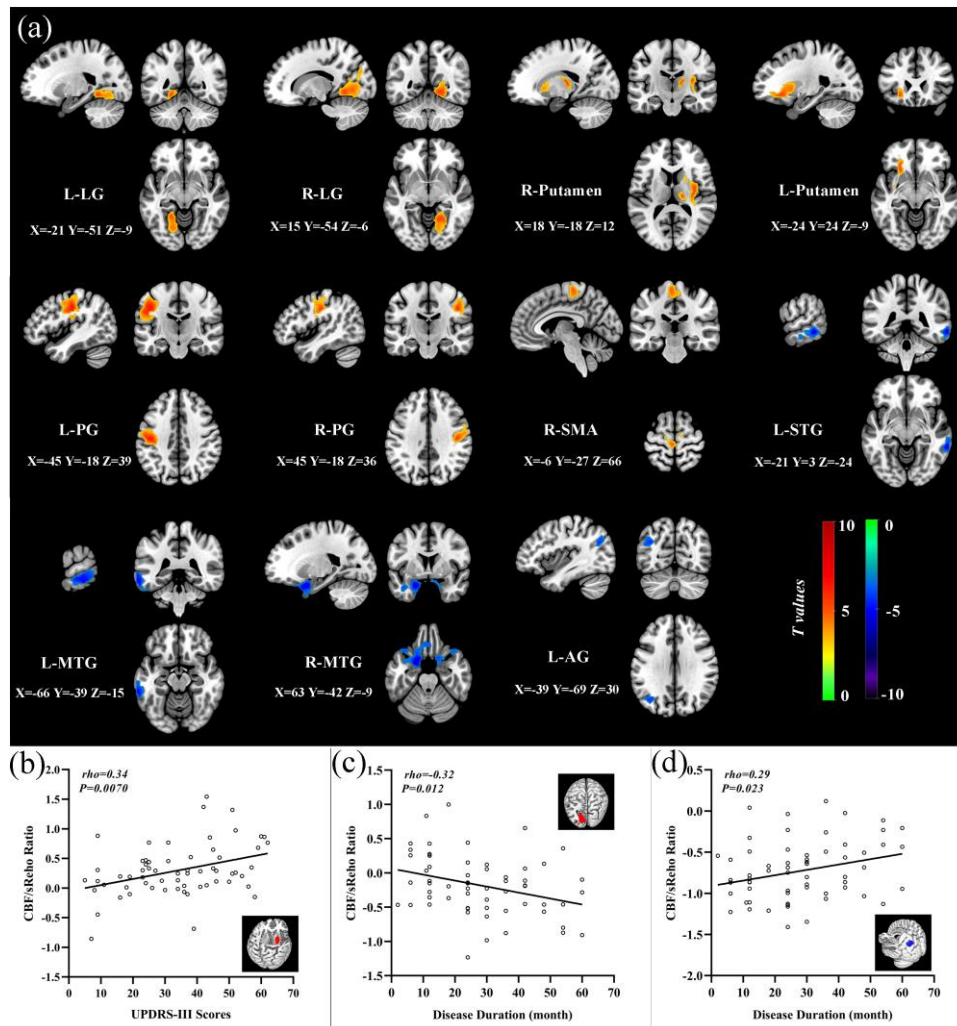
Supplementary Figure S2: The distribution of brain regions with significant intergroup differences in CBF/sReHo ratio and correlations to clinical assessments. Voxel-based analysis demonstrates the survived clusters between PD and HC groups (a). These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of $P = 0.001$ and a corrected cluster significance of $P < 0.05$). Significantly increased value in the group is shown with warm color, while significantly decreased value in the group is shown with cold color. For PD group: correlations (b) between the scores of UPDRS-III (X-axis) and CBF/sReHo ratio in right putamen (Y-axis); correlations (c) between the disease duration (X-axis) and CBF/sReHo ratio in left LG (Y-axis); correlations (d) between the disease duration (X-axis) and CBF/sReHo ratio in left AG (Y-axis).

Abbreviations: sReHo, static regional homogeneity; PD, Parkinson disease; HC, healthy control; FWE, familywise error; R, right; L, left; LG, lingual gyrus; PG, postcentral gyrus; SMA, supplementary motor area; STG, superior temporal gyrus; MTG, middle temporal gyrus; AG, angular gyrus

Supplementary Figure S3. The trend of brain regions with significant intergroup differences in CBF/sReHo ratio. In the voxel-based analyses of PD and HC groups, the CBF/sReHo ratio in regions of significant increased (a) and in regions of significant increased (b). The solid symbol refers to HC group, whereas blank symbol refers to PD group. Solid line indicates significant intergroup differences, whereas dotted line indicates non-significant differences.

Abbreviations: sReHo, static regional homogeneity; CBF, cerebral blood flow; PD, Parkinson disease; HC, healthy control; R, right; L, left; LG, lingual gyrus; Pu, putamen; PG, postcentral gyrus; SMA, supplementary motor area; STG, superior temporal gyrus; MTG, middle temporal gyrus; AG, angular gyrus
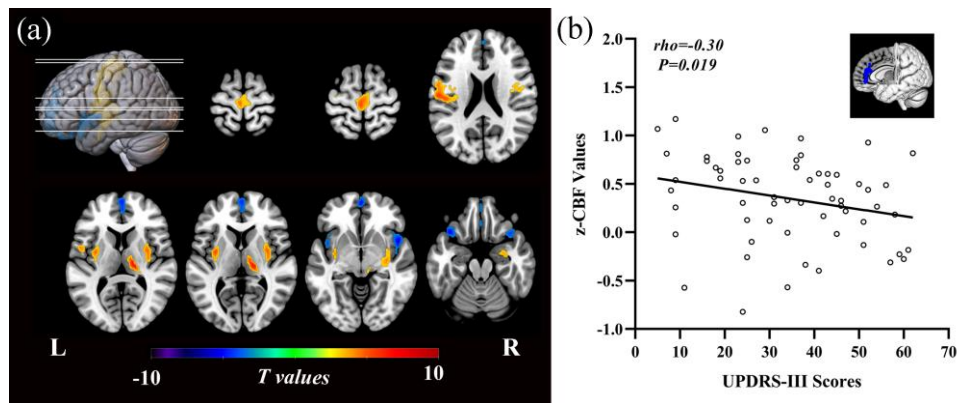
Supplementary Figure S4: The distribution of brain regions with significant intergroup differences in CBF and correlations to clinical assessments. Voxel-based analysis demonstrates the survived clusters between PD and HC groups (a). These clusters are referred to multiple comparisons correction using the FWE rate (a cluster-defining threshold of $P = 0.001$ and a corrected cluster significance of $P < 0.05$). Significantly increased in the group is shown with warm color, while significantly decreased in the group is shown with cold color. For PD group: correlations (b) between the scores of UPDRS-III (X-axis) and z-CBF values in left superior frontal gyrus (Y-axis).

Abbreviations: sReHo, static regional homogeneity; PD, Parkinson disease; HC, healthy control; FWE, familywise error; R, right; L, left