

Figure 1 Non-fatigue brain connectivity map of subject No. 9 (a) in non-fatigue state 0~20 minutes (b) in fatigue state 41~60 minutes

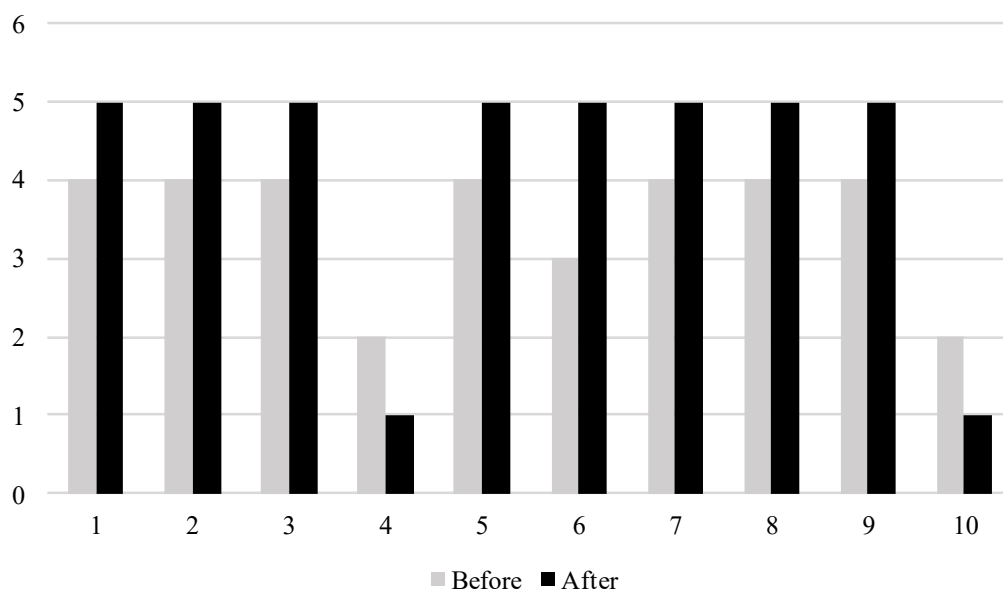


Figure 2 FAS questionnaire results for subject No. 9

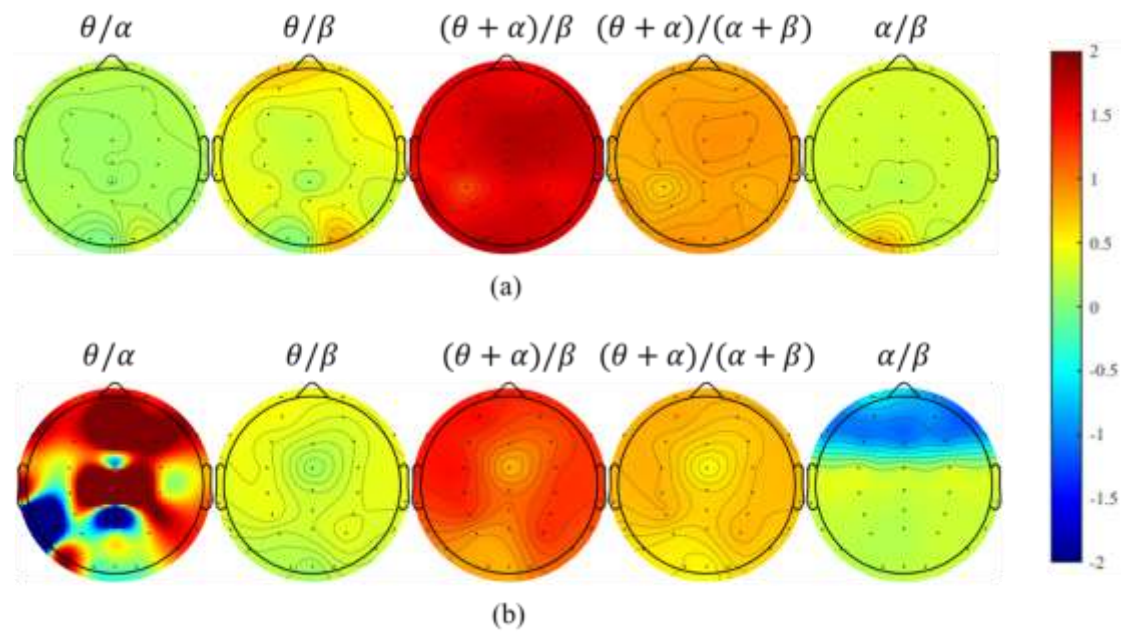


Figure 3 Subject No. 9 frequency band power characteristics (a) non-fatigue characteristics 0 to 20 minutes (b) fatigue characteristics 41 to 60 minutes

Table 1 Top 10 ranking of wPLI for subject No. 9

	1	2	3	4	5	6
1	"F3-Cz"	"F8-FT8"	"FT7-Cz"	"AF3-T7"	"FT7-Cz"	"AF4-T8"
2	"Fz-Cz"	"P4-T8"	"Cz-T8"	"FT7-T7"	"F8-FT8"	"AF4-CP4"
3	"F3-FC3"	"F7-FT7"	"FP1-F7"	"T7-CPz"	"CP4-P7"	"FT7-Cz"
4	"F7-Cz"	"FC4-FT8"	"TP7-CP4"	"FP2-T7"	"CP4-P4"	"C4-P3"
5	"FP1-CP3"	"AF4-P3"	"FT8-CP4"	"T7-P4"	"C4-P7"	"AF4-T8"
6	"CPz-Oz"	"AF3-P3"	"FP1-AF3"	"F8-FT8"	"CP4-Oz"	"C4-CP3"
7	"FP2-F7"	"AF4-Pz"	"CP4-P3"	"FP1-T7"	"F7-CP4"	"TP7-T8"
8	"FP1-FP2"	"F7-F3"	"FT8-C4"	"AF4-T7"	"Cz-Oz"	"AF4-C4"
9	"CPz-O2"	"FP2-Pz"	"C4-P3"	"T7-T8"	"AF4-P7"	"AF3-T8"
10	"F7-CPz"	"Pz-T8"	"AF3-T8"	"T7-P3"	"CPz-P7"	"P3-T8"
	7	8	9	10	11	12
1	"FT7-Cz"	"FT7-Cz"	"FT7-Cz"	"FP1-F7"	"F3-FC3"	"FP2-FCz"
2	"F8-FT8"	"O1-O2"	"FC4-TP8"	"F8-FT8"	"Fz-FC3"	"FCz-O2"
3	"FT7-CPz"	"FT7-CPz"	"FP1-CP4"	"FCz-O2"	"F3-FT7"	"FCz-Oz"
4	"T7-T8"	"F8-FT8"	"Pz-O1"	"FCz-Oz"	"F3-T8"	"AF4-FCz"
5	"FP1-CP4"	"FP1-F7"	"FP2-CP4"	"FP1-CP4"	"F7-T8"	"FCz-Pz"
6	"F3-FT7"	"Cz-P4"	"CP3-CP4"	"Cz-Pz"	"F4-T8"	"AF3-T7"
7	"FT7-CP4"	"Cz-Pz"	"F3-T7"	"Cz-O2"	"FT7-Cz"	"FCz-P4"
8	"F7-FT7"	"Fz-T8"	"FP2-Pz"	"Fz-Oz"	"FP2-FC3"	"FT7-T7"
9	"AF3-T7"	"FC3-Cz"	"CP4-P4"	"P7-Pz"	"Fz-T8"	"F4-FC4"
10	"FP2-CP4"	"Oz-O2"	"F3-C3"	"CP4-P7"	"FT7-T8"	"Cz-Oz"
	13	14	15	16	17	18
1	"FT7-Cz"	"F4-FT7"	"F8-FT8"	"FT7-CPz"	"AF4-TP7"	"F4-FT7"
2	"F4-FT7"	"FP2-FT7"	"FP2-C4"	"F8-FT8"	"FT7-CPz"	"FP2-FT7"
3	"FT7-CP3"	"AF3-FT7"	"C4-P4"	"F4-FT7"	"FT7-Cz"	"T7-TP8"
4	"F3-FT7"	"Cz-CPz"	"FP1-C4"	"FT7-Cz"	"F8-FT8"	"FC3-T7"
5	"AF4-P7"	"F3-T7"	"F4-FT7"	"F4-T8"	"F7-F3"	"FT7-Cz"
6	"FT7-Pz"	"FT7-TP7"	"Cz-P4"	"T7-TP8"	"F4-FT8"	"F7-T7"
7	"F7-Cz"	"F4-T7"	"C4-P7"	"AF4-T8"	"FP2-P4"	"Fz-T7"
8	"FP2-FT8"	"FT7-P7"	"P7-P4"	"CPz-P4"	"CP4-O1"	"T7-T8"

9	"FP1-FC3"	"FP2-FT8"	"C4-Pz"	"FP2-TP7"	"FT8-C4"	"T7-Pz"
10	"F8-FC3"	"FT7-Cz"	"FT7-FC3"	"AF3-F8"	"FT7-FC3"	"FCz-T7"
	19	20	21	22	23	24
1	"T7-CPz"	"F4-FT7"	"T7-CPz"	"T7-CPz"	"F4-FT7"	"T7-CPz"
2	"FT7-Cz"	"F4-T7"	"FT7-CPz"	"F4-FT7"	"FC3-T7"	"FP2-T8"
3	"FT7-CPz"	"F8-FT8"	"FP2-TP8"	"FT7-Cz"	"C4-Pz"	"FP2-Fz"
4	"F4-FT7"	"AF3-FT7"	"F8-FT8"	"F7-FC3"	"F4-C4"	"FP2-P4"
5	"FP2-FT7"	"F7-P4"	"TP7-P7"	"F8-FT8"	"C4-P3"	"F7-F3"
6	"F8-FT8"	"FP2-FT7"	"FP2-T8"	"FP2-O2"	"AF4-TP7"	"FP2-CPz"
7	"FP2-CPz"	"F7-FT7"	"F4-T7"	"T7-T8"	"C4-CPz"	"FT7-Cz"
8	"AF3-FT7"	"FT7-Cz"	"F8-T8"	"FT8-T7"	"F4-T7"	"F7-FT7"
9	"F4-P3"	"F4-T8"	"Cz-CPz"	"FT7-CPz"	"F3-T7"	"F7-C4"
10	"FCz-C3"	"F4-C4"	"F3-T7"	"FT7-T7"	"CP4-P4"	"FP1-FP2"
	25	26	27	28	29	30
1	"FT7-CPz"	"T7-CPz"	"T7-CPz"	"F8-FT8"	"FT7-CPz"	"T7-CPz"
2	"T7-CPz"	"FCz-O2"	"FT7-CPz"	"FT7-CPz"	"T7-CPz"	"FT7-P4"
3	"TP8-T8"	"FCz-T8"	"F8-FT8"	"T7-CPz"	"FP2-CPz"	"FCz-T8"
4	"C3-Cz"	"FP2-CPz"	"FT7-Cz"	"FT7-P4"	"AF3-T7"	"FCz-P4"
5	"Fz-T8"	"FC3-FCz"	"FP2-FT8"	"T7-O2"	"FT7-T7"	"AF4-FT7"
6	"TP8-O1"	"FT7-CPz"	"AF4-CPz"	"C4-Pz"	"FC4-P3"	"FCz-O2"
7	"FP2-FT7"	"AF3-T7"	"Fz-CPz"	"F8-C4"	"CP3-CPz"	"T7-TP8"
8	"FP1-F7"	"FP2-T8"	"T7-O2"	"T7-T8"	"AF4-CPz"	"FT7-FCz"
9	"FC3-Cz"	"T7-Cz"	"FC4-C3"	"F4-T7"	"FT8-CP4"	"FT7-O2"
10	"T7-T8"	"FCz-Oz"	"CPz-P7"	"C4-P3"	"C4-P3"	"FT7-CPz"
	31	32	33	34	35	36
1	"T7-CPz"	"T7-CPz"	"FT7-CPz"	"FP2-T8"	"FC3-T7"	"AF3-FT7"
2	"FT7-CPz"	"T7-Cz"	"AF3-T7"	"FT7-T7"	"FP1-TP8"	"FT7-O2"
3	"AF3-FT7"	"FT7-CPz"	"FT7-T7"	"F8-T8"	"FP1-F7"	"AF3-O2"
4	"F8-FT8"	"T7-T8"	"T7-P4"	"F8-FT8"	"FT7-T7"	"T8-O2"
5	"AF3-Fz"	"TP7-P7"	"AF3-FT7"	"AF3-T7"	"FT7-CPz"	"FT7-T7"
6	"F4-P3"	"AF4-FT7"	"T7-CPz"	"T8-Pz"	"AF4-FT7"	"FP2-CPz"
7	"AF3-T7"	"T7-O2"	"P7-Pz"	"CP4-Pz"	"T7-CPz"	"FP2-O2"

8	"FP2-CP3"	"FP1-TP8"	"FT8-C4"	"T8-CPz"	"F4-FC3"	"FT7-FC3"
9	"AF3- AF4"	"AF4-C3"	"P3-Pz"	"FT8-CP4"	"FT7-Cz"	"FP1-O2"
10	"P7-P4"	"FT8-P4"	"FCz-Oz"	"CP4-P4"	"FP1-AF4"	"FC4-O1"
↖	37	38	39	40	41	42
1	"FC3-Cz"	"FT7-TP7"	"FT7-T7"	"F4-O1"	"FP1-C4"	"FT7-T7"
2	"FC3-CPz"	"F4-FT7"	"AF4-FC3"	"FCz-O2"	"F8-FT8"	"FT7-T8"
3	"FT7-T7"	"FT7-Oz"	"F7-FT7"	"Cz-O2"	"FP2-T8"	"FT7-P4"
4	"AF3-T7"	"FT7-P7"	"Fz-FC3"	"AF4-T8"	"AF3-FT7"	"T7-T8"
5	"P4-O1"	"FT7-O1"	"T7-P4"	"F4-Oz"	"FP1-TP7"	"C4-O2"
6	"F7-FC3"	"FT7-T8"	"FC3-T7"	"FP1-T8"	"C4-Pz"	"AF3-FT7"
7	"Pz-O1"	"FP1-O2"	"FC4-O2"	"P4-O2"	"FT7-Cz"	"CPz-P4"
8	"AF3-FT7"	"FP2-O2"	"AF4-FT7"	"Fz-T8"	"CP4-Pz"	"Cz-P4"
9	"FT7-P4"	"F4-P3"	"FC4-Oz"	"FP1-TP8"	"T7-T8"	"AF4-FT7"
10	"FC3-CP4"	"AF3-T7"	"F3-T7"	"T8-O2"	"CPz-Pz"	"FT7-FCz"
↖	43	44	45	46	47	48
1	"FT7-T7"	"AF3-FT7"	"AF3-FT7"	"FT7-T8"	"CP3-O2"	"FP1-FT7"
2	"FCz-Oz"	"FT7-CPz"	"Cz-O2"	"AF3-FT7"	"T8-O2"	"FT7-T8"
3	"FCz-T8"	"FT7-TP7"	"FCz-O2"	"FT7-T7"	"FP1-CP4"	"CP4-Pz"
4	"Cz-Oz"	"FT7-T8"	"C4-O2"	"Fz-O2"	"O1-O2"	"F8-FCz"
5	"F3-T8"	"FT7-Cz"	"Cz-P3"	"Fz-FC3"	"FC4-T7"	"F4-O2"
6	"FCz-O1"	"TP8-P4"	"P3-Pz"	"AF4-TP7"	"F4-TP7"	"FP1-C4"
7	"FCz-P4"	"T7-CPz"	"Fz-O2"	"CPz-Oz"	"FCz-C4"	"FP1-CP4"
8	"FT7-T8"	"FT7-T7"	"F3-P4"	"CPz-Pz"	"T7-TP8"	"F8-C4"
9	"FP1-CP3"	"FP1-T8"	"CPz-P3"	"FC3-FC4"	"FP1-P4"	"Cz-Pz"
10	"CPz-Oz"	"Fz-Oz"	"Cz-Pz"	"F3-O2"	"AF4-O2"	"F8-CP4"
↖	49	50	51	52	53	54
1	"FT7-T8"	"AF3-FT7"	"FP1-C4"	"FP2-TP8"	"FP1-T8"	"C4-O2"
2	"FC4-T8"	"CPz-Pz"	"AF4-FC4"	"F3-T8"	"FP1-P3"	"F8-FT8"
3	"FT7-TP7"	"AF3-O2"	"C4-Pz"	"FP1-FT7"	"FP2-P3"	"FC3-CP3"
4	"T8-CP4"	"FT7-CP4"	"AF4-C4"	"F3-O2"	"FP2-T8"	"FC4-O1"
5	"T7-T8"	"FP2-T8"	"CP4-O2"	"F8-FT8"	"FP2-Pz"	"C4-Oz"

6	"T8-TP7"	"FP1-T8"	"FP1-T8"	"FP1-TP8"	"T8-CP4"	"FC3-C3"
7	"AF3-FT7"	"FP2-O2"	"FP2-CP3"	"F3-TP8"	"T8-P3"	"FC4-O2"
8	"T8-O1"	"FP1-Fz"	"FT7-T8"	"AF4-FT7"	"AF3-T8"	"T8-O2"
9	"T8-O2"	"T8-O2"	"C4-P4"	"AF4-F4"	"FP1-AF3"	"FC4-Oz"
10	"TP7-O1"	"AF4-Fz"	"TP8-O2"	"FT7-Cz"	"FP1-Pz"	"FCz-Oz"
	55	56	57	58	59	60
1	"FT7-T8"	"FP1-FT7"	"AF3-F4"	"FP2-Pz"	"FP1-FC4"	"FP1-TP8"
2	"AF4-T8"	"AF4-FC4"	"AF4-TP7"	"FP2-P3"	"AF4-FC4"	"TP8-P3"
3	"FP1-T8"	"FC3-T8"	"FP1-F4"	"FP1-FT7"	"FP1-P3"	"F8-CPz"
4	"FP1-FT7"	"C4-Pz"	"AF4-F4"	"F8-FC3"	"CPz-P4"	"F7-F8"
5	"T8-TP8"	"FCz-Pz"	"FP1-FT8"	"C4-Pz"	"FP2-O2"	"F8-CP3"
6	"T7-T8"	"F4-CP3"	"CP3-TP8"	"FCz-TP8"	"Cz-O2"	"FP2-TP8"
7	"FP2-T8"	"AF4-F4"	"CP4-O1"	"F7-FT7"	"CPz-O2"	"TP8-Oz"
8	"AF4-TP7"	"FP1-TP8"	"FP1-TP7"	"FC3-Cz"	"FP1-Cz"	"F3-FCz"
9	"F8-TP8"	"FT7-T8"	"FP2-F4"	"FP2-O1"	"FC4-T8"	"FC4-O1"
10	"F8-FT8"	"AF4-FT7"	"FP1-FC4"	"FCz-T8"	"Fz-FC4"	"TP8-O2"