Supplementary Information

Altered brain dynamics index levels of arousal in complete locked-in syndrome

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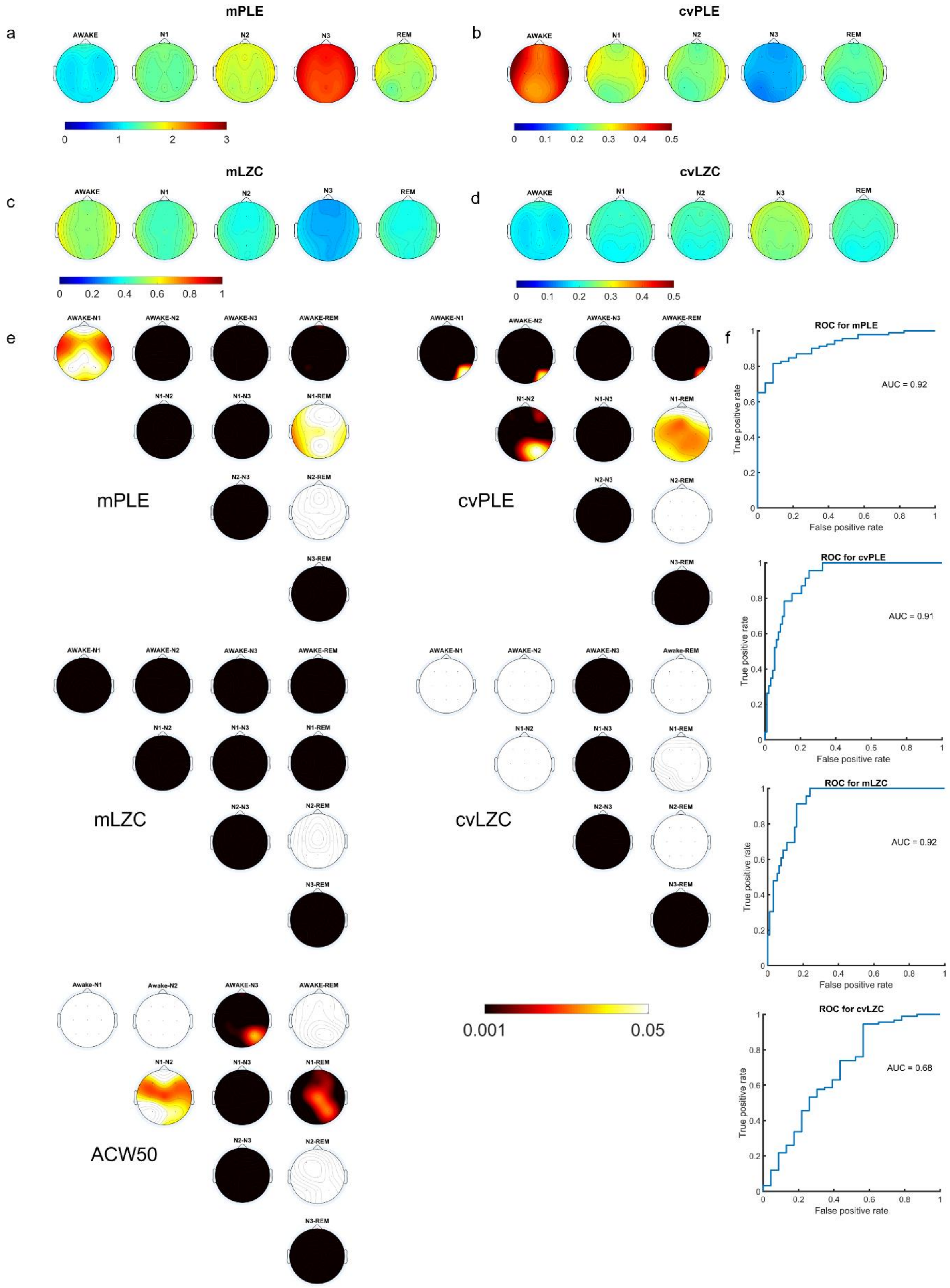
Supplementary Measurements

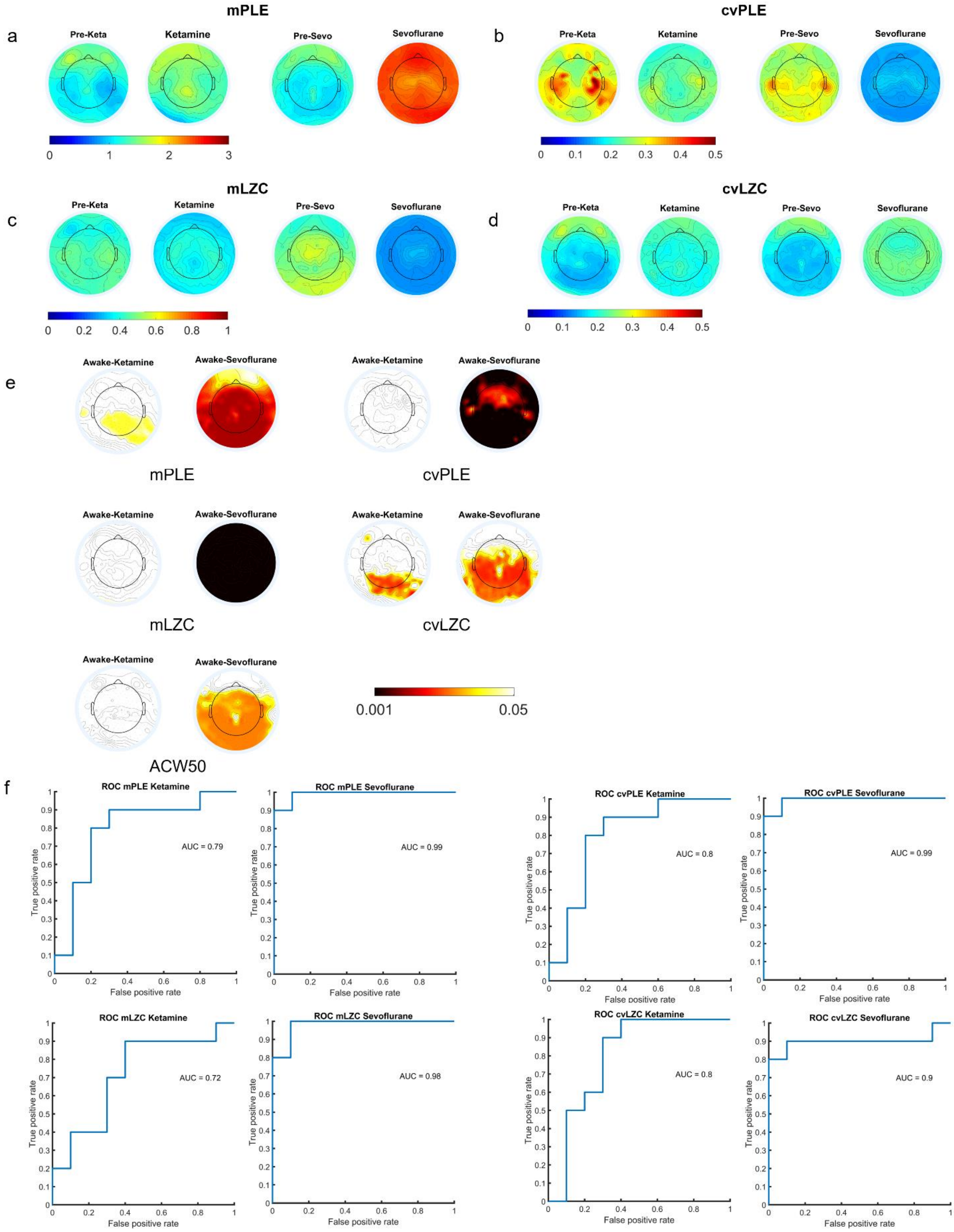
a. Supporting analysis – Autocorrelation window

The autocorrelation window (ACW) was computed in the Supporting Materials for each of the participants from the four datasets. For that purpose, custom scripts were developed to compute the ACW by measuring the full-width-half-maximum of the temporal autocorrelation function of each electrode, following the description provided by Honey and colleagues[1]. Autocorrelation was calculated using windows of 20 s-length with and overlap of 50%. The lag was set to 0.5 s since we observed in a previous study that the ACW values agreed for different lag values (ranged from 0.1 to 1 s)[2]. The full-width-half-maximum of the main lobe of each the autocorrelation functions was then computed for each epoch. ACW was estimated as the average of all the epochs for each electrode and condition. In order to reduce the number of comparisons and to minimize type I errors, a grand average across electrodes was performed. ACW values represent the extent of the periodicity of the EEG signal, whereby longer ACWs can be interpreted as greater stability of the frequencies over time. The length of the ACW can be seen, therefore, as an index that summarizes the degree of regularity of a signal, with longer ACW associated with more regular EEG oscillations. On the contrary, considering the extreme case, the autocorrelation of a white noise signal will have a peak in the origin, whereby the ACW, in this case, would be zero.

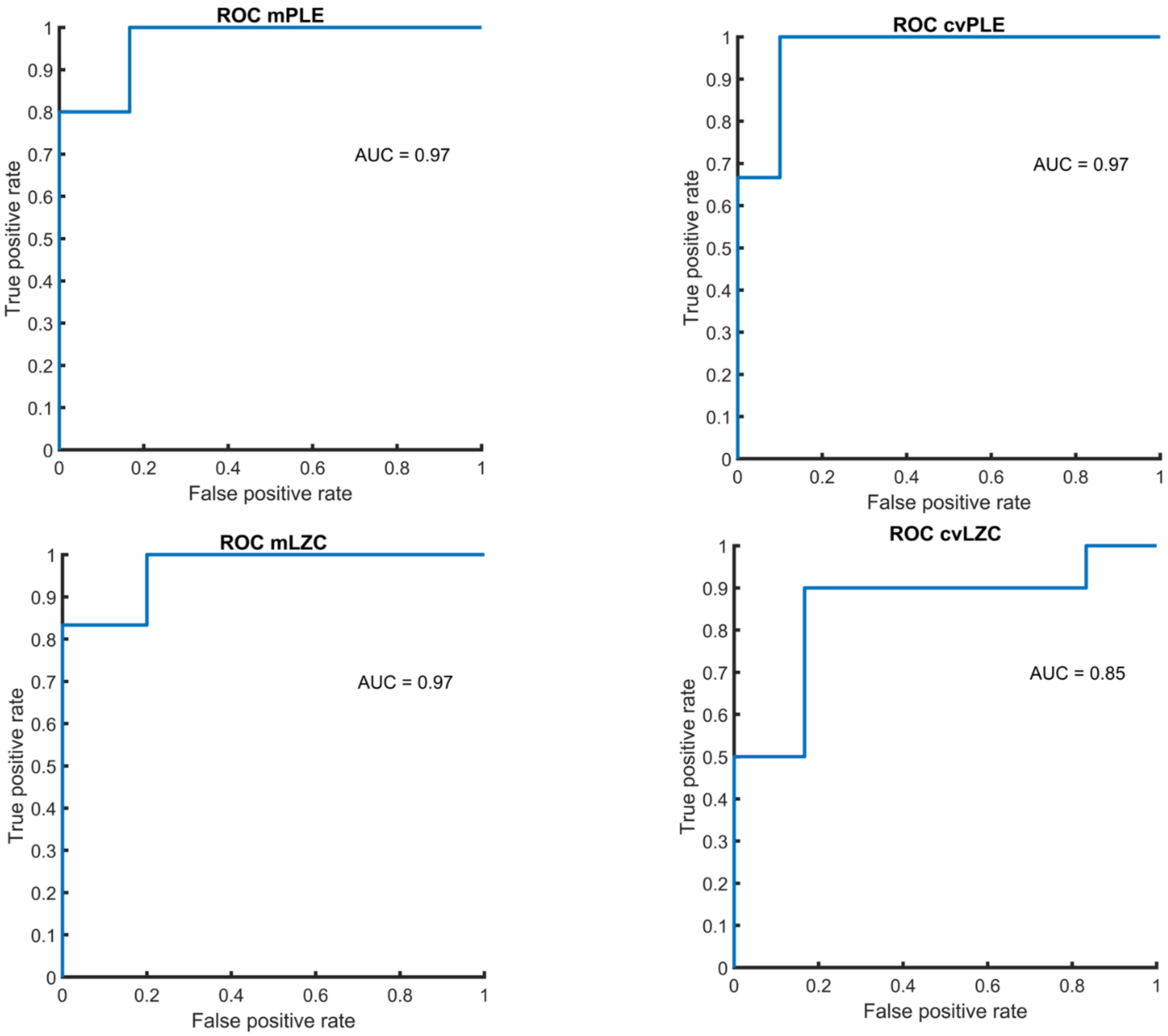
Supporting analysis



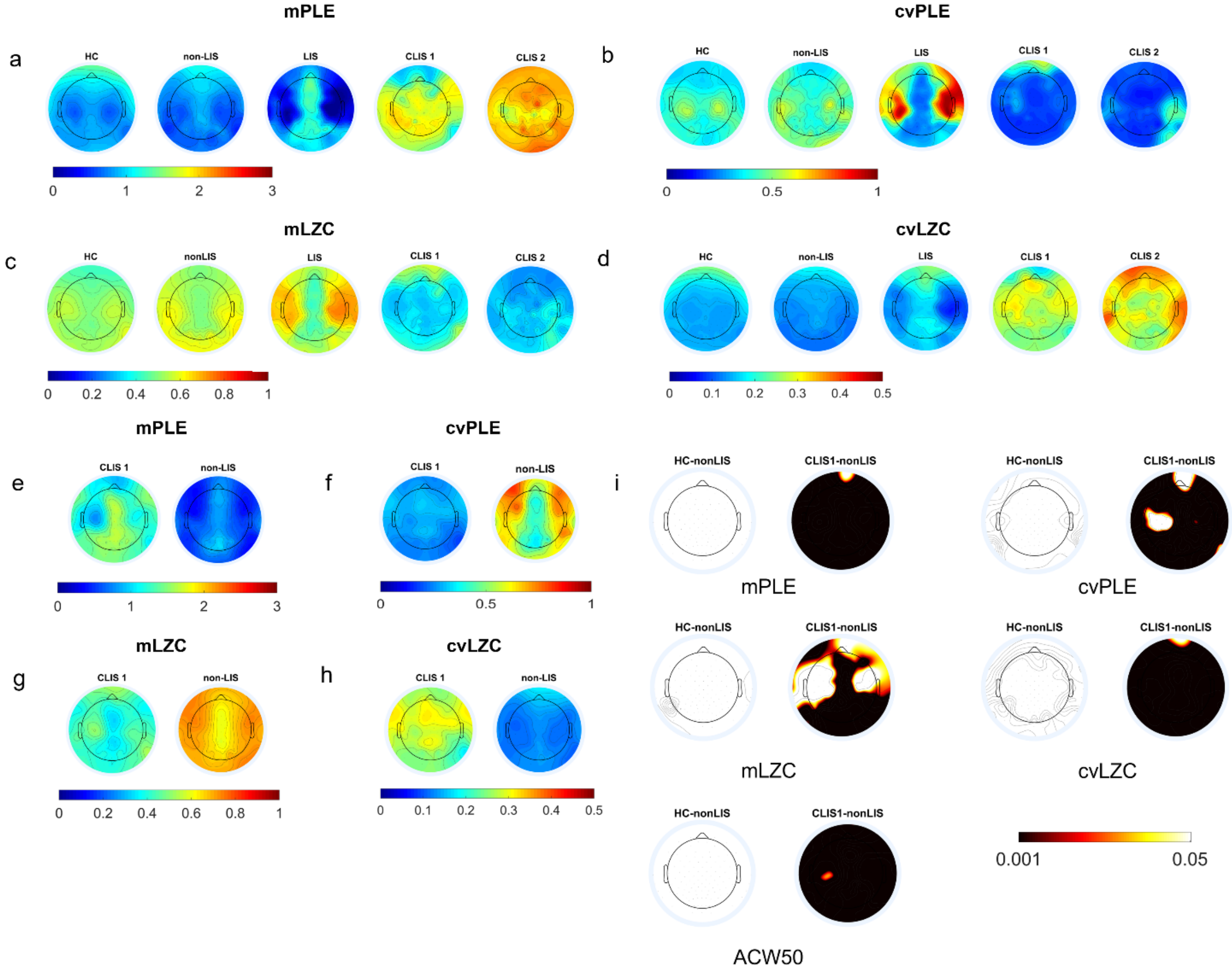
Supplementary Fig. 1: Sleep dataset. Topographical maps, comparisons of the topographical maps with FDR correction (Benjamini-Yekutieli), and Receiver Operating Characteristic curves (ROCs)



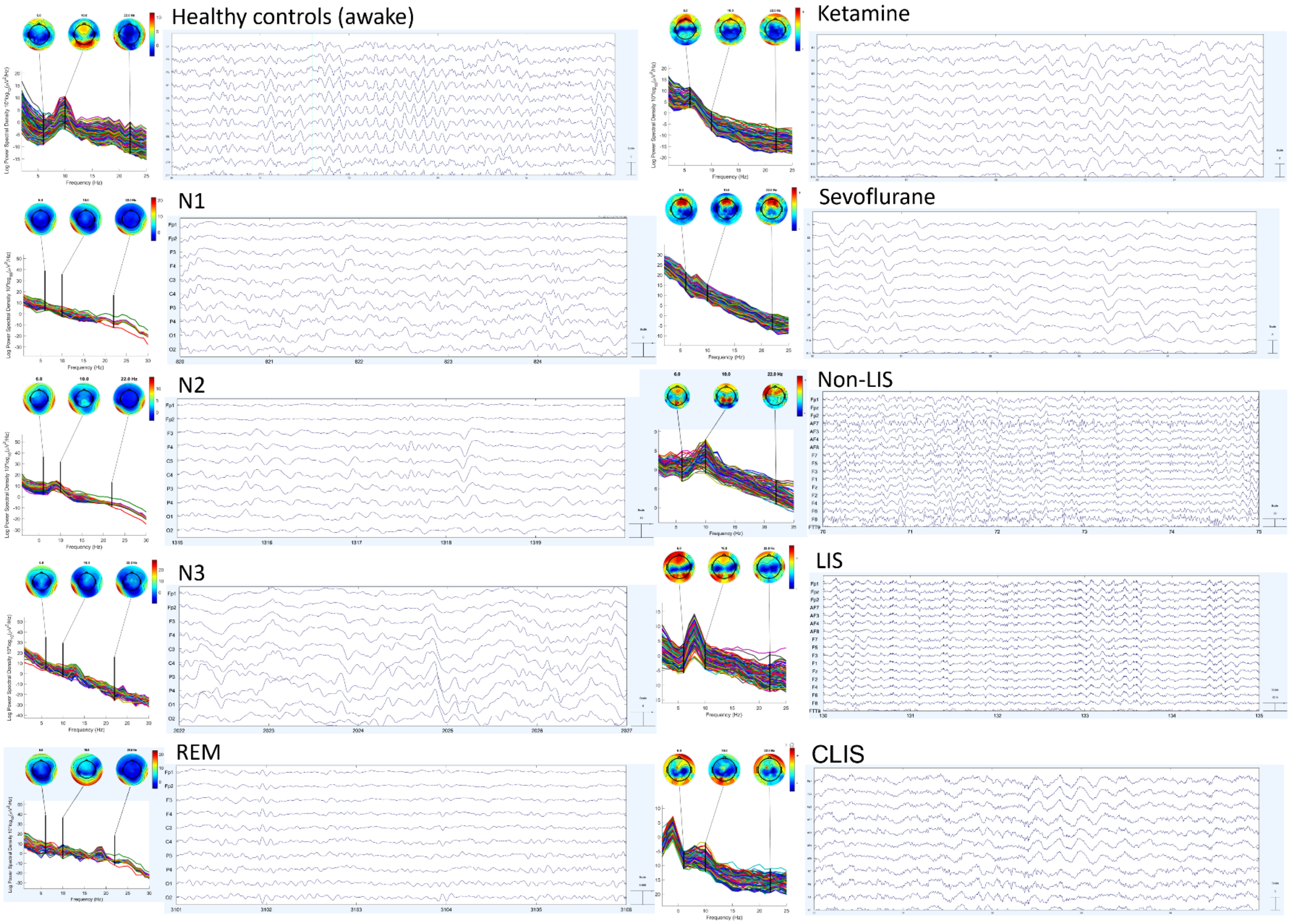
Supplementary Fig. 2: Anesthesia dataset. Topographical maps, topographical map comparisons with FDR correction (Benjamini-Hochberg), and Receiver Operating Characteristic curves (ROCs)



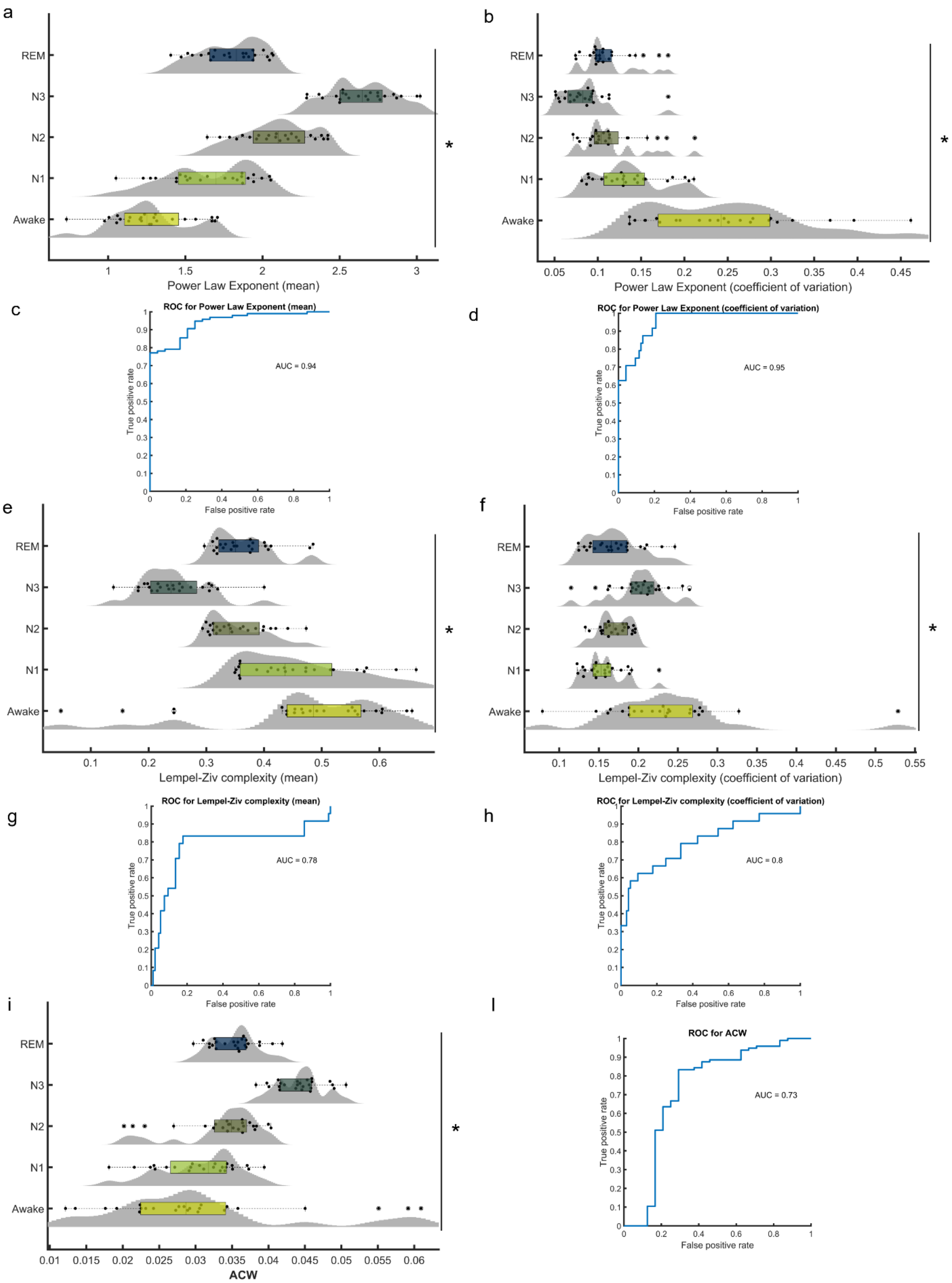
Supplementary Fig. 3: CLIS dataset (Healthy controls vs CLIS). Receiver Operating Characteristic curves (ROCs)



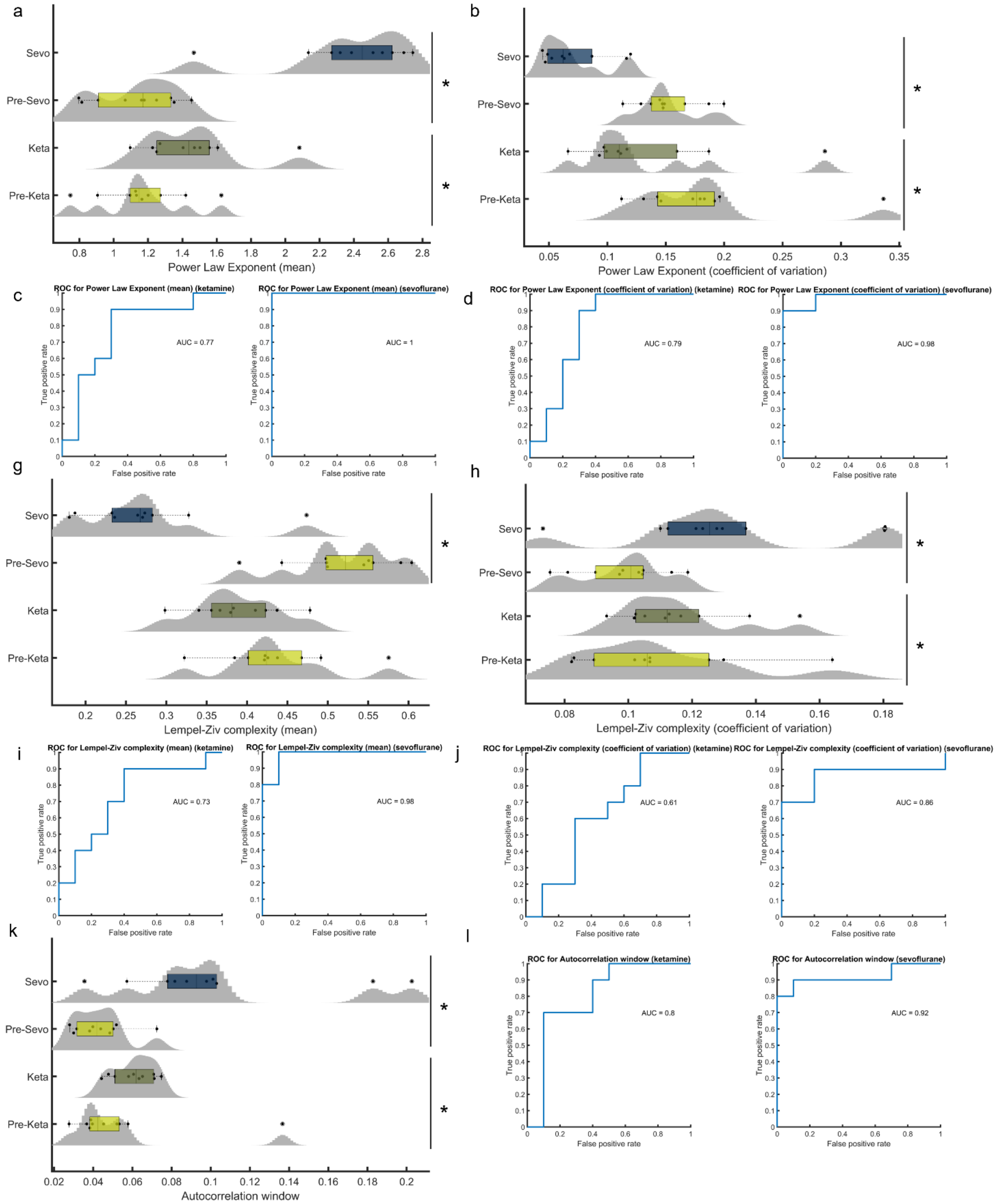
Supplementary Fig. 4: ALS dataset. Topographical maps, and CLIS vs. non-LIS topographical map comparisons with FDR correction (Benjamini-Yekutieli)



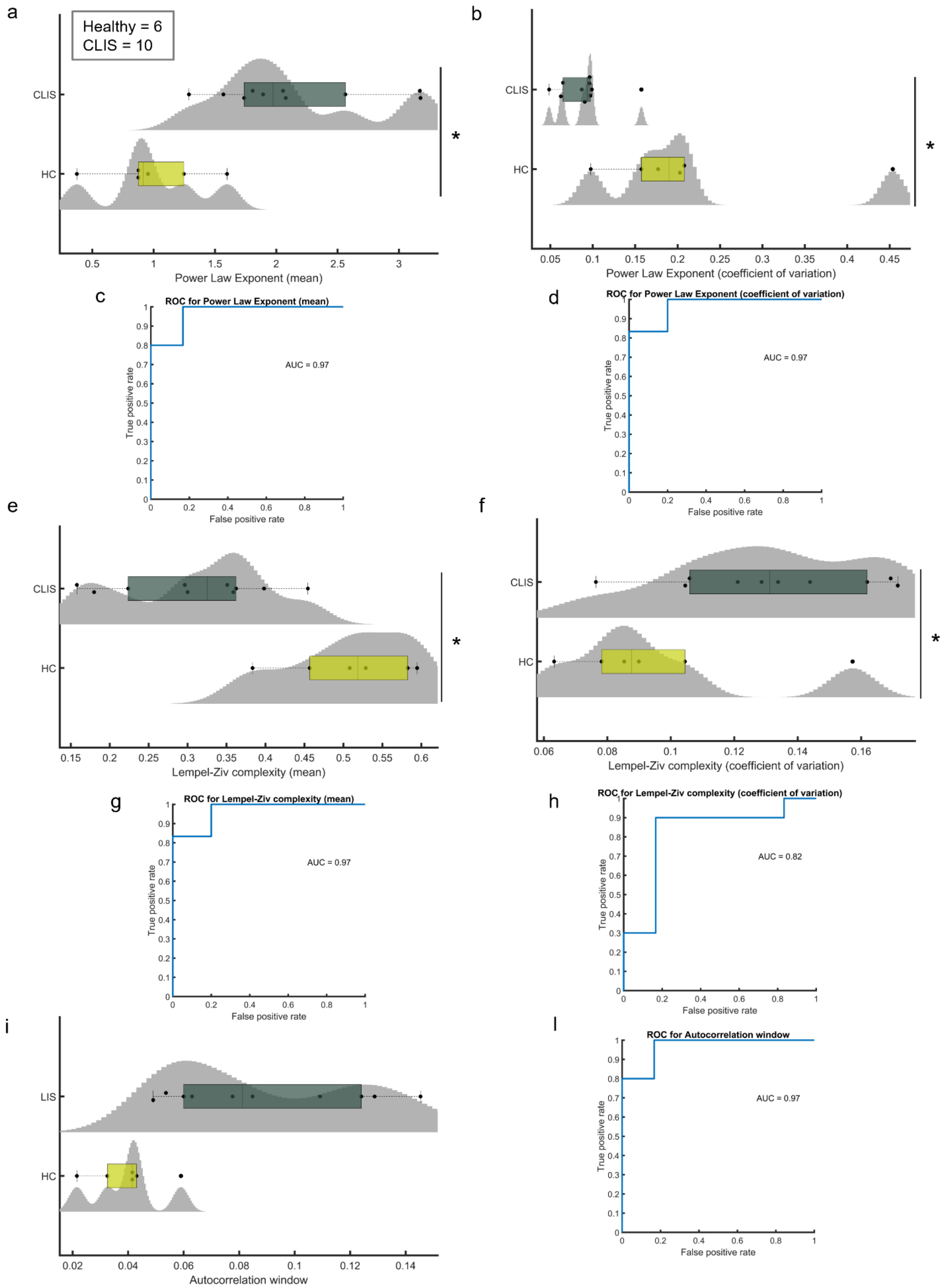
Supplementary Fig. 5: Sample of raw EEG data from each group, with the Power Spectral Density of the given EEG session



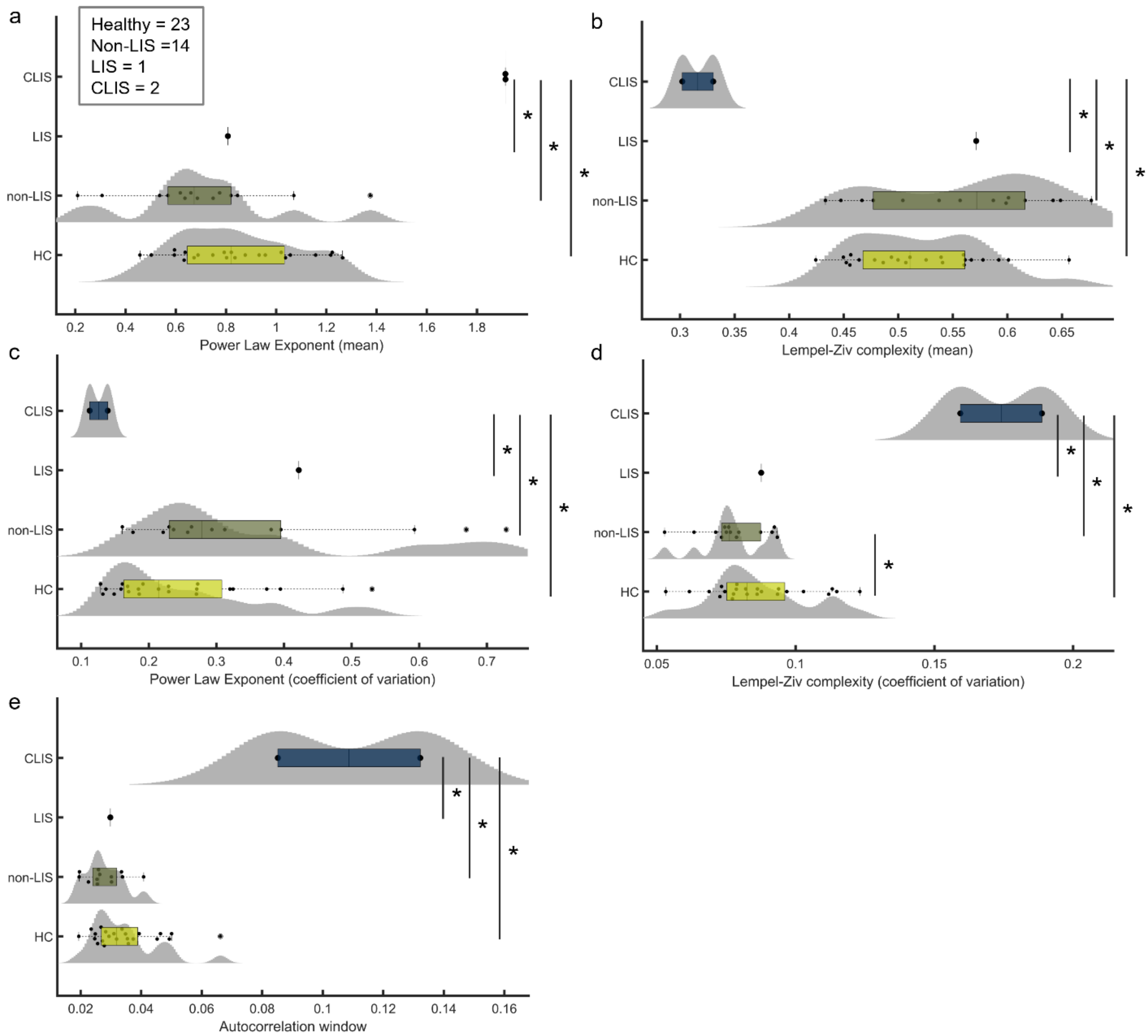
Supplementary Fig. 6: Sleep dataset analysis with 5-sec window, 50% overlap, and Autocorrelation window calculation.



Supplementary Fig. 7: Analysis of the anesthesia dataset with a 5-sec window, 50% overlap, and Autocorrelation window calculation.



Supplementary Fig. 8: CLIS dataset analysis with 5-sec window, 50% overlap, and Autocorrelation window calculation.



Supplementary Fig. 9: ALS dataset analysis with 5-sec window, 50% overlap, and Autocorrelation window calculation.

Supplementary Tables

Parameter	Awake state	Anaesthetic state	P-value
Sevoflurane anaesthesia			
HR (beats/min)	69.5±7.6	67.8±7.5	0.37
SBP (mmHg)	125.2±13.7	101.2±23.7	<0.01
DBP (mmHg)	71.2±9.6	56.3±17.9	<0.01
RR（times/min）	13.2±1.6	10.7±1.0	0.01
SpO_2（%）	98.5±1.4	99.0±0.6	0.08
PaO_2 (mmHg)	105.5±17.4	451.5±155.8	<0.01
$PaCO_2$ (mmHg)	38.9±3.5	39.1±3.7	0.28
PH	7.43±0.05	7.42±0.01	0.55
Ketamine anaesthesia			
HR (beats/min)	75.2±13.0	86.3±14.0	0.02
SBP (mmHg)	137.5±18.3	151.5±18.0	<0.01
DBP (mmHg)	73.2±15.2	84.9±8.3	0.01
RR（times/min）	13.4±1.6	11.4±1.3	0.04
SpO_2（%）	98.1±1.4	99.2±0.6	0.08
PaO_2 (mmHg)	105.5±12.1	451.5±150.8	<0.01
$PaCO_2$ (mmHg)	39.6±3.1	41.8±4.3	0.38
PH	7.43±0.05	7.42±0.01	0.75

Note: HR=heart rates; SBP=systolic blood pressure; DBP=diastolic blood pressure; RR=respiratory rates; SpO2=pulse oxygen saturation; PaO2 = partial oxygen pressure and PaCO2 = partial carbon dioxide pressure.

Supplementary Table 1: Clinical data before and after anaesthesia in two anaesthesia groups.

Supporting References

1. Honey, C. J. *et al.* Slow Cortical Dynamics and the Accumulation of Information over Long Timescales. *Neuron* **76**, 423–434 (2012).

2. Wolff, A. *et al.* The temporal signature of self: Temporal measures of resting-state EEG predict self-consciousness. *Hum Brain Mapp* (2019) doi:10.1002/hbm.24412.