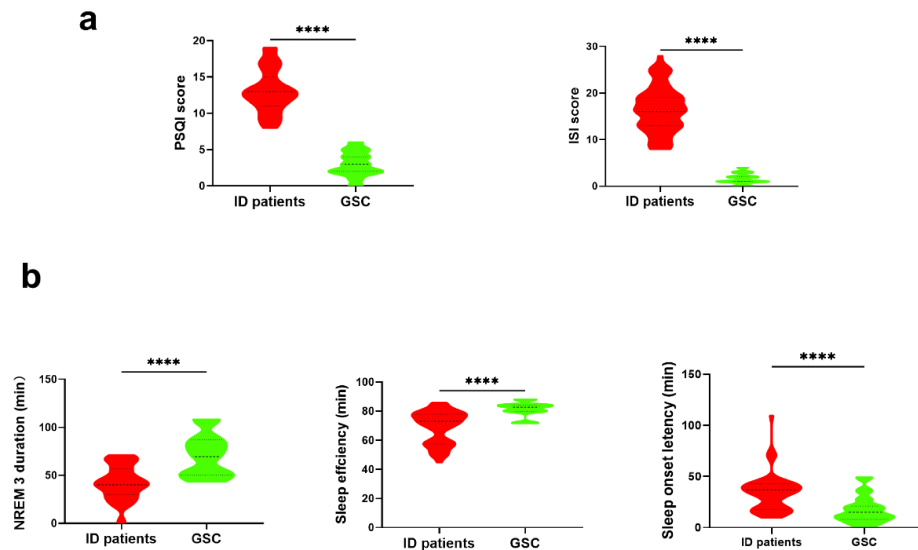**Supplementary Figure 1**

Microstate analysis process. a. For each subject, data at global maxima of the global field power are clustered using the modified k-means algorithm to obtain individual microstate maps. **b.** The individual maps are combined to obtain group maps within each group using group-level clusters. **c.** Group maps are fit back to the data at global field power peaks assigning each global field power peak to the microstate class with the highest topographical correlation.

Supplemental material

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Differences in sleep quality between ID patients and GSC at baseline

Supplementary Figure 2

Differences in sleep quality between insomnia disorder patients and good sleep controls at baseline. Polysomnography data from two participants in the good sleep controls group were excluded from the analysis due to poor data quality. **a.** Differences in subjective sleep quality (PSQI, ISI) between insomnia disorder patients and good sleep controls at baseline. **b.** Differences in objective sleep quality (non-rapid eye movement sleep stage 3 duration, sleep efficiency, sleep onset latency) between insomnia disorder patients and good sleep controls at baseline. *Note:* ns = not significant, $*P < 0.05$, $**P < 0.01$, $***P < 0.001$, $****P < 0.0001$; ID, insomnia disorder; GSC, good sleep controls; PSQI, Pittsburgh Sleep Quality Index; ISI, Insomnia Severity Index; NREM, non-rapid eye movement.

Table S1. Demographic and behavioural measures.

Variable	ID patients (N = 60)	GSC (N = 40)	Statistics	
	Mean (SD)	Mean (SD)	t-test	p value
Age	48.886 (11.795)	43.378 (7.414)	-2.635	0.010
PSQI	13.958 (2.790)	3.162 (1.500)	-22.861	<0.001
ISI	16.125 (4.867)	1.702 (1.102)	-19.880	<0.001
ESS	7.979 (4.953)	5.649 (3.441)	-2.556	0.012
BDI	14.125 (8.122)	4.338 (4.053)	-7.258	<0.001
BAI	35.105 (7.299)	26.212 (2.051)	-8.040	<0.001
MoCA	26.500 (4.01)	28.054 (3.018)	1.968	0.052
MMSE	27.542 (2.32)	29.297 (1.175)	4.535	<0.001

Note: ID, insomnia disorder; GSC, good sleep controls; SD, Standard Deviation.

Table S2. Demographic and behavioural measures.

Variable	ID patients (N = 86, male/female = 42/44)
	Mean (SD)
Age	47.5 (11.35)
PSQI	12.95 (3.50)

Note: PSQI, Pittsburgh Sleep Quality Index; ID, insomnia disorder; SD, Standard Deviation.

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Table S3. Comparison of electroencephalography microstate temporal parameters between the good sleep controls group and insomnia disorder group.

	Microstate class	ID patients (n = 48)	GSC (n = 37)	Statistics		
		Mean (SD)	Mean (SD)	t-test	p value	P_{FDR}
Duration (s)	A	0.075 (0.011)	0.073 (0.013)	-1.083	0.282	0.676
	B	0.064 (0.010)	0.063 (0.007)	-0.121	0.904	0.986
	C	0.067 (0.011)	0.067 (0.011)	-0.045	0.964	0.964
	D	0.069 (0.012)	0.070 (0.012)	0.446	0.657	0.985
Occurrence (times/s)	A	4.116 (0.538)	3.979 (0.771)	-0.962	0.339	0.581
	B	3.056 (0.812)	3.131 (0.864)	0.414	0.680	0.906
	C	3.669 (0.697)	3.457 (0.806)	-1.303	0.196	0.589
	D	3.606 (0.840)	4.057 (0.540)	2.999	0.004	**0.021**
Contribution (%)	A	0.310 (0.051)	0.282 (0.070)	-1.605	0.040	0.160
	B	0.197 (0.062)	0.193 (0.059)	0.325	0.948	1.034
	C	0.246 (0.062)	0.227 (0.066)	-0.981	0.198	0.396
	D	0.241 (0.070)	0.296 (0.060)	3.798	0.0003	**0.003**

Note: ID, insomnia disorder; GSC, good sleeper controls; SD, Standard Deviation.

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Table S4. Specific performance of each fold of the efficacy prediction mode.

	Accuracy	Precision	Recall	F1-score	AUC
Fold-1	0.78	0.84	0.78	0.76	0.80
Fold-2	1.00	1.00	1.00	1.00	1.00
Fold-3	0.78	0.85	0.78	0.77	0.75
Fold-4	0.78	0.78	0.78	0.78	0.80
Fold-5	0.78	0.84	0.78	0.76	0.85
Fold-6	0.78	0.84	0.78	0.76	0.80
Fold-7	0.75	0.75	0.75	0.75	0.81
Fold-8	0.75	0.83	0.75	0.73	0.69
Fold-9	1.00	1.00	1.00	1.00	1.00
Fold-10	0.63	0.63	0.62	0.62	0.81
Average	0.80	0.83	0.80	0.79	0.83

Note: AUC, Area Under the Curve.