

Supplementary Materials S1: Hemispheres- Frontal connectivity

Table S1 Repeated measures Anova with Session as repeated factors and Hand as between factors for the three windows of interest ($w1$, $w2$ and $w3$) and the two-connectivity metrics, PLV (left) and wPLI (right) for the right hemisphere-frontal connectivity. Statistically significant values are shadowed in grey with the respective p values in bold.

RHem - Frontal	PLV			wPLI		
	$w1$	$w2$	$w3$	$w1$	$w2$	$w3$
Session	F=8.8, p<0.001 BF ₁₀ = 697.17 , BF _{incl} =482.10	F=8.2, p<0.001 BF ₁₀ = 304.78 , BF _{incl} =482.10	F=8.2, p<0.001 BF ₁₀ = 637.80 , BF _{incl} =439.63	F=4.49, p=0.015 BF ₁₀ = 6.020 , BF _{incl} =4.13	F=5.29, p=0.008 BF ₁₀ = 11.562 , BF _{incl} =8.136	F=4.30, p=0.018 BF ₁₀ = 3.910 , BF _{incl} =2.755
Hand	F=0.02,p=0.87 BF ₁₀ =0.248, BF _{incl} =0.196	F=0.02,p=0.97 BF ₁₀ =0.279, BF _{incl} =0.198	F=0.00, p=0.99 BF ₁₀ =0.249 BF _{incl} =0.194	F=0.05,p=0.816 BF ₁₀ =0.277, BF _{incl} =0.206	F=0.31,p=0.584 BF ₁₀ =0.281, BF _{incl} =0.231	F=0.402,p=0.67 BF ₁₀ =0.317, BF _{incl} =0.251
Session *Hand	F=0.04,p=0.96 BF ₁₀ =177.70, BF _{incl} =0.127	F=0.02,p=0.98 BF ₁₀ =78.56, BF _{incl} =0.128	F=0.01, p=0.992 BF ₁₀ =160.69 BF _{incl} =0.127	F=0.14,p=0.868 BF ₁₀ =1.612, BF _{incl} =0.127	F=0.40,p=0.671 BF ₁₀ =3.340, BF _{incl} =0.181	F=4.02,p=0.529 BF ₁₀ =1.246, BF _{incl} =0.178

Table S2 Repeated measures Anova with Session as repeated factors and Hand as between factors for the three windows of interest ($w1$, $w2$ and $w3$) and the two-connectivity metrics, PLV (left) and wPLI (right) for the right hemisphere-frontal connectivity. Statistically significant values are shadowed in grey with the respective p values in bold.

LHem- Frontal	PLV			wPLI		
	$w1$	$w2$	$w3$	$w1$	$w2$	$w3$
Session	F=16.8, p<0.001 BF ₁₀ = 285202.44 , BF _{incl} =197355.38	F=15.1, p<0.001 BF ₁₀ = 66300.06 BF _{incl} =45682.4	F=16.5, p<0.001 BF ₁₀ = 188967.1 BF _{incl} =131181.0	F=3.38, p=0.040 BF ₁₀ = 1.85 , BF _{incl} =1.13	F=2.43, p=0.096 BF ₁₀ =0.868 BF _{incl} =0.605	F=3.21, p=0.047 BF ₁₀ = 2.12 , BF _{incl} =1.486
Hand	F=0.001,p=0.97 BF ₁₀ =0.250, BF _{incl} =0.198	F=0.016,p=0.90 BF ₁₀ =0.256, BF _{incl} =0.199	F=0.06,p=0.79 BF ₁₀ =0.252 BF _{incl} =0.203	F=0.05,p=0.825 BF ₁₀ =0.296 BF _{incl} =0.243	F=0.00,p=0.930 BF ₁₀ =0.279 BF _{incl} =0.204	F=0.06,p=0.803 BF ₁₀ =0.262 BF _{incl} =0.208
Ses- sion*Hand	F=0.010,p=0.99 BF ₁₀ =73413.86, BF _{incl} =0.127	F=0.013,p=0.99 BF ₁₀ =16894.79, BF _{incl} =0.137	F=0.01,p=0.99 BF ₁₀ =49308.56 BF _{incl} =0.137	F=1.09,p=0.342 BF ₁₀ =0.468 BF _{incl} =0.195	F=0.42,p=0.658 BF ₁₀ =0.240 BF _{incl} =0.087	F=0.67,p=0.514 BF ₁₀ =0.551 BF _{incl} =0.164

Table S3 Post-hoc analysis for Session from the right hand-frontal connections. Statistically significant values are shadowed in grey with the respective p values in bold and p -values less than 0.10 are only highlighted in bold. C=Cohens'd value.

RHem - Frontal	PLV			wPLI		
	$w1$	$w2$	$w3$	$w1$	$w2$	$w3$
Pre-Sleep	t=-0.48, p=0.64 C=-0.08 BF ₁₀ =0.21	t=-0.52, p=0.621 C=-0.09 BF ₁₀ =0.214	t=-0.65, p=0.52 C=-0.12 BF ₁₀ =0.230	t=-2.05, p=0.09 C=-0.36 BF ₁₀ = 1.193	t=-2.98, p=0.013 C= -0.58 BF ₁₀ = 7.35	t=-2.54, p=0.032 C= -0.45 BF ₁₀ = 2.954
Pre-Post	t=3.07, p=0.009 C=0.543	t=2.88, p=0.014 C=0.51	t=2.98, p=0.011 C=0.53	t=0.41, p=0.68 C=0.07	t=-0.16, p=0.87 C= -0.03	t=0.49, p=0.62 C=0.09

	BF ₁₀ =8.887	BF ₁₀ =5.890	BF ₁₀ =7.35	BF ₁₀ =0.204	BF ₁₀ =0.191	BF ₁₀ =0.212
Sleep-Post	t=4.43, p<0.001 C=0.78 BF₁₀=236.56	t=4.27, p<0.001 C=0.75 BF₁₀=157.95	t=4.40, p<0.001 C=0.78 BF₁₀=220.77	t=3.53, p=0.04 C=0.62 BF₁₀=25.27	t=3.09, p=0.013 C=0.546 BF₁₀=9.27	t=2.77, p=0.028 C=0.49 BF₁₀=4.701

Table S4 Post-hoc analysis for Session from the left hand-frontal connections. Statistically significant values are shadowed in grey with the respective *p* values in bold. *p*-values less than 0.10 are highlighted in bold.

LHem Frontal	PLV			wPLI		
	w1	w2	w3	w1	w2	w3
Pre-Sleep	t=-4.44, p<0.001 C= -0.78 BF₁₀=240.94	t=-4.44, p<0.001 C= -0.78 BF₁₀=242.97	t=-4.69, p<0.001 C= -0.83 BF₁₀=471.61	t=-2.39, p=0.069 C= -0.43 BF₁₀=2.202	t=-1.82,p=0.234 C=-0.31 BF ₁₀ =0.824	t=-2.10, p=0.088 C=-0.37 BF ₁₀ =1.294
Pre-Post	t=1.22, p=0.232 C=0.21 BF ₁₀ =0.371	t=1.02, p=0.317 C=0.18 BF ₁₀ =0.303	t=1.06, p=0.299 C=0.18 BF ₁₀ =0.315	t=0.16, p=0.869 C=0.029 BF ₁₀ =0.191	t=-1.78, p=0.234 C=-0.31 BF ₁₀ =0.772	t=0.39, p=0.699 C=0.029 BF ₁₀ =0.203
Sleep-Post	t=6.23, p<0.001 C=1.10 BF₁₀=26781.00	t=5.99, p<0.001 C=1.05 BF₁₀=13344.29	t=6.08, p<0.001 C=1.07 BF₁₀=17817.57	t=2.13, p=0.082 C=0.37 BF ₁₀ =1.363	t=0.08, p=0.939 C=0.01 BF ₁₀ =0.189	t=2.31, p=0.082 C=0.41 BF ₁₀ =1.899

Table S5 Paired t-test for Hand (Right versus Left) for PLV (top row) and wPLI (bottom row) connectivity metrics. Statistically significant values are shadowed in grey with the respective p values in bold. p-values less than 0.10 are highlighted in bold.

LHem - F	PLV				
	Statistic	df	p	Effect size	BF ₁₀
Pre w1	-0.436	15	0.669	-0.109	0.27
Sleep w1	0.013	15	0.990	0.003	0.25
Post w1	0.974	15	0.345	0.244	0.38
Pre w2	-1.200	15	0.249	-0.300	0.47
Sleep w2	-0.316	15	0.756	-0.079	0.26
Post w2	0.275	15	0.787	0.069	0.26
Pre w3	-1.43	15	0.174	-0.357	0.600
Sleep w3	-0.775	15	0.450	-0.194	0.332
Post w3	-0.617	15	0.547	-0.154	0.302

RHem - F	PLV				
	Statistic	df	p	Effect size	BF ₁₀
Pre w1	1.248	15	0.231	0.312	0.49
Sleep w1	-1.681	15	0.113	-0.420	0.81
Post w1	1.772	15	0.097	0.443	0.91
Pre w2	82.00	15	0.495	0.206	0.48
Sleep w2	-0.784	15	0.445	-0.206	0.33
Post w2	-0.049	15	0.961	-0.012	0.25
Pre w3	0.689	15	0.501	0.172	0.315
Sleep w3	-1.054	15	0.309	-0.264	0.412
Post w3	0.121	15	0.906	0.030	0.257

LHem - F	wPLI				
	Statistic	df	p	Effect size	BF ₁₀
Pre w1	0.253	15	0.804	0.063	0.486
Sleep w1	-0.295	15	0.772	-0.074	0.257
Post w1	0.530	15	0.604	0.133	0.258
Pre w2	0.964	15	0.350	0.241	0.290
Sleep w2	-0.250	15	0.806	-0.062	0.330
Post w2	0.219	15	0.830	0.055	0.363
Pre w3	-1.326	15	0.205	-0.331	0.314
Sleep w3	-0.577	15	0.573	-0.144	0.390
Post w3	0.168	15	0.869	0.042	0.398

RHem - F	wPLI				
	Statistic	df	p	Effect size	BF ₁₀
Pre w1	-1.229	15	0.238	-0.307	0.263
Sleep w1	-0.538	15	0.598	-0.135	0.382
Post w1	0.686	15	0.503	0.172	0.536
Pre w2	0.103	15	0.919	0.026	0.264
Sleep w2	0.764	15	0.457	0.191	0.263
Post w2	-0.991	15	0.337	0.191	0.296
Pre w3	-0.149	15	0.869	0.042	0.289
Sleep w3	0.899	15	0.383	0.225	0.261
Post w3	-1.015	15	0.326	-0.254	0.259

Wilcoxon signed-rank test is used when normality (Shapiro-Wilk test) assumption is violated. In this case effect size is given by the matched rank bi-serial correlation. Otherwise, Student t-test and Cohen's d for measure effect size are used.

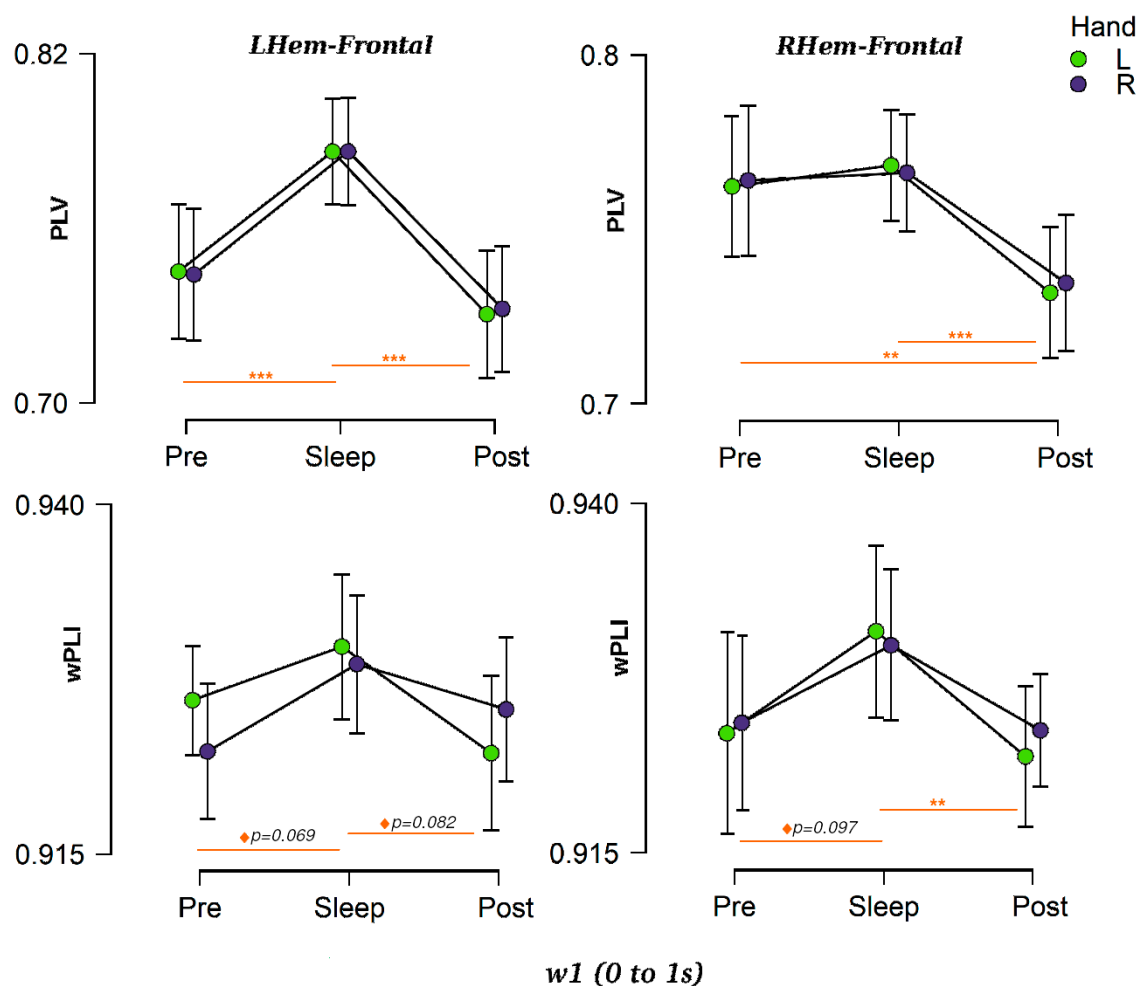


Figure S1. Hemisphere to frontal connectivity for w1 in each session (Pre, Sleep and Post sleep) for PLV (up) and wPLI (down), left hemisphere-frontal (LHem-F) on the first column and right hemisphere - frontal (RHem-F) in the second column. Purple indicates the connectivity for R hand trials and green dots for L hand trials. Horizontal bars represent 95% confident intervals and those sessions statistically significant are indicated by *** for $p < 0.001$, ** $p < 0.01$, * for $p < 0.05$ and ° $p < 0.10$.

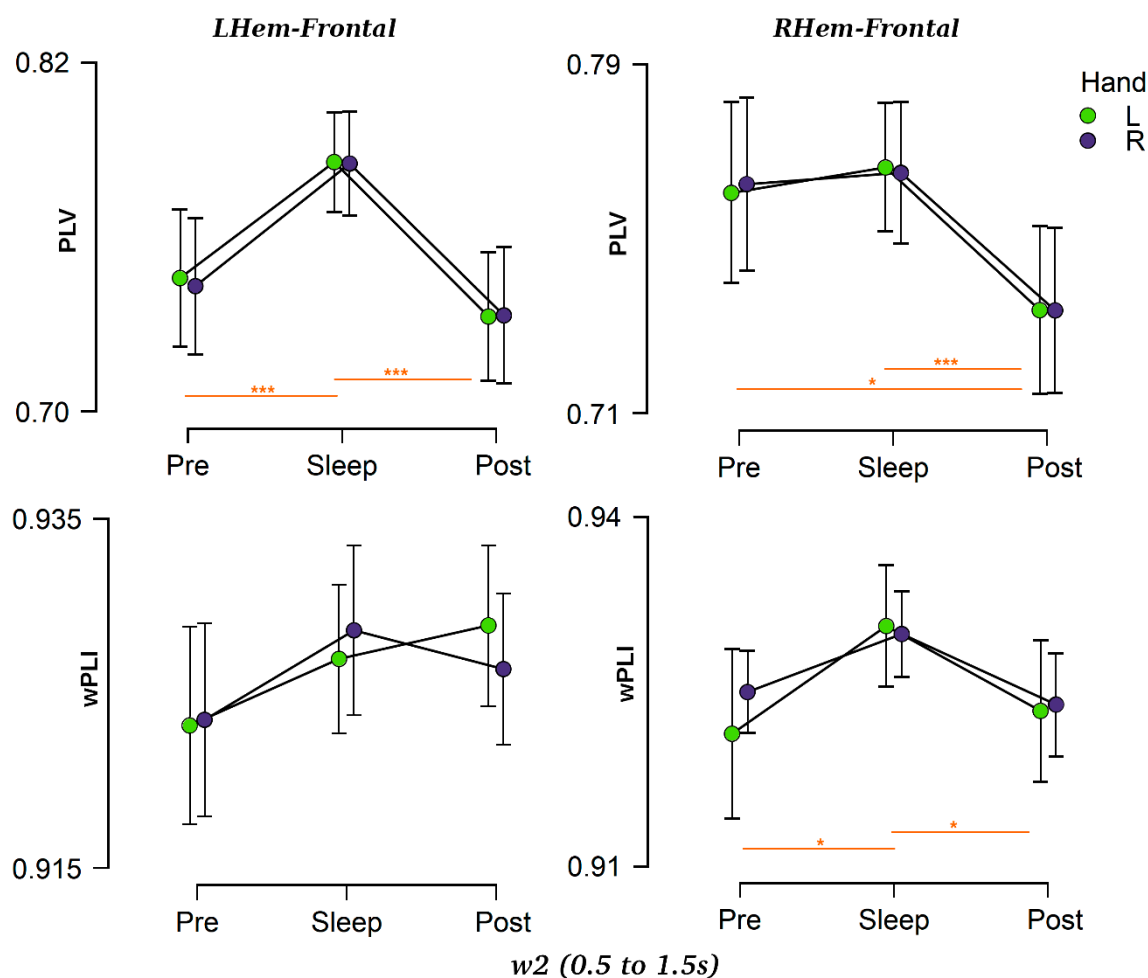


Figure S2. Hemisphere to frontal connectivity for $w2$ in each session (Pre, Sleep and Post sleep) for PLV (up) and wPLI (down), left hemisphere -frontal (LHem-F) on the first column and right hemisphere -frontal (RHem-F) in the second column. Purple dots indicate the connectivity for R hand trials and green dots for L hand trials. Horizontal bars represent 95% confident intervals and those sessions statistically significant are indicated by *** for $p<0.001$, ** $p<0.01$, * for $p<0.05$ and ° $p<0.10$.

Supplementary Materials S2: between hemispheres connectivity

Table S6 RM-Anova results for between hemispheres connectivity (RHem-LHem), PLV (left) and wPLI (right) for each window of interest ($w1$ to $w3$).

RHem - LHem	PLV			wPLI		
	$w1$	$w2$	$w3$	$w1$	$w2$	$w3$
Session	F=33.0, $p<0.001$ BF ₁₀ =4.33E10 BF _{incl} =2.98E10	F=34.38, $p<0.001$ BF ₁₀ =1.15E11 BF _{incl} =8.31E10	F=35.3, $p<0.001$ BF ₁₀ =1.87E11 BF _{incl} =1.30E11	F=0.73, $p=0.48$ BF ₁₀ =0.180 BF _{incl} =0.128	F=0.09, $p=0.91$ BF ₁₀ =0.105 BF _{incl} =0.074	F=8.92, $p<0.001$ BF ₁₀ =186.766 BF _{incl} =137.87
Hand	F=0.02, $p=0.88$ BF ₁₀ =0.257 BF _{incl} =0.199	F=0.01, $p=0.906$ BF ₁₀ =0.258 BF _{incl} =0.243	F=0.08, $p=0.77$ BF ₁₀ =0.253 BF _{incl} =0.207	F=0.25, $p=0.62$ BF ₁₀ =0.295 BF _{incl} =0.206	F=0.32, $p=0.58$ BF ₁₀ =0.297 BF _{incl} =0.202	F=0.24, $p=0.625$ BF ₁₀ =0.283 BF _{incl} =0.280

Session*Hand	F=0.00, p=0.98 BF ₁₀ =1.11E10 BF _{incl} =0.130	F=0.002, p=0.98 BF ₁₀ =3.78E10 BF _{incl} =0.105	F=0.01, p=0.98 BF ₁₀ =05.40E10 BF _{incl} =0.128	F=0.76,p=0.47 BF ₁₀ =0.054 BF _{incl} =0.041	F=0.66,p=0.52 BF ₁₀ =0.031 BF _{incl} =0.023	F=1.35,p=0.265 BF ₁₀ =53.262 BF _{incl} =0.418
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Table S7. Post-hoc analysis for Session. Statistically significant values are shadowed in grey with the respective *p* values in bold and *p*-values less than 0.10 are highlighted in bold.

RHem - LHem	PLV			wPLI		
	w1	w2	w3	w1	w2	w3
Pre-Sleep	t=-3.42, p=0.002 C=-0.60 BF₁₀=19.52	t=-3.46, p=0.002 C=-0.61 BF₁₀=21.37	t=-3.51, p=0.001 C=-0.62 BF₁₀=24.72	t=-0.75, p=0.92 C= -0.13 BF ₁₀ =0.245	t=-0.37, p=1 C= -0.13 BF ₁₀ =0.201	t=-2.89, p=0.014 C= -0.51 BF₁₀=5.965
Pre-Post	t=3.73, p=0.002 C=0.66 BF₁₀=41.45	t=3.84, p=0.001 C=0.67 BF₁₀=54.21	t=3.85, p=0.001 C=0.68 BF₁₀=55.03	t=0.52, p=0.92 C= -0.09 BF ₁₀ =0.214	t=-0.33, p=1 C= -0.06 BF ₁₀ =0.199	t=1.76, p=0.087 C= 0.31 BF ₁₀ =0.754
Sleep-Post	t=14.0, p<0.001 C=2.48 BF₁₀=1.19E12	t=14.1, p<0.001 C=-2.50 BF₁₀=1.50E12	t=14.9, p<0.001 C=-2.66 BF₁₀=5.4E12	t=1.10, p=0.841 C=0.19 BF ₁₀ =0.328	t=1.12, p=1 C= 0.22 BF ₁₀ =0.190	t=3.76, p=0.002 C= 0.66 BF₁₀=543.793

Table S8 Paired *t*-test for Hand (Right versus Left) in wPLI connectivity. Statistically significant values are shadowed in grey with the respective *p* values in bold.

RHem - LHem	wPLI				
	Statistic	df	<i>p</i>	Effect size	BF ₁₀
Pre w1	-1.754	15	0.100	-0.439	0.891
Sleep w1	0.010	15	0.992	0.003	0.255
Post w1	0.331	15	0.745	0.083	0.268
Pre w2	-0.319	15	0.754	-0.080	0.267
Sleep w2	1.801	15	0.092	0.450	0.947
Post w2	63.00	15	0.821	-0.074	0.256
Pre w3	-0.872	15	0.397	-0.218	0.356
Sleep w3	0.394	15	0.699	0.099	0.274
Post w3	1.299	15	0.214	0.325	0.521

Supplementary Materials S3: within hemispheres connectivity

Table S9 RM-Anova results for within right hemisphere (RHem) connectivity, PLV (left) and wPLI (right) for each window of interest (w1 to w3).

within RHem	PLV			wPLI		
	w1	w2	w3	w1	w2	w3
Session	F=0.46, p=0.63 BF ₁₀ =0.198 BF _{incl} =0.137	F=1.37, p=0.26 BF ₁₀ =0.302 BF _{incl} =0.214	F=0.18, p=0.84 BF ₁₀ =0.109 BF _{incl} =0.076	F=3.15, p=0.05 BF ₁₀ = 1.427 BF _{incl} =1.044	F=1.49, p=0.23 BF ₁₀ =0.338 BF _{incl} =0.249	F=0.47, p=0.62 BF ₁₀ =0.136 BF _{incl} =0.919

Hand	F=0.002, p=0.96 BF ₁₀ =0.282 BF _{incl} =0.193	F=0.46, p=0.50 BF ₁₀ =0.337 BF _{incl} =0.238	F=0.25, p=0.62 BF ₁₀ =0.328 BF _{incl} =0.223	F=0.96, p=0.33 BF ₁₀ =0.385 BF _{incl} =0.310	F=4.68, p=0.039 BF ₁₀ = 1.600 BF _{incl} =1.112	F=0.659, p=0.42 BF ₁₀ =0.340 BF _{incl} =1.205
Session*Hand	F=0.034, p=0.96 BF ₁₀ =0.056 BF _{incl} =0.023	F=0.64, p=0.53 BF ₁₀ =0.102 BF _{incl} =0.60	F=0.25, p=0.77 BF ₁₀ =0.036 BF _{incl} =0.019	F=0.92, p=0.40 BF ₁₀ =0.564 BF _{incl} =0.211	F=0.15, p=0.86 BF ₁₀ =0.537 BF _{incl} =0.109	F=6.90, p=0.002 BF ₁₀ = 2.667 BF _{incl} =4.384

Table S10 RM-Anova results for within left hemisphere (LHem) connectivity, PLV (left) and wPLI (right) for each window of interest (w1 to w3).

within LHem	PLV			wPLI		
	w1	w2	w3	w1	w2	w3
Session	F=3.26, p=0.057 BF ₁₀ = 1.623 BF _{incl} =1.18	F=3.43, p=0.039 BF ₁₀ = 2.306 BF _{incl} =1.60	F=2.73, p=0.073 BF ₁₀ = 1.292 BF _{incl} =0.896	F=0.22, p=0.80 BF ₁₀ =0.136 BF _{incl} =0.094	F=0.35, p=0.71 BF ₁₀ =0.131 BF _{incl} =0.126	F=0.34, p=0.71 BF ₁₀ =0.128 BF _{incl} =0.134
Hand	F=0.001, p=0.97 BF ₁₀ =0.260 BF _{incl} =0.191	F=0.57, p=0.45 BF ₁₀ =0.313 BF _{incl} =0.233	F=0.21, p=0.64 BF ₁₀ =0.272 BF _{incl} =0.201	F=4.27, p=0.047 BF ₁₀ =0.852 BF _{incl} =0.574	F=0.49, p=0.49 BF ₁₀ =0.295 BF _{incl} =0.241	F=0.31, p=0.58 BF ₁₀ =0.293 BF _{incl} =0.251
Session*Hand	F=0.012, p=0.97 BF ₁₀ =0.417 BF _{incl} =0.088	F=0.16, p=0.85 BF ₁₀ =0.710 BF _{incl} =0.120	F=0.05, p=0.95 BF ₁₀ =0.358 BF _{incl} =0.081	F=0.56, p=0.58 BF ₁₀ =0.101 BF _{incl} =0.047	F=2.06, p=0.14 BF ₁₀ =0.038 BF _{incl} =0.206	F=3.38, p=0.041 BF ₁₀ =0.096 BF _{incl} =0.262

Table S11. Post-hoc analysis for Session (Pre, Sleep, Post) for within right hemisphere (RHem). Statistically significant values are shadowed in grey with the respective p values in bold, p-values less than 0.10 are highlighted in bold. C=Cohen's d for measures of effect size.

within RHem	PLV			wPLI		
	w1	w2	w3	w1	w2	w3
Pre-Sleep	t=-1.05, p=1 C=-0.01 BF ₁₀ =0.361	t=1.34, p=0.57 C=0.24 BF ₁₀ =0.427	t=0.53, p=1 C=0.09 BF ₁₀ =0.216	t=2.92, p=0.10 C=0.39 BF ₁₀ =1.518	t=1.54, p=0.40 C=0.27 BF ₁₀ =0.545	t=0.67, p=1 C=0.11 BF ₁₀ =0.229
Pre-Post	t=0.92, p=1 C=0.16 BF ₁₀ =0.275	t=1.34, p=0.57 C=0.24 BF ₁₀ =0.427	t=0.51, p=1 C=0.07 BF ₁₀ =0.205	t=0.85, p=0.40 C=0.15 BF ₁₀ =0.263	t=1.28, p=0.42 C=0.22 BF ₁₀ =0.400	t=0.74, p=1 C=0.13 BF ₁₀ =0.244
Sleep-Post	t=0.87, p=1 C=0.15 BF ₁₀ =0.203	t=-0.08, p=0.94 C=-0.01 BF ₁₀ =0.189	t=-0.15, p=1 C=-0.03 BF ₁₀ =0.191	t=-1.85, p=0.15 C=-0.33 BF ₁₀ =0.826	t=-0.25, p=0.80 C=-0.04 BF ₁₀ =0.194	t=0.24, p=1 C=0.04 BF ₁₀ =0.194

Table S12. Post-hoc analysis for Session (Pre, Sleep, Post) for within left hemisphere (LHem). Statistically significant values are shadowed in grey with the respective p values in bold, p-values less than 0.10 are highlighted in bold. C=Cohen's d for measures of effect size.

within LHem	PLV	wPLI
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	<i>w1</i>	<i>w2</i>	<i>w3</i>	<i>w1</i>	<i>w2</i>	<i>w3</i>
Pre –Sleep	t=-1.09, p=0.91 C=-0.019 BF ₁₀ =0.192	t=-0.31, p=0.82 C=0.04 BF ₁₀ =0.194	t=-0.04, p=0.97 C=-0.01 BF ₁₀ =0.189	t=-0.23, p=1 C=-0.04 BF ₁₀ =0.194	t=0.71, p=1 C=0.12 BF ₁₀ =0.238	t=-0.57, p=1 C=-0.10 BF ₁₀ =0.220
Pres-Post	t=2.04, p=0.099 C=0.361 BF ₁₀ =0.884	t=1.97, p=0.12 C=0.35 BF ₁₀ =1.040	t=0.33, p=0.15 C=0.33 BF ₁₀ =0.853	t=-0.61, p=1 C=-0.11 BF ₁₀ =0.225	t=0.73, p=1 C=0.13 BF ₁₀ =0.241	t=-0.75, p=1 C=-0.13 BF ₁₀ =0.244
Sleep-Post	t=3.20, p=0.009 C=0.567 BF₁₀=9.687	t=3.72, p=0.002 C=0.66 BF₁₀=40.595	t=2.79, p=0.027 C=0.493 BF₁₀=4.853	t=-0.42, p=1 C=-0.07 BF ₁₀ =0.205	t=0.01, p=1 C=0.02 BF ₁₀ =0.189	t=-0.20, p=1 C=-0.03 BF ₁₀ =0.192

Table S13. Statistical results from paired t-test comparing R vs. L hands for each window and session for within right hemisphere connectivity. Wilcoxon signed-rank test is used when normality (Shapiro-Wilk test) assumption is violated. In this case, effect size is given by the matched rank bi-serial correlation. Otherwise, paired student t-test and Cohen’s d values are stated. All tests were one-tailed.

R vs. L hand		within RHem							
		PLV				wPLI			
		Statistic	<i>p</i>	Effect size	BF ₁₀	Statistic	<i>p</i>	Effect size	BF ₁₀
Pre	w1	-1.18	0.128	-0.29	0.12	0.365	0.640	0.091	0.199
	w2	1.86	0.959	0.46	0.10	-1.85	0.042	-0.46	2.938
	w3	95.0	0.920	0.39	0.21	2.65	0.991	0.66	0.087
Sleep	w1	0.80	0.784	0.20	0.36	-1.603	0.042	-0.401	1.360
	w2	33.0	0.037	-0.51	2.79	-1.46	0.082	-0.36	1.130
	w3	34.0	0.042	-0.50	2.58	-1.55	0.070	-0.38	1.276
Post	w1	-0.60	0.277	-0.15	0.51	-0.817	0.213	-0.20	0.529
	w2	29.0	0.022	-0.57	3.75	-1.53	0.072	-0.38	1.247
	w3	61.0	0.372	-0.10	0.53	-2.49	0.012	-0.62	5.115

Table S14. Statistical results from paired t-test comparing R vs. L hands for each window and session for within left hemisphere connectivity. Wilcoxon signed-rank test is used when normality (Shapiro-Wilk test) assumption is violated. In this case, effect size is given by the matched rank bi-serial correlation. Otherwise, paired student t-test and Cohen's d values are stated. All tests were one-tailed.

R vs. L hand		within LHem							
		PLV				wPLI			
		Statistic	p	Effect size	BF ₁₀	Statistic	p	Effect size	BF ₁₀
Pre	w1	-0.28	0.609	-0.07	0.26	0.62	0.270	0.15	0.437
	w2	79.0	0.298	0.16	0.23	-2.28	0.981	-0.57	0.094
	w3	0.31	0.311	0.12	0.38	-1.49	0.923	-0.37	0.117
Sleep	w1	1.97	0.063	0.49	1.03	0.69	0.250	0.17	0.465
	w2	116.0	0.005	0.70	2.38	1.84	0.042	0.46	1.912
	w3	86.0	0.188	0.26	1.09	1.76	0.049	0.44	1.703
Post	w1	-0.77	0.774	-0.19	0.12	2.05	0.029	0.51	2.602
	w2	85.0	0.202	0.25	0.11	0.77	0.227	0.19	0.053
	w3	104.0	0.033	0.52	2.30	1.50	0.076	0.37	1.195

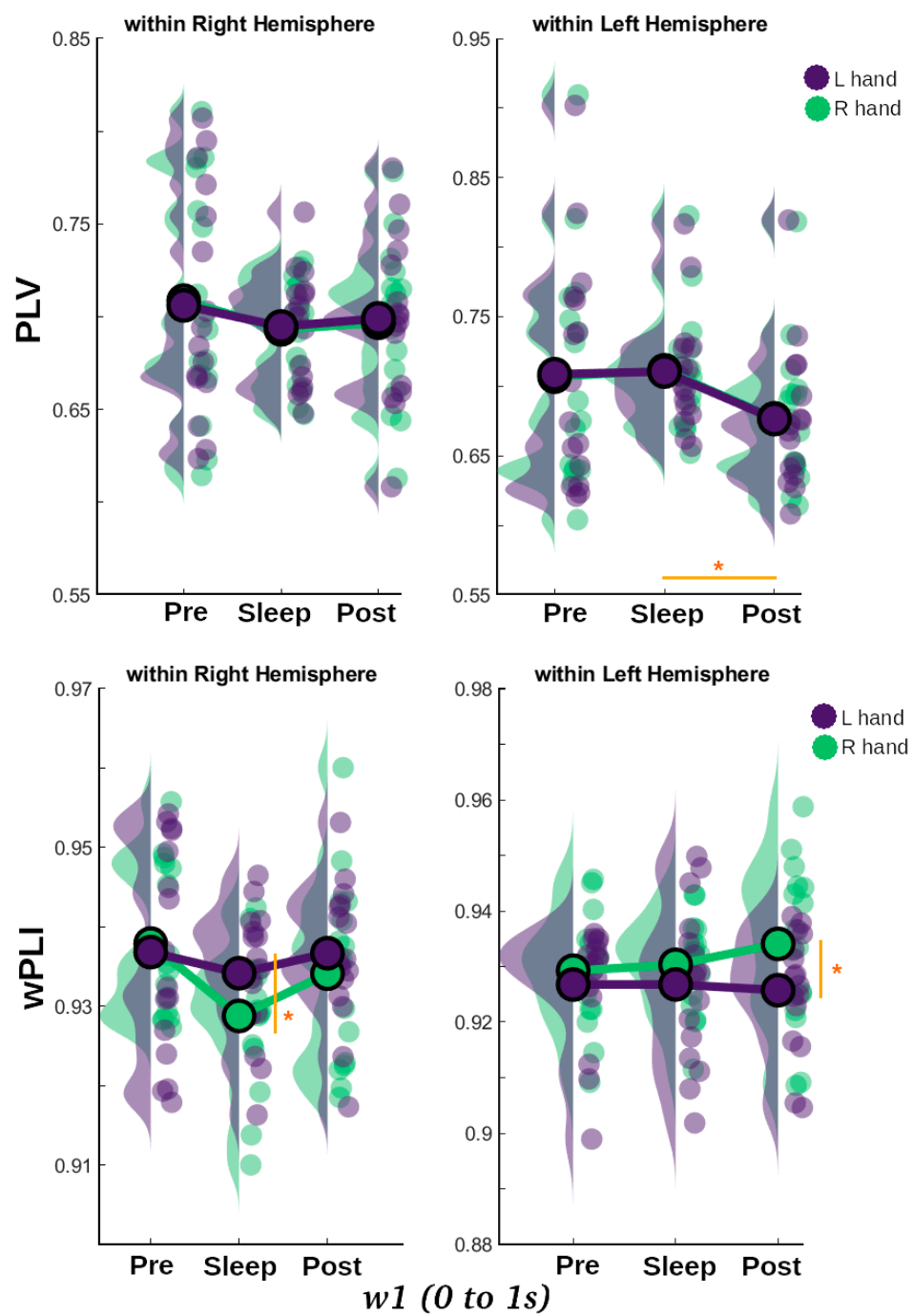


Figure S3. Repeated Measures Anova for PLV (upper row) and wPLI (bottom row) for within right hemisphere (left column) and within left hemisphere (right column) and w1. R hand is shown in green and L hand is represented in purple. Statistically significant results are highlighted in orange (* $p < 0.05$, ** $p < 0.01$, ° $p < 0.09$).

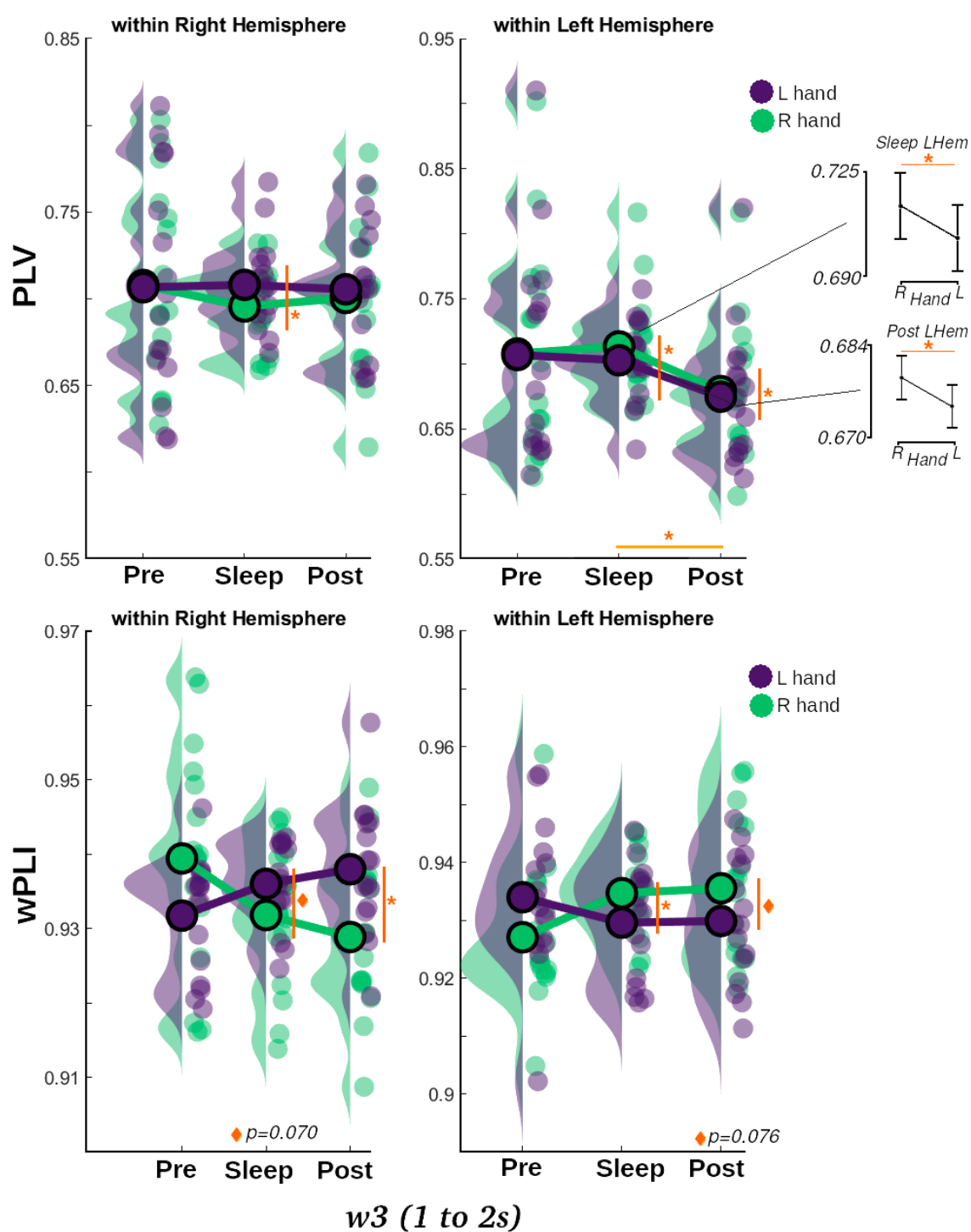


Figure S4. Repeated Measures Anova for PLV (upper row) and wPLI (bottom row) for within right hemisphere (left column) and within left hemisphere (right column) and w3. R hand is shown in green and L hand is represented in purple. Statistically significant results are highlighted in orange (* $p<0.05$, ** $p<0.01$, ◊ $p<0.09$). Top-left corner graph have two zoomed

Supplementary Materials S4: correlations

For each connectivity we calculated within right hemisphere (left column) and within left hemisphere (right column) values, that are also separated by R and L (the former in a yellowish background) hands. Correlation values are expressed by its value *Rho* and the bootstrapped (n=50000) corrected *p*-value. For clarity only correlations under 0.150 are depicted in the tables. Statistically significant correlations are highlighted in bold and darker background.

Table S15 Correlations between within hemispheres PLV-connectivity and behavioural measures.

PLV									
Behaviour	Session	Within Right Hemisphere				Within Left Hemisphere			
		R hand		L hand		R hand		L hand	
		Rho	<i>p</i>	Rho	<i>p</i>	Rho	<i>p</i>	Rho	<i>p</i>
Reactivated blocks									
sss pre									
sss post early	Sleep w1			0.54	0.116				
	Sleep w2			0.63	0.037				
sss post early									
ssi early	Sleep w1								
	Sleep w2			0.63	0.057				
	Post w1	-0.55	0.109						
	Post w2			-0.55	0.125				
	Post w3			-0.53	0.148				
ssi late									
Non- Reactivated blocks									
sss pre									
sss post early	Sleep w2			0.50	0.143				
sss post late									
ssi early	Post w2			-0.55	0.107				
	Post w1			-0.48	0.146				
ssi late	Pre w1			-0.55	0.108				
	Pre w3			-0.55	0.106				
	Sleep w2	-0.50	0.12					0.58	0.066

Table S16 Correlations between within hemispheres wPLI-connectivity and behavioural measures.

wPLI									
Behaviour	Session	Within Right Hemisphere				Within Left Hemisphere			
		R hand		L hand		R hand		L hand	
		Rho	<i>p</i>	Rho	<i>p</i>	Rho	<i>p</i>	Rho	<i>p</i>
Reactivated blocks									
sss pre	Sleep w3			0.47	0.159	-0.53	0.088		
	Post w3			0.47	0.159			0.47	0.129
sss post early									
sss post late	Sleep w3					-0.50	0.13		
ssi early	Sleep w2							-0.59	0.061
	Sleep w3	0.49	0.144						
ssi late	Sleep w3					-0.50	0.150		
Non-Reactivated blocks									
sss pre	Sleep w1					-0.66	0.053		
	Post w2	0.54	0.099						
sss post early	Sleep w2					-0.56	0.102		
	Sleep w3			0.50	0.130				
sss post late	Sleep w2					-0.54	0.114		
ssi early	Sleep w2					-0.51	0.136		
ssi late									

Supplementary Materials S5: Power analysis

All spectral analysis was performed in fieldtrip for each participant and window of interest without separate between L and R hand conditions. Power spectrum was calculated in the theta band (3-8Hz) using 3 cycles wavelets. The z-normalised values were then averaged within that frequency band and compared between sessions using cluster permutations Fieldtrip function (permutations=10000, alpha=0.05). There were not significant differences among sessions for any of the cases, with the lowest p-value (p=0.099) between Pre and Seep for w1 in the occipital channel 02.