

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

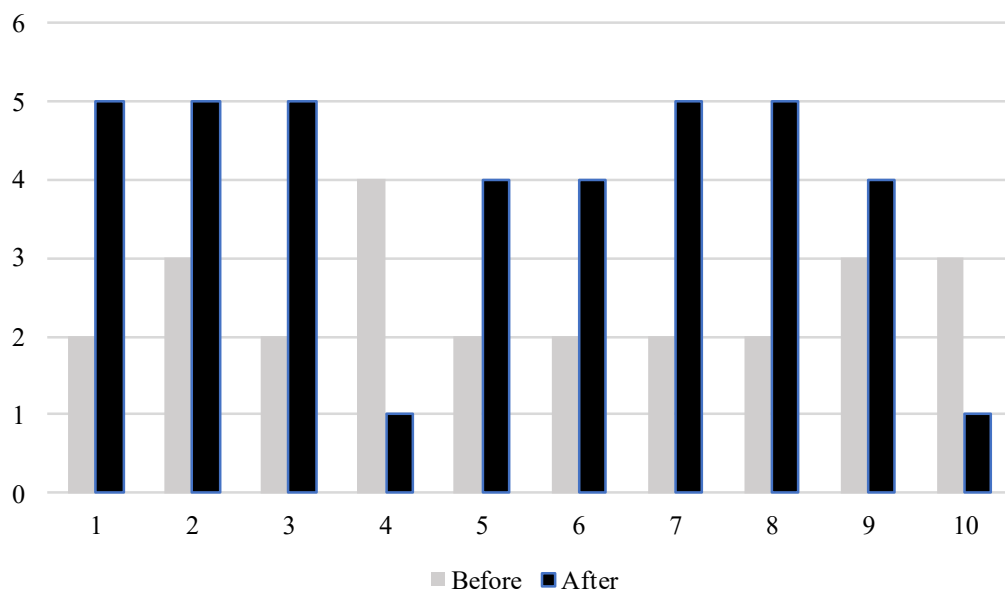


Figure 2 FAS questionnaire results for subject No. 1

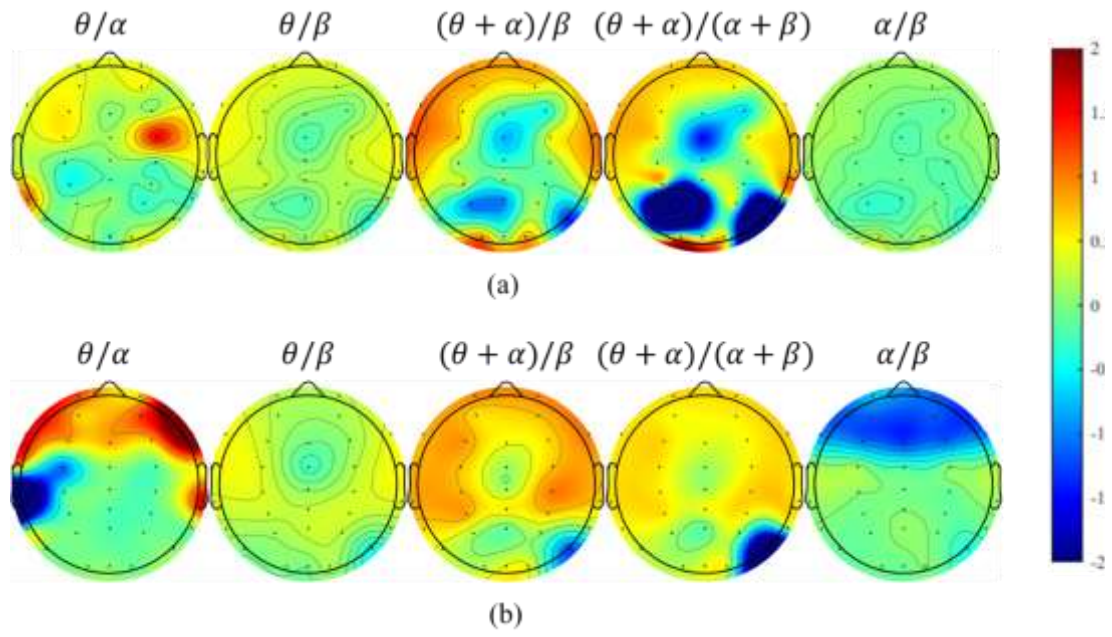


Figure 3 Subject No. 1 frequency band power characteristics (a) non-fatigue characteristics 0 to 20 minutes (b) fatigue characteristics 41 to 60 minutes

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

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

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

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

8	"FP1-T7"	"AF3-FT7"	"FT8-O1"	"T7-Oz"	"FT8-CP4"	"FC4-FT8"
9	"FP1-F3"	"AF3-FT8"	"F4-T7"	"FT8-CPz"	"F7-Pz"	"FP1-O1"
10	"FP1-CP4"	"FP2-F8"	"F4-Oz"	"FT8-P3"	"F4-C4"	"FP2-CP4"
	55	56	57	58	59	60
1	"CP3-Pz"	"F4-F8"	"F8-P3"	"FC3-Pz"	"FC3-Oz"	"F8-T8"
2	"FT8-CP3"	"T8-T8"	"C3-T8"	"Pz-O1"	"T7-TP7"	"FC3-T8"
3	"F4-C4"	"F4-C4"	"AF4-F4"	"Pz-P4"	"FCz-TP7"	"Pz-P4"
4	"FT8-CP4"	"CP4-P4"	"P3-Pz"	"F3-Pz"	"Fz-TP7"	"FT8-C4"
5	"T7-TP7"	"F4-O2"	"F7-Pz"	"F8-FT8"	"FT7-TP7"	"F8-CP4"
6	"CP3-P3"	"FC3-T8"	"FP2-AF4"	"Cz-Pz"	"Cz-TP7"	"AF3-T8"
7	"TP7-TP8"	"FT7-T8"	"FT8-TP8"	"F8-C4"	"FC3-TP8"	"F8-FT7"
8	"CP3-CPz"	"T8-P7"	"F7-F3"	"Pz-Oz"	"C3-TP7"	"FC3-O2"
9	"C3-CP3"	"FP1-FP2"	"FP2-FT8"	"CPz-Pz"	"TP7-CP3"	"TP7-Oz"
10	"FT8-P3"	"F4-O1"	"F7-P4"	"AF3-Pz"	"T7-C3"	"F4-F8"