Supplementary material

Table S1. Structural integrity of subcortical structures in patients with post-COVID fatigue compared to matched healthy controls. (AD: axial diffusivity, FA: fractional anisotropy, MD: mean diffusivity, RD: radial diffusivity, BH: Benjamini-Hochberg, * p(BH-adjusted) < 0.05)

Structure	Hemisphere	Marker	Hedges' g	Paired t(df)	p	p (BH-adjusted)
Accumbens	left	Volume	-0.25, [-0.55, 0.04]	t(44) = -1.74	0.089	0.26
		FA	0.06, [-0.23, 0.35]	t(44) = 0.43	0.67	0.84
		MD	-0.24, [-0.54, 0.05]	t(44) = -1.67	0.1	0.26
		AD	0.03, [-0.26, 0.32]	t(43) = 0.20	0.84	0.84
		RD	-0.17, [-0.46, 0.12]	t(44) = -1.17	0.25	0.42
	right	Volume	-0.24, [-0.53, 0.06]	t(44) = -1.61	0.11	0.47
		FA	0.03, [-0.26, 0.33]	t(44) = 0.24	0.81	0.81
		MD	-0.16, [-0.45, 0.14]	t(44) = -1.06	0.29	0.49
		AD	0.1, [-0.2, 0.4]	t(41) = 0.63	0.53	0.66
		RD	-0.2, [-0.49, 0.1]	t(44) = -1.34	0.19	0.47
Caudate	left	Volume	-0.2, [-0.5, 0.09]	t(43) = -1.36	0.18	0.54
		FA	0.12, [-0.17, 0.41]	t(44) = 0.80	0.43	0.54
		MD	-0.07, [-0.36, 0.22]	t(44) = -0.50	0.62	0.62
		AD	-0.14, [-0.43, 0.15]	t(44) = -0.95	0.35	0.54
		RD	-0.16, [-0.45, 0.13]	t(44) = -1.08	0.28	0.54
	right	Volume	-0.02, [-0.31, 0.27]	t(45) = -0.15	0.88	0.88
		FA	0.05, [-0.25, 0.34]	t(43) = 0.31	0.76	0.88
		MD	-0.1, [-0.41, 0.21]	t(38) = -0.63	0.53	0.88
		AD	-0.07, [-0.37, 0.23]	t(42) = -0.47	0.64	0.88
		RD	-0.28, [-0.6, 0.03]	t(39) = -1.81	0.079	0.39
Pallidum	left	Volume	0.04, [-0.26, 0.34]	t(41) = 0.24	0.81	0.85
		FA	0.03, [-0.27, 0.33]	t(42) = 0.19	0.85	0.85
		MD	0.18, [-0.11, 0.48]	t(44) = 1.25	0.22	0.44
		AD	-0.17, [-0.47, 0.13]	t(42) = -1.13	0.27	0.44
		RD	0.19, [-0.1, 0.48]	t(44) = 1.29	0.2	0.44
	right	Volume	0.01, [-0.29, 0.31]	t(42) = 0.08	0.94	0.94
		FA	-0.42, [-0.74, -0.11]	t(40) = -2.76	0.0086	0.043 *

		MD	0.07, [-0.22, 0.36]	t(44) = 0.48	0.63	0.94
		AD	-0.02, [-0.31, 0.28]	t(42) = -0.11	0.91	0.94
		RD	0.2, [-0.09, 0.5]	t(44) = 1.39	0.17	0.43
Putamen	left	Volume	-0.4, [-0.7, -0.1]	t(44) = -2.70	0.0097	0.049 *
		FA	0.07, [-0.22, 0.36]	t(44) = 0.47	0.64	0.89
		MD	-0.02, [-0.32, 0.28]	t(42) = -0.14	0.89	0.89
		AD	0.03, [-0.3, 0.35]	t(35) = 0.16	0.87	0.89
		RD	0.05, [-0.26, 0.36]	t(39) = 0.30	0.76	0.89
	right	Volume	-0.32, [-0.62, -0.02]	t(44) = -2.17	0.035	0.18
		FA	-0.18, [-0.48, 0.11]	t(44) = -1.26	0.22	0.27
		MD	0.2, [-0.1, 0.49]	t(44) = 1.34	0.19	0.27
		AD	0.17, [-0.15, 0.5]	t(36) = 1.07	0.29	0.29
		RD	0.22, [-0.07, 0.52]	t(44) = 1.50	0.14	0.27
Thalamus	left	Volume	-0.32, [-0.62, -0.02]	t(44) = -2.16	0.036	0.09
		FA	0.55, [0.2, 0.91]	t(34) = 3.32	0.0022	0.011 *
		MD	0.17, [-0.12, 0.47]	t(44) = 1.19	0.24	0.40
		AD	-0.06, [-0.35, 0.23]	t(44) = -0.39	0.70	0.80
		RD	0.04, [-0.25, 0.33]	t(44) = 0.25	0.80	0.80
	right	Volume	-0.22, [-0.52, 0.07]	t(45) = -1.54	0.13	0.33
		FA	-0.28, [-0.6, 0.03]	t(38) = -1.81	0.078	0.33
		MD	-0.06, [-0.35, 0.23]	t(44) = -0.43	0.67	0.83
		AD	0, [-0.29, 0.29]	t(44) = 0.03	0.98	0.98
		RD	-0.1, [-0.41, 0.2]	t(40) = -0.67	0.50	0.83

Table S2. Structural integrity of subcortical structures in MS patients with fatigue compared to matched healthy controls. (AD: axial diffusivity, FA: fractional anisotropy, MD: mean diffusivity, RD: radial diffusivity, * p(BH-adjusted) < 0.05, ** p(BH-adjusted) < 0.01, *** p(BH-adjusted) < 0.001)

Structure	Hemisphere	Marker	Hedges' g	Paired t(df)	p	p (BH-adjusted)
Accumbens	left	Volume	-0.69, [-1.02, -0.37]	t(44) = -4.70	< 0.0001	0.00013 ***
		FA	0.06, [-0.23, 0.35]	t(45) = 0.40	0.69	0.69
		MD	-0.46, [-0.77, -0.15]	t(44) = -3.12	0.0032	0.0081 **
		AD	-0.27, [-0.57, 0.02]	t(45) = -1.89	0.066	0.082
		RD	-0.38, [-0.69, -0.08]	t(43) = -2.57	0.014	0.023 *
	right	Volume	-1.06, [-1.44, -0.69]	t(42) = -7.07	< 0.0001	< 0.0001 ***
		FA	-0.02, [-0.31, 0.27]	t(44) = -0.16	0.87	0.87
		MD	-0.05, [-0.34, 0.24]	t(43) = -0.33	0.74	0.87
		AD	-0.09, [-0.39, 0.21]	t(42) = -0.60	0.55	0.87
		RD	-0.14, [-0.44, 0.15]	t(43) = -0.97	0.34	0.85
Caudate	left	Volume	-0.74, [-1.09, -0.4]	t(40) = -4.85	< 0.0001	< 0.0001 ***
		FA	-0.62, [-0.95, -0.3]	t(43) = -4.19	0.00014	0.00017 ***
		MD	0.91, [0.56, 1.26]	t(44) = 6.18	< 0.0001	< 0.0001 ***
		AD	-0.6, [-0.92, -0.29]	t(44) = -4.08	0.00019	0.00019 ***
		RD	0.82, [0.49, 1.16]	t(44) = 5.58	< 0.0001	< 0.0001 ***
	right	Volume	-0.29, [-0.58, 0.01]	t(45) = -1.98	0.054	0.054
		FA	-0.49, [-0.81, -0.18]	t(42) = -3.25	0.0023	0.0028 **
		MD	0.77, [0.41, 1.13]	t(37) = 4.82	< 0.0001	0.00012 ***
		AD	0.58, [0.26, 0.9]	t(42) = 3.84	0.00041	0.001 **
		RD	0.57, [0.22, 0.92]	t(35) = 3.48	0.0014	0.0023 **
Pallidum	left	Volume	-0.46, [-0.78, -0.14]	t(40) = -2.99	0.0047	0.0059 **
		FA	-1.22, [-1.64, -0.83]	t(41) = -8.08	< 0.0001	< 0.0001 ***
		MD	-0.95, [-1.31, -0.6]	t(43) = -6.39	< 0.0001	< 0.0001 ***
		AD	-3.16, [-3.93, -2.44]	t(42) = -21.07	< 0.0001	< 0.0001 ***
		RD	0.11, [-0.19, 0.4]	t(43) = 0.72	0.47	0.47
	right	Volume	-0.18, [-0.48, 0.12]	t(42) = -1.22	0.23	0.23
		FA	-1.07, [-1.46, -0.7]	t(41) = -7.05	< 0.0001	< 0.0001 ***
		MD	-1.04, [-1.41, -0.68]	t(44) = -7.10	< 0.0001	< 0.0001 ***
		AD	-1.92, [-2.44, -1.43]	t(43) = -12.93	< 0.0001	< 0.0001 ***
		RD	-0.36, [-0.66, -0.06]	t(45) = -2.48	0.017	0.021 *

Putamen	left	Volume	-1.03, [-1.41, -0.67]	t(43) = -6.98	< 0.0001	< 0.0001 ***
		FA	-1.23, [-1.63, -0.85]	t(44) = -8.38	< 0.0001	< 0.0001 ***
		MD	0.4, [0.1, 0.71]	t(43) = 2.71	0.0096	0.0096 **
		AD	-2.42, [-3.08, -1.81]	t(37) = -15.21	< 0.0001	< 0.0001 ***
		RD	1.63, [1.18, 2.1]	t(42) = 10.87	< 0.0001	< 0.0001 ***
	left	Volume	-0.78, [-1.12, -0.45]	t(44) = -5.31	< 0.0001	< 0.0001 ***
		FA	-1.23, [-1.63, -0.86]	t(45) = -8.51	< 0.0001	< 0.0001 ***
		MD	0.34, [0.05, 0.64]	t(45) = 2.38	0.022	0.022 *
		AD	-0.54, [-0.88, -0.2]	t(37) = -3.37	0.0018	0.0022 **
		RD	0.67, [0.36, 0.99]	t(45) = 4.63	< 0.0001	< 0.0001 ***
Thalamus	left	Volume	-1.04, [-1.41, -0.69]	t(46) = -7.27	< 0.0001	< 0.0001 ***
		FA	0.66, [0.3, 1.02]	t(35) = 4.04	0.00028	0.00047 ***
		MD	-0.09, [-0.38, 0.2]	t(44) = -0.63	0.53	0.53
		AD	-1.33, [-1.75, -0.93]	t(43) = -8.99	< 0.0001	< 0.0001 ***
		RD	0.13, [-0.16, 0.42]	t(44) = 0.88	0.38	0.48
	right	Volume	-1.06, [-1.44, -0.7]	t(44) = -7.25	< 0.0001	< 0.0001 ***
		FA	0.54, [0.21, 0.88]	t(38) = 3.42	0.0015	0.0019 **
		MD	-1.16, [-1.55, -0.79]	t(43) = -7.84	< 0.0001	< 0.0001 ***
		AD	-0.28, [-0.58, 0.02]	t(42) = -1.85	0.072	0.072
		RD	-1.45, [-1.9, -1.03]	t(41) = -9.57	< 0.0001	< 0.0001 ***

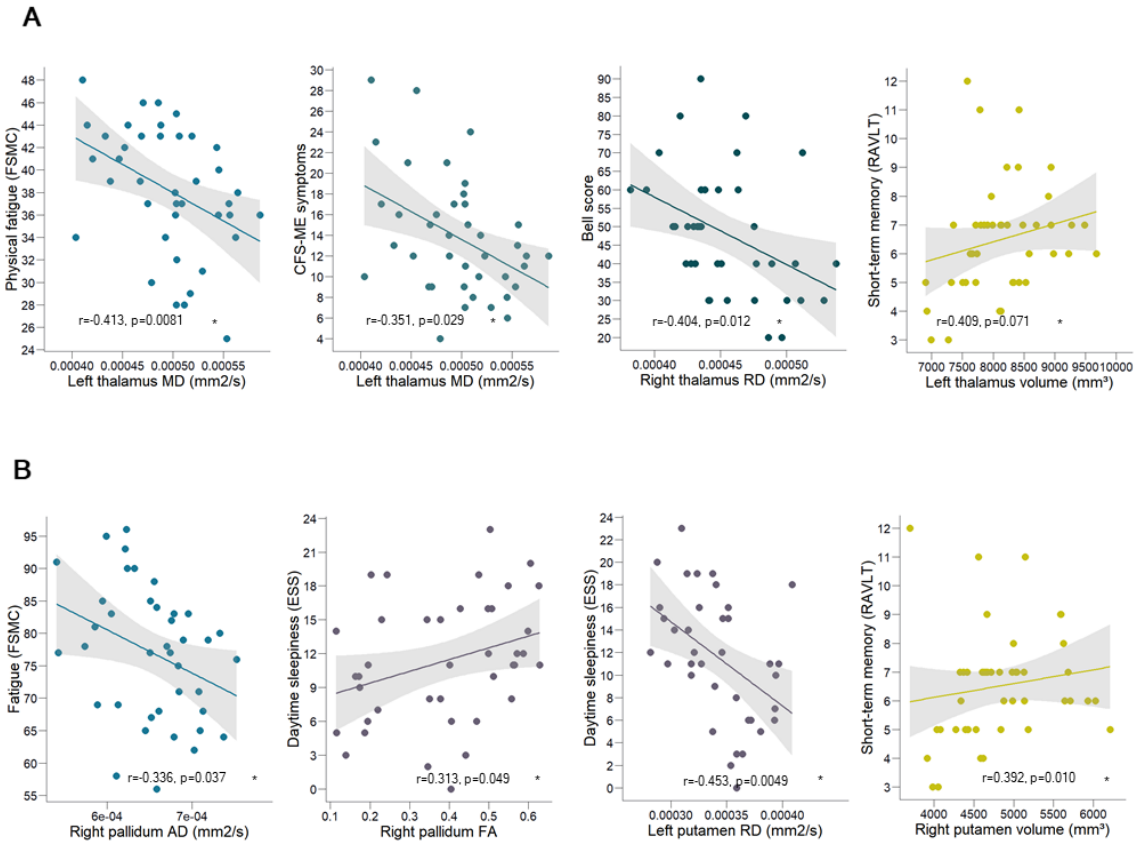

Figure S1. Correlation plots with 95% confidence interval. **A**. Lower thalamic volumes and altered diffusion characteristics were associated with fatigue severity and short-term memory performance. **B**. Diffusion parameters and volume of basal ganglia was related to worse memory performance, fatigue symptoms, and daytime sleepiness. **Abbreviations**: AD: axial diffusivity, CFS-ME: chronic fatigue syndrome/myalgic encephalomyelitis – consensus criteria symptom count, ESS: Epworth Sleepiness Scale, FA: fractional anisotropy, FSMC: Fatigue Scale for Motor and Cognitive Function, IQR: interquartile range, MD: mean diffusivity, RAVLT: Rey Auditory Verbal Learning Test, RD: radial diffusivity.