Supplemental Tables

Table S1: Mean proportions of time spent in different sleep stages out of total time asleep. Sleep efficiency denotes time spent in Stages 1-4 or REM between sleep onset and last wake up.

	mean	***s.d.***
Stage1	28%	21%
Stage2	41%	15%
Stage3	12%	9%
Stage4	3%	4%
REM	16%	9%
Sleep time	8.42h	2.00h
Sleep efficiency	90%	10%

Table S2a: Length of artifact free NREM data segments ('dataminutes'), total number of events and event densities (n events/dataminutes) for SOs, spindles and ripples detected in the hippocampus.

	HC						
		SOs		***spindles***		***ripples***	
participant	***dataminutes***	***n events***	***density***	***n events***	***density***	***n events***	***density***
p01	122	421	3.4	674	5.5	75	0.6
p02	104	319	3.1	378	3.6	280	2.7
p03	215	1015	4.7	1487	6.9	194	0.9
p04	169	530	3.1	572	3.4	207	1.2
p05	162	450	2.8	523	3.2	107	0.7
p06	120	382	3.2	517	4.3	83	0.7
p07	187	743	4.0	1340	7.2	162	0.9
p08	160	886	5.6	1725	10.8	348	2.2
p09	147	479	3.3	683	4.6	112	0.8
p10	145	579	4.0	953	6.6	83	0.6
p11	50	186	3.7	184	3.7	104	2.1
p12	157	544	3.5	816	5.2	233	1.5
mean	**145**	**545**	**3.7**	**821**	**5.4**	**166**	**1.2**
s.d.	**42**	**236**	**0.8**	**470**	**2.2**	**88**	**0.7**

Table S2b: Length of artifact free NREM data segments ('dataminutes'), total number of events and event densities (n events/dataminutes) for SOs and spindles detected at Cz.

		Cz			
		SOs		***spindles***	
participant	***dataminutes***	***n events***	***density***	***n events***	***density***
p01	180	1045	5.8	1494	8.3
p02	169	748	4.4	1215	7.2
p03	277	1504	5.4	2407	8.7
p04	231	1096	4.7	1466	6.3
p05	244	748	3.1	2299	9.4
p06	179	1045	5.9	1074	6.0
p07	257	1422	5.5	1506	5.9
p08	165	784	4.7	1391	8.4
p09	227	1123	4.9	1903	8.4
p10	148	673	4.6	1182	8.0
p11	86	676	7.8	513	5.9
p12	189	782	4.2	1313	7.0
mean	**196**	**971**	**5.1**	**1480**	**7.5**
s.d.	**53**	**283**	**1.2**	**523**	**1.2**

Table S3a. EEG SO metrics and results for SO-spindle coupling using various event detection criteria. EEG metrics include the number of detected events (avg n) as well as the across-participant average of the peak, trough and peak-to-peak amplitude after bandpass filtering the EEG in the SO frequency ranges. PAC results include (i) the change in spindle power (12–16 Hz, relative to the –2.5 s to –1.5 s pre-event baseline) during the SO up-state (.25 s to .75 s relative to maximal down-state) along with results of a two-tailed t-test against 0, (ii) P values of a V-test against the hypothesized mean direction of 180° (i.e., modulation by the SO up-state) and (iii) number of significant participant-specific Rayleigh tests against the H_0 of uniform distribution of preferred phase angles across all detected events (in the overall group of 12 participants). Percentiles denote the p2p amplitude cut-off, such that only the top 25% SOs were included for the 75th percentile criterion. *Mean + 2SD* denotes the SOs whose p2p amplitude $\geq$ mean + 2 standard deviations of all SO candidates. *Multi-event SOs* denotes SOs that were preceded and/or followed by another SO down-state within $\pm$1.3 s (~.75 Hz). *75th perc., cons.art.det.* denotes SOs whose p2p amplitude $\geq$ 75th percentile (i.e., the top 25%), as used in the main text, but after raising the thresholds for automated artifact detection (resulting in fewer rejected data segments).

Hippocampus	avg n	SO EEG			PAC				
		µV peak	µV trough	µV p2p	spindle power (.25–.75 s, 12–16 Hz)			V-test (180°) P value	individually significant (Rayleigh test)
					% change	*t*	*p*		
75th percentile	545	134.5	-130.4	264.9	45.6	3.90	.003	.001	9
75th percentile (both half-waves ≥ 400 ms)	527	130.2	-128.0	258.2	44.0	3.75	.003	.001	9
75th percentile (for both half-waves separately)	258	150.9	-151.1	302.1	51.5	3.60	.004	.005	9
75th - 95th percentile	482	115.9	-109.4	225.3	39.3	3.80	.003	.001	11
80th percentile	482	137.6	-134.1	271.7	48.5	4.07	.002	.001	9
85th percentile	362	148.7	-144.5	293.2	52.3	3.86	.003	.000	9
90th percentile	241	161.5	-161.3	322.8	56.8	3.62	.004	.003	9
mean + 2SD	93	194.8	-202.9	397.7	57.7	3.80	.003	.047	7
multi-event SOs	133	136.7	-135.8	272.5	21.7	3.03	.015	.041	8
75th perc., cons.art.det.	781	146.7	-140.4	287.0	49.5	4.40	.001	.001	10

Cz	avg n	SO EEG			PAC				
		µV peak	µV trough	µV p2p	spindle power (.25–.75 s, 12–16 Hz)			V-test (0°) P value	individually significant (Rayleigh test)
					% change	*t*	*p*		
75th percentile	971	31.1	-31.2	62.2	27.3	5.73	.000	.004	10
75th percentile (both half-waves ≥ 400 ms)	872	31.3	-31.5	62.8	28.2	5.82	.000	.004	10
75th percentile (for both half-waves separately)	487	36.8	-36.9	73.7	35.8	4.83	.001	.003	11
75th - 95th percentile	804	26.4	-26.4	52.8	23.5	5.97	.000	.020	8
80th percentile	803	33.1	-33.3	66.4	29.1	5.54	.000	.004	12
85th percentile	602	36.2	-36.6	72.8	34.3	6.33	.000	.001	11
90th percentile	402	40.5	-41.1	81.7	40.0	5.15	.000	.002	10
mean + 2SD	202	47.5	-48.2	95.8	45.9	4.70	.001	.009	9
multi-event SOs	317	32.3	-32.8	65.1	21.5	4.99	.000	.001	10
75th perc., cons.art.det.	1226	33.5	-33.8	67.3	28.9	5.41	.000	.008	12

Table S3b. EEG spindle metrics and results for spindle-ripple coupling using various event detection criteria. EEG metrics include the number of detected events (avg n) as well as the across-participant average of the peak, trough and peak-to-peak amplitude after bandpass filtering the EEG in the spindle range. PAC results include (i) the change in ripple power (80–100 Hz, relative to the –2.5 s to –1.5 s pre-event baseline) from –.25 s to +.25 s relative to the maximal spindle trough (HC) or peak (Cz) along with results of a two-tailed t-test against 0, (ii) P values of a V-test against the hypothesized mean direction of 180° (HC, i.e., modulation by the spindle trough) or 0° (Cz, i.e., modulation by the spindle peak) and (iii) number of significant participant-specific Rayleigh tests against the H_0 of uniform distribution of preferred phase angles across all detected events (in the overall group of 12 participants). Percentiles denote the RMS amplitude cut-off, such that only the top 25% spindles were included for the 75th percentile criterion. *Mean + 2SD* denotes the spindles whose RMS amplitude ≥ mean + 2 standard deviations of all spindle candidates. *75th perc., cons.art.det.* denotes spindles whose RMS amplitude ≥ 75th percentile (i.e., the top 25%), as used in the main text, but after raising the thresholds for automated artifact detection (resulting in fewer rejected data segments).

		spindle EEG			***PAC***				
Hippocampus	**avg n**	**µV peak**	**µV trough**	**µV p2p**	**ripple power (±.25 s, 80–100 Hz)**			**V-test (180°) P value**	**individually significant (Rayleigh test)**
					% change	*t*	*p*		
75th percentile	821	59.8	-59.8	119.6	17.9	4.59	.001	.010	11
80th percentile	664	63.6	-63.6	127.1	17.9	5.89	.000	.010	12
85th percentile	496	68.2	-68.2	136.5	19.9	6.76	.000	.007	11
90th percentile	317	74.5	-74.5	149.1	20.3	6.89	.000	.006	11
mean + 2SD	150	83.9	-84.0	167.8	21.0	3.63	.004	.002	10
75th perc., cons.art.det.	1170	63.6	-63.5	127.1	19.8	4.41	.001	.011	12

		spindle EEG			***PAC***				
Cz	**avg n**	**µV peak**	**µV trough**	**µV p2p**	**ripple power (±.25 s, 80–100 Hz)**			**V-test (0°) P value**	**individually significant (Rayleigh test)**
					% change	*t*	*p*		
75th percentile	1480	12.5	-12.5	25.0	0.3	0.59	.567	.829	2
80th percentile	1182	13.2	-13.2	26.4	-0.4	0.58	.573	.724	3
85th percentile	877	14.1	-14.1	28.2	0.0	0.03	.975	.906	1
90th percentile	558	15.3	-15.3	30.7	-0.3	0.26	.802	.826	0
mean + 2SD	257	17.2	-17.2	34.5	1.1	0.93	.371	.893	0
75th perc., cons.art.det.	1805	12.7	-12.7	25.4	1.0	1.98	.074	.650	2

Table S3c. Results for spindle-ripple coupling *in ripple-locked TFR* using various event detection criteria. PAC results include the change in spindle power (12–16 Hz, relative to the –1.5 s to –1.0 s pre-event baseline) from –.25 s to +.25 s relative to the ripple peak along with results of a two-tailed t-test against 0. Percentiles denote the RMS amplitude cut-off, such that only the top 1% ripples were included for the 99th percentile criterion. *Mean + 3SD* denotes the ripples whose RMS amplitude ≥ mean + 3 standard deviations of all ripple candidates. *99th perc., cons.art.det.* denotes ripples whose RMS amplitude ≥ 99th percentile (i.e., the top 1%), as used in the main text, but after raising the thresholds for automated artifact detection (resulting in fewer rejected data segments).

		PAC		
Hippocampus	**avg n**	**spindle power (±.25 s, 12–16 Hz)**		
		% change	*t*	*p*
99th percentile	166	65.5	4.49	.001
98th percentile	354	43.0	4.45	.001
mean + 3SD	203	60.0	4.37	.001
99th perc., cons.art.det.	238	67.5	4.53	.001

Table S4. Participant's drug regimen at the time of recordings

participant	Anticonvulsant	Antidepressant
p01	Clobazam, Valproat	-
p02	Clobazam, Valproat	-
p03	Lamotrigin, Levetiracetam	-
p04	Lacosamide, Levetiracetam	-
p05	Lamotrigin, Levetiracetam	-
p06	Lamotrigin, Oxcarbazepin	-
p07	Lamotrigin, Oxcarbazepin	Citalopram
p08	Lamotrigin	-
p09	Levetiracetam	-
p10	Lamotrigin	Sertralin
p11	Levetiracetam, Oxcarbazepin	-
p12	Oxcarbazepin	-

Table S5. Documented effects of anticonvulsant and antidepressant drugs on sleep architecture/oscillations. ↑ … increase ↓ … decrease. N1-3 … sleep stages according to Iber, C., Ancoli-Israel, S., Chesson, A. & Quan, S.F. The AASM manual for the scoring of sleep and associated events: rules, terminology and technical specifications. (2007). 1 … D. Neckelmann, B. Bjorvatn, A. Bjørkum, R. Ursin, Behavioural brain research 79, 183 (1996). 2 ... A. L. van Bemmel, R. H. van den Hoofdakker, D. G. Beersma, A. L. Bouhuys, Psychopharmacology 113, 225 (1993). 3 ... S. Wilson et al., European neuropsychopharmacology 14, 367 (2004). 4 ... S. V. Jain, T. A. Glauser, Epilepsia 55, 26 (2014). 5 … J. D. Hudson et al., Seizure 25, 155 (2014). 6 ... R. D. Jindal et al., Journal of clinical psychopharmacology 23, 540 (2003).

Drug	Effects on sleep structure
Citalopram	REM ↓; REM alpha power ↓ ([1-3])
Clobazam	N2↑, N1↓, SWS↓ ([4])
Lacosamide	none ([5])
Lamotrigin	REM↑, N2↑, SWS↓ ([4])
Levetiracetam	N2↑, REM↓ ([4])
Oxcarbazepin	unknown
Sertralin	delta power ↑ during first sleep cycle ([6])
Valproat	N1↑, REM↑ ([4])