

Supplementary Data and Results (All Roads Lead to Rome: Resting-State Criticality as a Neurophysiological Marker of Brain-Computer Interface (BCI) Performance in People with Amyotrophic Lateral Sclerosis (ALS) and Healthy Participants)

Table S 1: **Correlation analysis (Spearman's rank correlation) of all resting-state neurophysiological markers of criticality and subsequent BCI performance (person in locked-in state after disease history with ALS, Dataset 1)**

Variable1	Variable2	Spearman_Rho	p_Value	CI_lower	CI_upper
MSCr_Sigma_B	MSCr_Sigma_A	-0.9	<0.001	-0.98	-0.62
MSCr_Sigma_B	Tau	0.73	0.016	0.17	0.94
MSCr_Sigma_B	Alpha	0.68	0.029	0.08	0.92
MSCr_Sigma_B	PLE_mean	-0.67	0.033	-0.92	-0.05
MSCr_Sigma_B	LZC_CV	-0.65	0.043	-0.91	-0.01
MSCr_Sigma_B	Sigma	0.64	0.048	-0.01	0.91
MSCr_Sigma_B	MSCr_Alpha_B	0.62	0.054	-0.03	0.9
MSCr_Sigma_B	RelDeltaPwr	-0.62	0.054	-0.9	0.03
MSCr_Sigma_B	LZC_mean	0.62	0.054	-0.03	0.9
MSCr_Sigma_B	spSlopeExp_mean	-0.55	0.098	-0.88	0.14
MSCr_Sigma_B	PLE_CV	0.43	0.214	-0.29	0.84
MSCr_Sigma_B	MSCr_Alpha_A	-0.39	0.26	-0.83	0.33
MSCr_Sigma_B	BCI_Online_Accuracy_mean	-0.38	0.281	-0.82	0.35
MSCr_Sigma_B	spSlopeExp_CV	0.36	0.31	-0.37	0.81
MSCr_Sigma_B	spSlopeOffs_mean	-0.33	0.347	-0.8	0.39
MSCr_Sigma_B	AbsDeltaPwr	-0.21	0.556	-0.75	0.5
MSCr_Sigma_B	BCI_Online_Accuracy_CV	-0.01	0.973	-0.65	0.64
MSCr_Sigma_A	RelDeltaPwr	0.56	0.09	-0.12	0.89
MSCr_Sigma_A	LZC_CV	0.56	0.09	-0.12	0.89
MSCr_Sigma_A	PLE_mean	0.54	0.108	-0.16	0.88
MSCr_Sigma_A	MSCr_Alpha_B	-0.52	0.128	-0.87	0.19
MSCr_Sigma_A	Alpha	-0.49	0.15	-0.86	0.22
MSCr_Sigma_A	LZC_mean	-0.44	0.2	-0.84	0.28
MSCr_Sigma_A	Tau	-0.41	0.244	-0.83	0.32
MSCr_Sigma_A	spSlopeExp_mean	0.41	0.244	-0.32	0.83
MSCr_Sigma_A	Sigma	-0.37	0.293	-0.82	0.36
MSCr_Sigma_A	MSCr_Alpha_A	0.36	0.31	-0.37	0.81
MSCr_Sigma_A	spSlopeOffs_mean	0.24	0.511	-0.48	0.76
MSCr_Sigma_A	PLE_CV	-0.22	0.533	-0.76	0.49
MSCr_Sigma_A	BCI_Online_Accuracy_mean	0.22	0.542	-0.49	0.76
MSCr_Sigma_A	AbsDeltaPwr	0.16	0.651	-0.54	0.73
MSCr_Sigma_A	spSlopeExp_CV	-0.16	0.651	-0.73	0.54
MSCr_Sigma_A	BCI_Online_Accuracy_CV	-0.16	0.658	-0.73	0.54
MSCr_Alpha_B	Sigma	0.9	<0.001	0.62	0.98
MSCr_Alpha_B	MSCr_Alpha_A	-0.89	0.001	-0.98	-0.58
MSCr_Alpha_B	PLE_mean	-0.81	0.005	-0.95	-0.34

MSCr_Alpha_B	BCI_Online_Accuracy_mean	-0.76	0.01	-0.94	-0.23
MSCr_Alpha_B	spSlopeExp_mean	-0.75	0.013	-0.94	-0.2
MSCr_Alpha_B	LZC_mean	0.67	0.033	0.05	0.92
MSCr_Alpha_B	RelDeltaPwr	-0.64	0.048	-0.91	0.01
MSCr_Alpha_B	Alpha	0.62	0.054	-0.03	0.9
MSCr_Alpha_B	PLE_CV	0.62	0.054	-0.03	0.9
MSCr_Alpha_B	spSlopeOffs_mean	-0.6	0.067	-0.9	0.07
MSCr_Alpha_B	AbsDeltaPwr	-0.55	0.098	-0.88	0.14
MSCr_Alpha_B	spSlopeExp_CV	0.55	0.098	-0.14	0.88
MSCr_Alpha_B	LZC_CV	-0.47	0.174	-0.85	0.25
MSCr_Alpha_B	Tau	0.39	0.26	-0.33	0.83
MSCr_Alpha_B	BCI_Online_Accuracy_CV	0.33	0.356	-0.4	0.8
MSCr_Alpha_A	Sigma	-0.77	0.009	-0.94	-0.25
MSCr_Alpha_A	PLE_mean	0.6	0.067	-0.07	0.9
MSCr_Alpha_A	BCI_Online_Accuracy_mean	0.58	0.079	-0.1	0.89
MSCr_Alpha_A	spSlopeExp_mean	0.53	0.117	-0.17	0.87
MSCr_Alpha_A	LZC_mean	-0.42	0.229	-0.84	0.31
MSCr_Alpha_A	RelDeltaPwr	0.36	0.31	-0.37	0.81
MSCr_Alpha_A	PLE_CV	-0.36	0.31	-0.81	0.37
MSCr_Alpha_A	spSlopeOffs_mean	0.35	0.328	-0.38	0.81
MSCr_Alpha_A	AbsDeltaPwr	0.33	0.347	-0.39	0.8
MSCr_Alpha_A	BCI_Online_Accuracy_CV	-0.33	0.356	-0.8	0.4
MSCr_Alpha_A	spSlopeExp_CV	-0.32	0.365	-0.8	0.41
MSCr_Alpha_A	Alpha	-0.3	0.405	-0.79	0.43
MSCr_Alpha_A	Tau	-0.14	0.701	-0.72	0.55
MSCr_Alpha_A	LZC_CV	0.08	0.829	-0.59	0.69
Sigma	PLE_mean	-0.77	0.009	-0.94	-0.25
Sigma	spSlopeExp_mean	-0.73	0.016	-0.94	-0.17
Sigma	LZC_mean	0.7	0.025	0.1	0.93
Sigma	BCI_Online_Accuracy_mean	-0.69	0.028	-0.92	-0.08
Sigma	PLE_CV	0.68	0.029	0.08	0.92
Sigma	Tau	0.67	0.033	0.05	0.92
Sigma	spSlopeExp_CV	0.62	0.054	-0.03	0.9
Sigma	Alpha	0.61	0.06	-0.05	0.9
Sigma	RelDeltaPwr	-0.55	0.098	-0.88	0.14
Sigma	spSlopeOffs_mean	-0.5	0.138	-0.87	0.21
Sigma	AbsDeltaPwr	-0.38	0.276	-0.82	0.35
Sigma	LZC_CV	-0.38	0.276	-0.82	0.35
Sigma	BCI_Online_Accuracy_CV	0.1	0.773	-0.58	0.7
Alpha	LZC_CV	-0.89	0.001	-0.98	-0.58
Alpha	LZC_mean	0.83	0.003	0.4	0.96

Alpha	PLE_mean	-0.79	0.006	-0.95	-0.31
Alpha	spSlopeOffs_mean	-0.78	0.008	-0.95	-0.28
Alpha	RelDeltaPwr	-0.76	0.011	-0.94	-0.22
Alpha	BCI_Online_Accuracy_mean	-0.76	0.011	-0.94	-0.22
Alpha	spSlopeExp_mean	-0.72	0.019	-0.93	-0.15
Alpha	AbsDeltaPwr	-0.71	0.022	-0.93	-0.12
Alpha	PLE_CV	0.66	0.038	0.03	0.91
Alpha	Tau	0.62	0.054	-0.03	0.9
Alpha	spSlopeExp_CV	0.59	0.074	-0.09	0.89
Alpha	BCI_Online_Accuracy_CV	-0.06	0.865	-0.68	0.6
Tau	LZC_mean	0.7	0.025	0.1	0.93
Tau	PLE_CV	0.62	0.054	-0.03	0.9
Tau	PLE_mean	-0.61	0.06	-0.9	0.05
Tau	spSlopeExp_CV	0.6	0.067	-0.07	0.9
Tau	spSlopeExp_mean	-0.59	0.074	-0.89	0.09
Tau	RelDeltaPwr	-0.53	0.117	-0.87	0.17
Tau	LZC_CV	-0.43	0.214	-0.84	0.29
Tau	BCI_Online_Accuracy_mean	-0.39	0.265	-0.83	0.34
Tau	spSlopeOffs_mean	-0.31	0.385	-0.79	0.42
Tau	BCI_Online_Accuracy_CV	-0.26	0.469	-0.77	0.46
Tau	AbsDeltaPwr	-0.1	0.777	-0.7	0.58
RelDeltaPwr	LZC_mean	-0.93	<0.001	-0.98	-0.7
RelDeltaPwr	PLE_mean	0.9	<0.001	0.62	0.98
RelDeltaPwr	spSlopeExp_mean	0.92	<0.001	0.66	0.98
RelDeltaPwr	spSlopeOffs_mean	0.82	0.004	0.37	0.96
RelDeltaPwr	PLE_CV	-0.79	0.006	-0.95	-0.31
RelDeltaPwr	spSlopeExp_CV	-0.77	0.009	-0.94	-0.25
RelDeltaPwr	BCI_Online_Accuracy_mean	0.74	0.015	0.18	0.94
RelDeltaPwr	AbsDeltaPwr	0.73	0.016	0.17	0.94
RelDeltaPwr	LZC_CV	0.65	0.043	0.01	0.91
RelDeltaPwr	BCI_Online_Accuracy_CV	-0.41	0.235	-0.83	0.31
AbsDeltaPwr	spSlopeOffs_mean	0.92	<0.001	0.66	0.98
AbsDeltaPwr	BCI_Online_Accuracy_mean	0.71	0.022	0.12	0.93
AbsDeltaPwr	LZC_mean	-0.65	0.043	-0.91	-0.01
AbsDeltaPwr	LZC_CV	0.62	0.054	-0.03	0.9
AbsDeltaPwr	spSlopeExp_mean	0.62	0.054	-0.03	0.9
AbsDeltaPwr	PLE_mean	0.61	0.06	-0.05	0.9
AbsDeltaPwr	PLE_CV	-0.49	0.15	-0.86	0.22
AbsDeltaPwr	spSlopeExp_CV	-0.44	0.2	-0.84	0.28

AbsDeltaPwr	BCI_Online_Accuracy_CV	-0.28	0.426	-0.78	0.44
LZC_mean	PLE_mean	-0.96	<0.001	-0.99	-0.84
LZC_mean	spSlopeExp_mean	-0.96	<0.001	-0.99	-0.84
LZC_mean	PLE_CV	0.89	0.001	0.58	0.98
LZC_mean	spSlopeExp_CV	0.88	0.001	0.54	0.97
LZC_mean	BCI_Online_Accuracy_mean	-0.82	0.003	-0.96	-0.38
LZC_mean	spSlopeOffs_mean	-0.81	0.005	-0.95	-0.34
LZC_mean	LZC_CV	-0.61	0.06	-0.9	0.05
LZC_mean	BCI_Online_Accuracy_CV	0.2	0.572	-0.51	0.75
LZC_CV	spSlopeOffs_mean	0.68	0.029	0.08	0.92
LZC_CV	PLE_mean	0.6	0.067	-0.07	0.9
LZC_CV	spSlopeExp_mean	0.53	0.117	-0.17	0.87
LZC_CV	BCI_Online_Accuracy_mean	0.52	0.125	-0.19	0.87
LZC_CV	PLE_CV	-0.48	0.162	-0.86	0.24
LZC_CV	spSlopeExp_CV	-0.38	0.276	-0.82	0.35
LZC_CV	BCI_Online_Accuracy_CV	-0.01	0.986	-0.65	0.64
PLE_mean	spSlopeExp_mean	0.98	<0.001	0.89	0.99
PLE_mean	PLE_CV	-0.87	0.001	-0.97	-0.51
PLE_mean	spSlopeExp_CV	-0.84	0.002	-0.96	-0.44
PLE_mean	BCI_Online_Accuracy_mean	0.84	0.002	0.43	0.96
PLE_mean	spSlopeOffs_mean	0.77	0.009	0.25	0.94
PLE_mean	BCI_Online_Accuracy_CV	-0.32	0.366	-0.8	0.41
PLE_CV	spSlopeExp_mean	-0.93	<0.001	-0.98	-0.7
PLE_CV	spSlopeExp_CV	0.99	<0.001	0.95	1
PLE_CV	BCI_Online_Accuracy_mean	-0.84	0.002	-0.96	-0.43
PLE_CV	spSlopeOffs_mean	-0.66	0.038	-0.91	-0.03
PLE_CV	BCI_Online_Accuracy_CV	0.32	0.366	-0.41	0.8
spSlopeExp_mean	spSlopeExp_CV	-0.92	<0.001	-0.98	-0.66
spSlopeExp_mean	BCI_Online_Accuracy_mean	0.84	0.002	0.43	0.96
spSlopeExp_mean	spSlopeOffs_mean	0.78	0.008	0.28	0.95
spSlopeExp_mean	BCI_Online_Accuracy_CV	-0.41	0.242	-0.83	0.32
spSlopeExp_CV	BCI_Online_Accuracy_mean	-0.8	0.006	-0.95	-0.32
spSlopeExp_CV	spSlopeOffs_mean	-0.64	0.048	-0.91	0.01
spSlopeExp_CV	BCI_Online_Accuracy_CV	0.3	0.396	-0.42	0.79
spSlopeOffs_mean	BCI_Online_Accuracy_mean	0.71	0.021	0.13	0.93

spSlopeOffs_mean	BCI_Online_Accuracy_CV	-0.18	0.621	-0.74	0.52
BCI_Online_Accuracy_mean	BCI_Online_Accuracy_CV	-0.33	0.353	-0.8	0.4

The table lists the Spearman's rank correlation coefficients (ρ), uncorrected p -values, and 95% confidence intervals for all resting-state criticality markers (EEG) and BCI performance metrics. Abbreviations: MSCr_Sigma/Alpha_A/B: slope/intercept of σ/α as a function of timescales; Rel/AbsDeltaPwr: relative/absolute delta power; LZC: Lempel-Ziv complexity; PLE: power-law exponent; spSlopeExp/Offs: exponent/offset of the aperiodic (1/f) EEG component (FOOOF); CV: coefficient of variation.

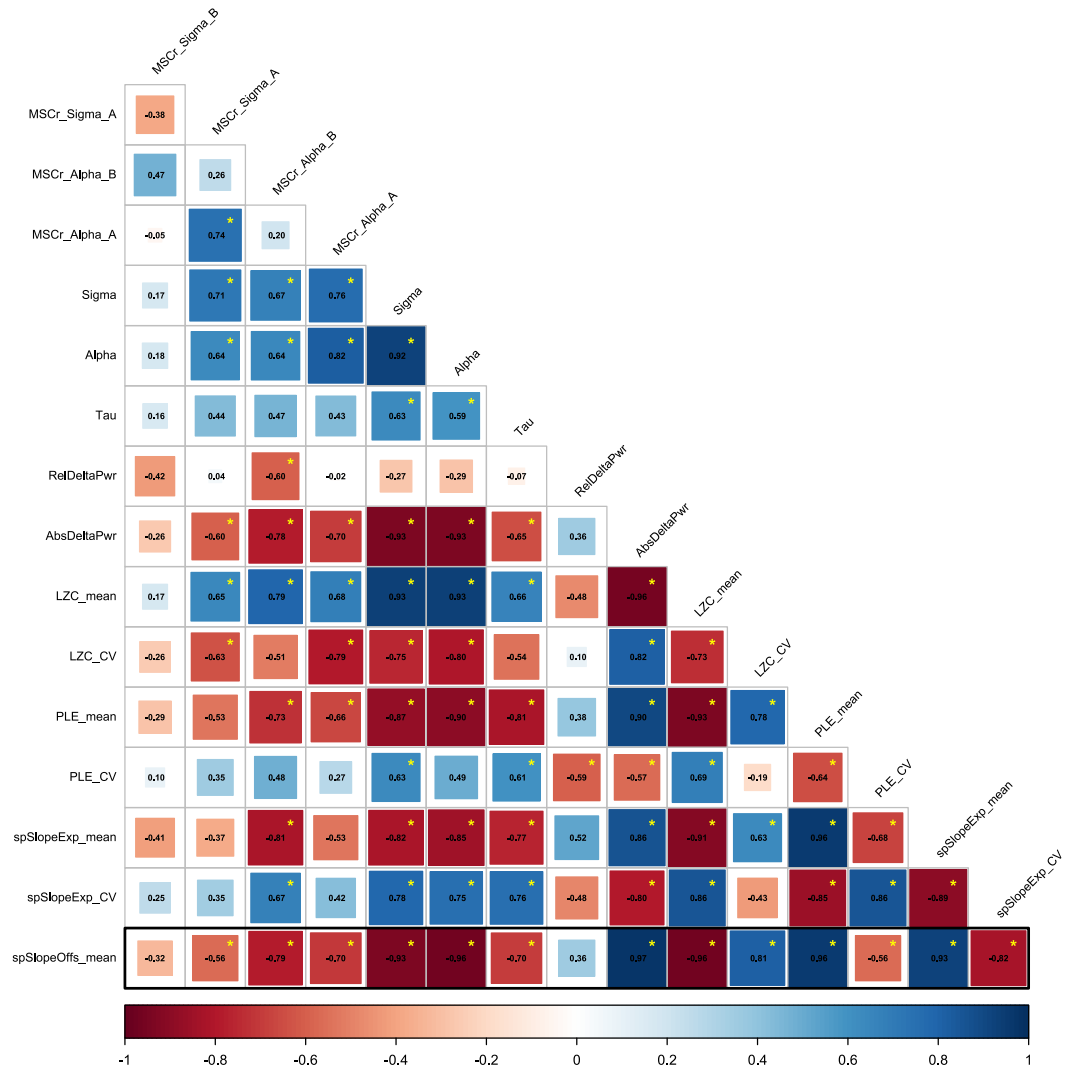


Figure S 1: Inter-correlations between resting-state neurophysiological markers of criticality (people with ALS, Dataset 2; pooled analysis). The correlogram shows Spearman's rank correlation coefficients (ρ) between resting-state criticality markers (EEG) pooled across all available sessions ($N = 13$ session from $N = 5$ people with ALS). Asterisks indicate uncorrected significance at $p < .05$. Complete test statistics are provided in Table S2. Note: P -values should be interpreted with caution due to the non-independence of observations.

Table S 2: Inter-correlation analysis (Spearman's rank correlation) of all resting-state neurophysiological markers of criticality (people with ALS, Dataset 2, pooled analysis)

Variable1	Variable2	Spearman_rho	p_value	CI_lower	CI_upper
MSCr_Sigma_B	MSCr_Sigma_A	-0.38	0.194	-0.78	0.23

MSCr_Sigma_B	MSCr_Alpha_B	0.47	0.103	-0.12	0.82
MSCr_Sigma_B	MSCr_Alpha_A	-0.05	0.873	-0.6	0.53
MSCr_Sigma_B	Sigma	0.17	0.578	-0.44	0.67
MSCr_Sigma_B	Alpha	0.18	0.566	-0.43	0.67
MSCr_Sigma_B	Tau	0.16	0.590	-0.44	0.67
MSCr_Sigma_B	RelDeltaPwr	-0.42	0.150	-0.8	0.18
MSCr_Sigma_B	AbsDeltaPwr	-0.26	0.384	-0.72	0.35
MSCr_Sigma_B	LZC_mean	0.17	0.578	-0.44	0.67
MSCr_Sigma_B	LZC_CV	-0.26	0.394	-0.72	0.36
MSCr_Sigma_B	PLE_mean	-0.29	0.344	-0.73	0.33
MSCr_Sigma_B	PLE_CV	0.1	0.748	-0.49	0.63
MSCr_Sigma_B	spSlopeExp_mean	-0.41	0.162	-0.79	0.2
MSCr_Sigma_B	spSlopeExp_CV	0.25	0.405	-0.36	0.71
MSCr_Sigma_B	spSlopeOffs_mean	-0.32	0.280	-0.75	0.29
MSCr_Sigma_A	MSCr_Alpha_B	0.26	0.394	-0.36	0.72
MSCr_Sigma_A	MSCr_Alpha_A	0.74	0.004	0.31	0.92
MSCr_Sigma_A	Sigma	0.71	0.006	0.25	0.91
MSCr_Sigma_A	Alpha	0.64	0.019	0.12	0.88
MSCr_Sigma_A	Tau	0.44	0.133	-0.16	0.8
MSCr_Sigma_A	RelDeltaPwr	0.04	0.887	-0.53	0.59
MSCr_Sigma_A	AbsDeltaPwr	-0.6	0.031	-0.87	-0.05
MSCr_Sigma_A	LZC_mean	0.65	0.017	0.13	0.89
MSCr_Sigma_A	LZC_CV	-0.63	0.021	-0.88	-0.11
MSCr_Sigma_A	PLE_mean	-0.53	0.061	-0.84	0.04
MSCr_Sigma_A	PLE_CV	0.35	0.239	-0.26	0.76
MSCr_Sigma_A	spSlopeExp_mean	-0.37	0.209	-0.77	0.24
MSCr_Sigma_A	spSlopeExp_CV	0.35	0.247	-0.27	0.76
MSCr_Sigma_A	spSlopeOffs_mean	-0.56	0.046	-0.85	0
MSCr_Alpha_B	MSCr_Alpha_A	0.2	0.517	-0.41	0.69
MSCr_Alpha_B	Sigma	0.67	0.012	0.17	0.9
MSCr_Alpha_B	Alpha	0.64	0.018	0.12	0.89
MSCr_Alpha_B	Tau	0.47	0.108	-0.13	0.82
MSCr_Alpha_B	RelDeltaPwr	-0.6	0.031	-0.87	-0.05
MSCr_Alpha_B	AbsDeltaPwr	-0.78	0.002	-0.93	-0.39
MSCr_Alpha_B	LZC_mean	0.79	0.001	0.41	0.94
MSCr_Alpha_B	LZC_CV	-0.51	0.074	-0.83	0.07
MSCr_Alpha_B	PLE_mean	-0.73	0.005	-0.91	-0.27
MSCr_Alpha_B	PLE_CV	0.48	0.094	-0.11	0.82
MSCr_Alpha_B	spSlopeExp_mean	-0.81	< 0.001	-0.94	-0.46
MSCr_Alpha_B	spSlopeExp_CV	0.67	0.012	0.17	0.9
MSCr_Alpha_B	spSlopeOffs_mean	-0.79	0.001	-0.94	-0.4
MSCr_Alpha_A	Sigma	0.76	0.002	0.35	0.93
MSCr_Alpha_A	Alpha	0.82	< 0.001	0.49	0.95
MSCr_Alpha_A	Tau	0.43	0.138	-0.17	0.8

MSCr_Alpha_A	RelDeltaPwr	-0.02	0.957	-0.57	0.55
MSCr_Alpha_A	AbsDeltaPwr	-0.7	0.008	-0.91	-0.22
MSCr_Alpha_A	LZC_mean	0.68	0.010	0.19	0.9
MSCr_Alpha_A	LZC_CV	-0.79	0.001	-0.94	-0.41
MSCr_Alpha_A	PLE_mean	-0.66	0.013	-0.89	-0.16
MSCr_Alpha_A	PLE_CV	0.27	0.364	-0.34	0.73
MSCr_Alpha_A	spSlopeExp_mean	-0.53	0.061	-0.84	0.04
MSCr_Alpha_A	spSlopeExp_CV	0.42	0.150	-0.18	0.8
MSCr_Alpha_A	spSlopeOffs_mean	-0.7	0.007	-0.91	-0.23
Sigma	Alpha	0.92	< 0.001	0.75	0.98
Sigma	Tau	0.63	0.021	0.11	0.88
Sigma	RelDeltaPwr	-0.27	0.364	-0.73	0.34
Sigma	AbsDeltaPwr	-0.93	< 0.001	-0.98	-0.78
Sigma	LZC_mean	0.93	< 0.001	0.78	0.98
Sigma	LZC_CV	-0.75	0.003	-0.92	-0.33
Sigma	PLE_mean	-0.87	< 0.001	-0.96	-0.61
Sigma	PLE_CV	0.63	0.021	0.11	0.88
Sigma	spSlopeExp_mean	-0.82	< 0.001	-0.95	-0.47
Sigma	spSlopeExp_CV	0.78	0.002	0.39	0.93
Sigma	spSlopeOffs_mean	-0.93	< 0.001	-0.98	-0.78
Alpha	Tau	0.59	0.033	0.04	0.87
Alpha	RelDeltaPwr	-0.29	0.344	-0.73	0.33
Alpha	AbsDeltaPwr	-0.93	< 0.001	-0.98	-0.78
Alpha	LZC_mean	0.93	< 0.001	0.78	0.98
Alpha	LZC_CV	-0.8	< 0.001	-0.94	-0.44
Alpha	PLE_mean	-0.9	< 0.001	-0.97	-0.67
Alpha	PLE_CV	0.49	0.086	-0.1	0.83
Alpha	spSlopeExp_mean	-0.85	< 0.001	-0.95	-0.54
Alpha	spSlopeExp_CV	0.75	0.003	0.33	0.92
Alpha	spSlopeOffs_mean	-0.96	< 0.001	-0.99	-0.87
Tau	RelDeltaPwr	-0.07	0.817	-0.61	0.51
Tau	AbsDeltaPwr	-0.65	0.017	-0.89	-0.13
Tau	LZC_mean	0.66	0.013	0.16	0.89
Tau	LZC_CV	-0.54	0.055	-0.85	0.03
Tau	PLE_mean	-0.81	< 0.001	-0.94	-0.46
Tau	PLE_CV	0.61	0.027	0.07	0.87
Tau	spSlopeExp_mean	-0.77	0.002	-0.93	-0.36
Tau	spSlopeExp_CV	0.76	0.003	0.34	0.93
Tau	spSlopeOffs_mean	-0.7	0.008	-0.91	-0.22
RelDeltaPwr	AbsDeltaPwr	0.36	0.231	-0.26	0.77
RelDeltaPwr	LZC_mean	-0.48	0.098	-0.82	0.12
RelDeltaPwr	LZC_CV	0.1	0.748	-0.49	0.63
RelDeltaPwr	PLE_mean	0.38	0.194	-0.23	0.78

RelDeltaPwr	PLE_CV	-0.59	0.033	-0.87	-0.04
RelDeltaPwr	spSlopeExp_mean	0.52	0.067	-0.06	0.84
RelDeltaPwr	spSlopeExp_CV	-0.48	0.094	-0.82	0.11
RelDeltaPwr	spSlopeOffs_mean	0.36	0.231	-0.26	0.77
AbsDeltaPwr	LZC_mean	-0.96	< 0.001	-0.99	-0.85
AbsDeltaPwr	LZC_CV	0.82	< 0.001	0.47	0.95
AbsDeltaPwr	PLE_mean	0.9	< 0.001	0.69	0.97
AbsDeltaPwr	PLE_CV	-0.57	0.044	-0.86	0
AbsDeltaPwr	spSlopeExp_mean	0.86	< 0.001	0.58	0.96
AbsDeltaPwr	spSlopeExp_CV	-0.8	0.001	-0.94	-0.42
AbsDeltaPwr	spSlopeOffs_mean	0.97	< 0.001	0.9	0.99
LZC_mean	LZC_CV	-0.73	0.005	-0.92	-0.28
LZC_mean	PLE_mean	-0.93	< 0.001	-0.98	-0.78
LZC_mean	PLE_CV	0.69	0.010	0.2	0.9
LZC_mean	spSlopeExp_mean	-0.91	< 0.001	-0.97	-0.72
LZC_mean	spSlopeExp_CV	0.86	< 0.001	0.57	0.96
LZC_mean	spSlopeOffs_mean	-0.96	< 0.001	-0.99	-0.87
LZC_CV	PLE_mean	0.78	0.002	0.39	0.93
LZC_CV	PLE_CV	-0.19	0.541	-0.68	0.42
LZC_CV	spSlopeExp_mean	0.63	0.021	0.11	0.88
LZC_CV	spSlopeExp_CV	-0.43	0.144	-0.8	0.18
LZC_CV	spSlopeOffs_mean	0.81	< 0.001	0.46	0.94
PLE_mean	PLE_CV	-0.64	0.018	-0.89	-0.12
PLE_mean	spSlopeExp_mean	0.96	< 0.001	0.85	0.99
PLE_mean	spSlopeExp_CV	-0.85	< 0.001	-0.96	-0.55
PLE_mean	spSlopeOffs_mean	0.96	< 0.001	0.85	0.99
PLE_CV	spSlopeExp_mean	-0.68	0.011	-0.9	-0.18
PLE_CV	spSlopeExp_CV	0.86	< 0.001	0.57	0.96
PLE_CV	spSlopeOffs_mean	-0.56	0.046	-0.85	0
spSlopeExp_mean	spSlopeExp_CV	-0.89	< 0.001	-0.97	-0.66
spSlopeExp_mean	spSlopeOffs_mean	0.93	< 0.001	0.77	0.98
spSlopeExp_CV	spSlopeOffs_mean	-0.82	< 0.001	-0.95	-0.49

The table lists Spearman's rank correlation coefficients (ρ), uncorrected p-values, and 95% confidence intervals for resting-state criticality markers (EEG) pooled across all available sessions ($N = 13$ from $N = 5$ people with ALS). Note:

P-values should be interpreted with caution due to the non-independence of observations.

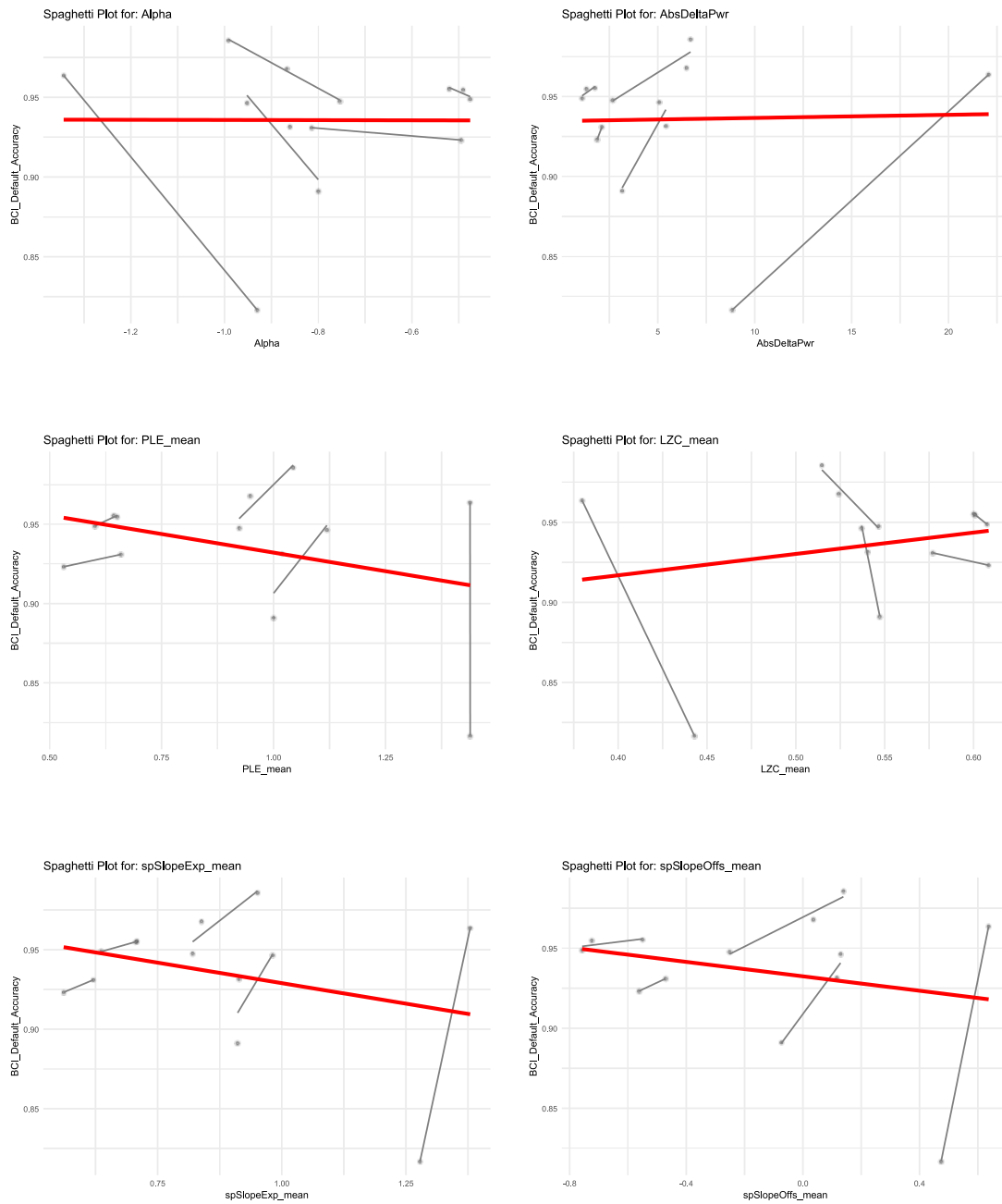


Figure S 2: Spaghetti Plots for selected resting-state neurophysiological markers of criticality (people with ALS, Dataset 2). Grey lines represent linear fits for individual persons (within-subject), while the red line indicates the overall linear trend across all data points. Only criticality markers demonstrating consistent directionalities of within-subject associations are shown.

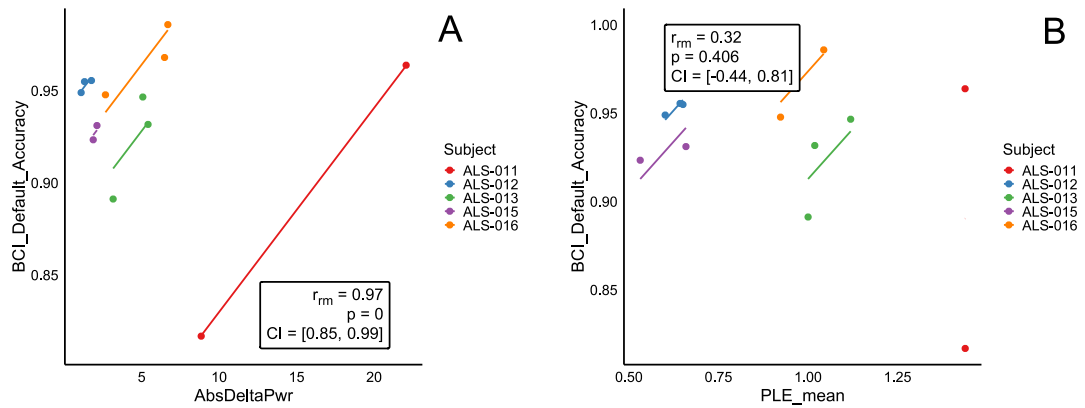


Figure S 3: Repeated measures correlations (rmCorr) between BCI performance and absolute delta power and mean power-law exponent (pre-exclusion) (people with ALS, Dataset 2). Plots depict the associations between BCI performance (BCI_Default_Accuracy) and absolute delta power (AbsDeltaPwr) as well as mean power-law exponent (PLE_mean) for the full sample ($N = 5$ people with ALS with $N = 13$ sessions). These visualizations illustrate the outlier patterns (extreme value for AbsDeltaPwr, lack of variance for PLE_mean) that lead to the exclusion of participant ALS-11 from the final analysis of these features.

Table S 3: Correlation analysis (Spearman's rank correlation) between resting-state neurophysiological markers of criticality and BCI performance (healthy participants, Dataset 2)

Variable1	Variable2	Spearman_rho	p_Value	CI_lower	CI_upper
MSCr_Sigma_B	MSCr_Sigma_A	-0.89	0.019	-0.99	-0.23
MSCr_Sigma_B	LZC_mean	0.6	0.208	-0.44	0.95
MSCr_Sigma_B	LZC_CV	-0.6	0.208	-0.95	0.44
MSCr_Sigma_B	Alpha	0.49	0.329	-0.56	0.93
MSCr_Sigma_B	BCI_Default_Accuracy	0.49	0.329	-0.56	0.93
MSCr_Sigma_B	RelDeltaPwr	-0.43	0.397	-0.93	0.61
MSCr_Sigma_B	PLE_mean	-0.43	0.397	-0.93	0.61
MSCr_Sigma_B	MSCr_Alpha_A	0.26	0.623	-0.72	0.89
MSCr_Sigma_B	AbsDeltaPwr	0.26	0.623	-0.72	0.89
MSCr_Sigma_B	Tau	0.14	0.787	-0.77	0.86
MSCr_Sigma_B	PLE_CV	-0.14	0.787	-0.86	0.77
MSCr_Sigma_B	spSlopeExp_mean	-0.14	0.787	-0.86	0.77
MSCr_Sigma_B	spSlopeExp_CV	-0.14	0.787	-0.86	0.77
MSCr_Sigma_B	spSlopeOffs_mean	0.14	0.787	-0.77	0.86
MSCr_Sigma_B	MSCr_Alpha_B	-0.09	0.872	-0.85	0.79
MSCr_Sigma_B	Sigma	-0.09	0.872	-0.85	0.79
MSCr_Sigma_A	LZC_mean	-0.89	0.019	-0.99	-0.23
MSCr_Sigma_A	PLE_mean	0.77	0.072	-0.14	0.98
MSCr_Sigma_A	Sigma	0.49	0.329	-0.56	0.93
MSCr_Sigma_A	RelDeltaPwr	0.49	0.329	-0.56	0.93
MSCr_Sigma_A	spSlopeExp_mean	0.49	0.329	-0.56	0.93
MSCr_Sigma_A	MSCr_Alpha_B	0.43	0.397	-0.61	0.93

MSCr_Sigma_A	MSCr_Alpha_A	-0.43	0.397	-0.93	0.61
MSCr_Sigma_A	LZC_CV	0.31	0.544	-0.69	0.9
MSCr_Sigma_A	PLE_CV	-0.31	0.544	-0.9	0.69
MSCr_Sigma_A	spSlopeExp_CV	-0.31	0.544	-0.9	0.69
MSCr_Sigma_A	Tau	0.26	0.623	-0.72	0.89
MSCr_Sigma_A	spSlopeOffs_mean	0.26	0.623	-0.72	0.89
MSCr_Sigma_A	Alpha	-0.14	0.787	-0.86	0.77
MSCr_Sigma_A	BCI_Default_Accuracy	-0.14	0.787	-0.86	0.77
MSCr_Sigma_A	AbsDeltaPwr	0.09	0.872	-0.79	0.85
MSCr_Alpha_B	Tau	0.83	0.042	0.02	0.98
MSCr_Alpha_B	spSlopeOffs_mean	0.83	0.042	0.02	0.98
MSCr_Alpha_B	MSCr_Alpha_A	-0.71	0.111	-0.97	0.26
MSCr_Alpha_B	AbsDeltaPwr	0.66	0.156	-0.36	0.96
MSCr_Alpha_B	LZC_mean	-0.6	0.208	-0.95	0.44
MSCr_Alpha_B	PLE_CV	-0.6	0.208	-0.95	0.44
MSCr_Alpha_B	spSlopeExp_CV	-0.6	0.208	-0.95	0.44
MSCr_Alpha_B	Alpha	0.54	0.266	-0.51	0.94
MSCr_Alpha_B	BCI_Default_Accuracy	0.54	0.266	-0.51	0.94
MSCr_Alpha_B	Sigma	0.49	0.329	-0.56	0.93
MSCr_Alpha_B	RelDeltaPwr	0.49	0.329	-0.56	0.93
MSCr_Alpha_B	PLE_mean	0.49	0.329	-0.56	0.93
MSCr_Alpha_B	spSlopeExp_mean	0.49	0.329	-0.56	0.93
MSCr_Alpha_B	LZC_CV	-0.37	0.468	-0.91	0.65
MSCr_Alpha_A	RelDeltaPwr	-0.94	0.005	-0.99	-0.54
MSCr_Alpha_A	spSlopeExp_mean	-0.66	0.156	-0.96	0.36
MSCr_Alpha_A	LZC_mean	0.54	0.266	-0.51	0.94
MSCr_Alpha_A	PLE_mean	-0.37	0.468	-0.91	0.65
MSCr_Alpha_A	Tau	-0.31	0.544	-0.9	0.69
MSCr_Alpha_A	spSlopeOffs_mean	-0.31	0.544	-0.9	0.69
MSCr_Alpha_A	LZC_CV	-0.26	0.623	-0.89	0.72
MSCr_Alpha_A	PLE_CV	0.26	0.623	-0.72	0.89
MSCr_Alpha_A	spSlopeExp_CV	0.26	0.623	-0.72	0.89
MSCr_Alpha_A	AbsDeltaPwr	-0.2	0.704	-0.88	0.75
MSCr_Alpha_A	Alpha	0.14	0.787	-0.77	0.86
MSCr_Alpha_A	BCI_Default_Accuracy	0.14	0.787	-0.77	0.86
MSCr_Alpha_A	Sigma	-0.09	0.872	-0.85	0.79
Sigma	PLE_CV	-0.94	0.005	-0.99	-0.54
Sigma	spSlopeExp_CV	-0.94	0.005	-0.99	-0.54
Sigma	PLE_mean	0.83	0.042	0.02	0.98
Sigma	Tau	0.77	0.072	-0.14	0.98
Sigma	spSlopeOffs_mean	0.77	0.072	-0.14	0.98
Sigma	AbsDeltaPwr	0.71	0.111	-0.26	0.97
Sigma	LZC_mean	-0.66	0.156	-0.96	0.36

Sigma	Alpha	0.6	0.208	-0.44	0.95
Sigma	spSlopeExp_mean	0.6	0.208	-0.44	0.95
Sigma	BCI_Default_Accuracy	0.6	0.208	-0.44	0.95
Sigma	LZC_CV	-0.54	0.266	-0.94	0.51
Sigma	RelDeltaPwr	-0.03	0.957	-0.83	0.81
Alpha	BCI_Default_Accuracy	1	<0.001	1	1
Alpha	LZC_CV	-0.94	0.005	-0.99	-0.54
Alpha	Tau	0.83	0.042	0.02	0.98
Alpha	spSlopeOffs_mean	0.83	0.042	0.02	0.98
Alpha	AbsDeltaPwr	0.77	0.072	-0.14	0.98
Alpha	PLE_CV	-0.66	0.156	-0.96	0.36
Alpha	spSlopeExp_CV	-0.66	0.156	-0.96	0.36
Alpha	RelDeltaPwr	-0.43	0.397	-0.93	0.61
Alpha	PLE_mean	0.2	0.704	-0.75	0.88
Alpha	LZC_mean	-0.09	0.872	-0.85	0.79
Alpha	spSlopeExp_mean	0.03	0.957	-0.81	0.83
Tau	spSlopeOffs_mean	1	<0.001	1	1
Tau	AbsDeltaPwr	0.94	0.005	0.54	0.99
Tau	PLE_CV	-0.83	0.042	-0.98	-0.02
Tau	spSlopeExp_CV	-0.83	0.042	-0.98	-0.02
Tau	BCI_Default_Accuracy	0.83	0.042	0.02	0.98
Tau	LZC_CV	-0.77	0.072	-0.98	0.14
Tau	PLE_mean	0.49	0.329	-0.56	0.93
Tau	LZC_mean	-0.43	0.397	-0.93	0.61
Tau	spSlopeExp_mean	0.37	0.468	-0.65	0.91
Tau	RelDeltaPwr	0.09	0.872	-0.79	0.85
RelDeltaPwr	spSlopeExp_mean	0.6	0.208	-0.44	0.95
RelDeltaPwr	LZC_mean	-0.49	0.329	-0.93	0.56
RelDeltaPwr	LZC_CV	0.49	0.329	-0.56	0.93
RelDeltaPwr	BCI_Default_Accuracy	-0.43	0.397	-0.93	0.61
RelDeltaPwr	PLE_mean	0.31	0.544	-0.69	0.9
RelDeltaPwr	PLE_CV	-0.09	0.872	-0.85	0.79
RelDeltaPwr	spSlopeExp_CV	-0.09	0.872	-0.85	0.79
RelDeltaPwr	spSlopeOffs_mean	0.09	0.872	-0.79	0.85
RelDeltaPwr	AbsDeltaPwr	0.03	0.957	-0.81	0.83
AbsDeltaPwr	spSlopeOffs_mean	0.94	0.005	0.54	0.99
AbsDeltaPwr	LZC_CV	-0.83	0.042	-0.98	-0.02
AbsDeltaPwr	PLE_CV	-0.77	0.072	-0.98	0.14
AbsDeltaPwr	spSlopeExp_CV	-0.77	0.072	-0.98	0.14
AbsDeltaPwr	BCI_Default_Accuracy	0.77	0.072	-0.14	0.98
AbsDeltaPwr	PLE_mean	0.31	0.544	-0.69	0.9

AbsDeltaPwr	spSlopeExp_mean	0.26	0.623	-0.72	0.89
AbsDeltaPwr	LZC_mean	-0.2	0.704	-0.88	0.75
LZC_mean	PLE_mean	-0.94	0.005	-0.99	-0.54
LZC_mean	spSlopeExp_mean	-0.77	0.072	-0.98	0.14
LZC_mean	PLE_CV	0.6	0.208	-0.44	0.95
LZC_mean	spSlopeExp_CV	0.6	0.208	-0.44	0.95
LZC_mean	spSlopeOffs_mean	-0.43	0.397	-0.93	0.61
LZC_mean	LZC_CV	-0.14	0.787	-0.86	0.77
LZC_mean	BCI_Default_Accuracy	-0.09	0.872	-0.85	0.79
LZC_CV	BCI_Default_Accuracy	-0.94	0.005	-0.99	-0.54
LZC_CV	spSlopeOffs_mean	-0.77	0.072	-0.98	0.14
LZC_CV	PLE_CV	0.6	0.208	-0.44	0.95
LZC_CV	spSlopeExp_CV	0.6	0.208	-0.44	0.95
LZC_CV	spSlopeExp_mean	0.09	0.872	-0.79	0.85
LZC_CV	PLE_mean	-0.03	0.957	-0.83	0.81
PLE_mean	spSlopeExp_mean	0.83	0.042	0.02	0.98
PLE_mean	PLE_CV	-0.77	0.072	-0.98	0.14
PLE_mean	spSlopeExp_CV	-0.77	0.072	-0.98	0.14
PLE_mean	spSlopeOffs_mean	0.49	0.329	-0.56	0.93
PLE_mean	BCI_Default_Accuracy	0.2	0.704	-0.75	0.88
PLE_CV	spSlopeExp_CV	1	<0.001	1	1
PLE_CV	spSlopeOffs_mean	-0.83	0.042	-0.98	-0.02
PLE_CV	spSlopeExp_mean	-0.71	0.111	-0.97	0.26
PLE_CV	BCI_Default_Accuracy	-0.66	0.156	-0.96	0.36
spSlopeExp_mean	spSlopeExp_CV	-0.71	0.111	-0.97	0.26
spSlopeExp_mean	spSlopeOffs_mean	0.37	0.468	-0.65	0.91
spSlopeExp_mean	BCI_Default_Accuracy	0.03	0.957	-0.81	0.83
spSlopeExp_CV	spSlopeOffs_mean	-0.83	0.042	-0.98	-0.02
spSlopeExp_CV	BCI_Default_Accuracy	-0.66	0.156	-0.96	0.36
spSlopeOffs_mean	BCI_Default_Accuracy	0.83	0.042	0.02	0.98

The table lists the Spearman's rank correlation coefficients (ρ), uncorrected p-values, and 95% confidence intervals for all resting-state criticality markers (EEG) and BCI performance (BCI_Default_Accuracy).