

Hub Electrode Analysis — Research Question 1

Generated: 2025-11-26

Source: [src/results/hubs/](#)

Summary:

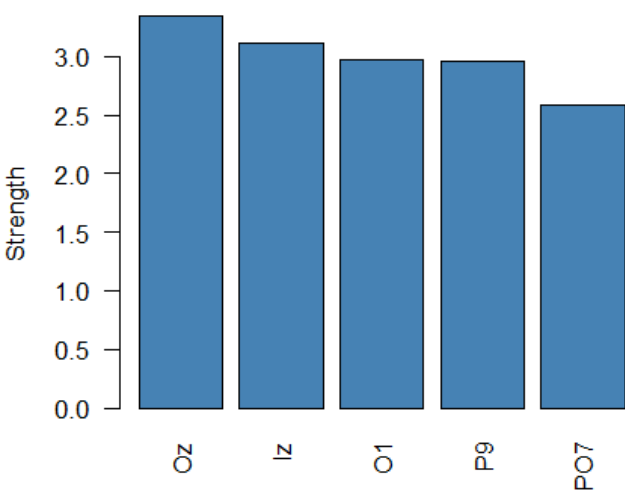
This report summarizes the hub electrode analysis comparing meditation and thinking states for Alpha and Beta bands.

Centrality measures used: Degree, Strength (weighted), Betweenness (normalized).

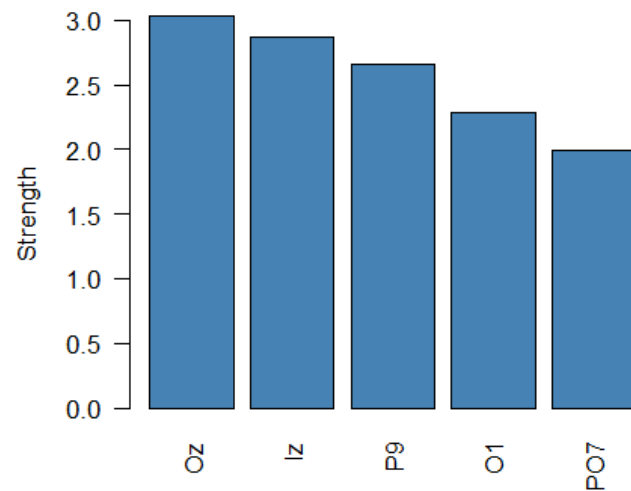
Thresholding for visualization: top 15% strongest edges (proportional density).

	band	state	region	avg_strength	avg_degree	avg_betweenness	hub_count
1	alpha	meditation	occipital	2.304406725	30.875000	0.0238095238	8
2	alpha	meditation	other	0.614549744	8.903226	0.0087128157	62
3	alpha	meditation	frontal	0.597152858	8.590909	0.0017921147	22
4	alpha	meditation	parietal	0.490776038	7.428571	0.0116670324	14
5	alpha	meditation	central	0.433400534	6.222222	0.0071969050	18
6	alpha	meditation	temporal	0.061114704	1.000000	0.0001280082	4
7	alpha	thinking	occipital	2.129386502	29.000000	0.0224014337	4
8	alpha	thinking	other	0.628093649	9.354839	0.0086219712	31
9	alpha	thinking	frontal	0.554766057	8.181818	0.0010240655	11
10	alpha	thinking	parietal	0.499256139	7.714286	0.0154341306	7
11	alpha	thinking	central	0.408395627	6.000000	0.0052910053	9
12	alpha	thinking	temporal	0.000000000	0.000000	0.0000000000	2
13	beta	meditation	occipital	0.223037831	18.375000	0.0347542243	8
14	beta	meditation	central	0.138302299	10.722222	0.0093588212	18
15	beta	meditation	other	0.119809519	9.645161	0.0133871794	62
16	beta	meditation	frontal	0.111453610	8.772727	0.0039100684	22
17	beta	meditation	parietal	0.060410980	5.285714	0.0138248848	14
18	beta	meditation	temporal	0.009758091	0.750000	0.0067844342	4
19	beta	thinking	occipital	0.150114081	15.250000	0.0266257040	4
20	beta	thinking	central	0.138935680	13.111111	0.0125163566	9
21	beta	thinking	other	0.095614184	9.419355	0.0139405051	31
22	beta	thinking	parietal	0.081320913	8.428571	0.0264062614	7
23	beta	thinking	frontal	0.063681531	6.454545	0.0024205185	11
24	beta	thinking	temporal	0.013600076	1.500000	0.0015360983	2

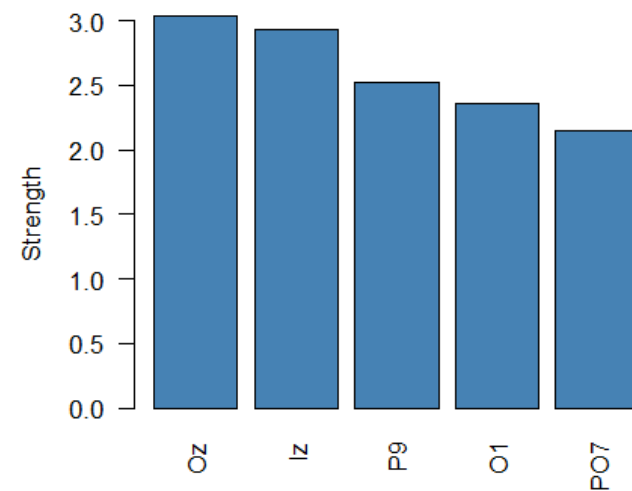
Top 5 Hubs: alpha_med1



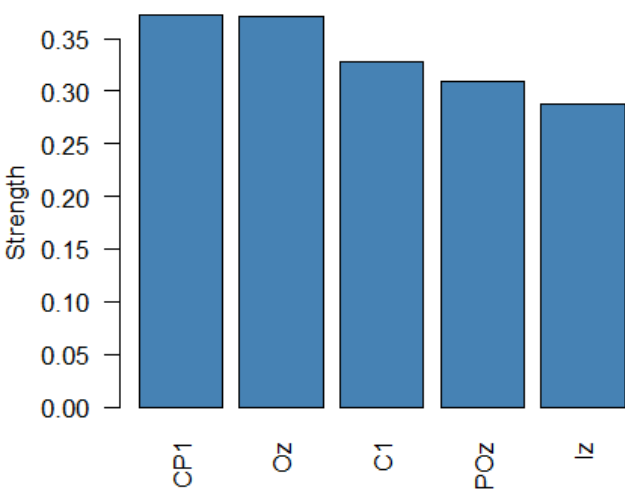
Top 5 Hubs: alpha_med2



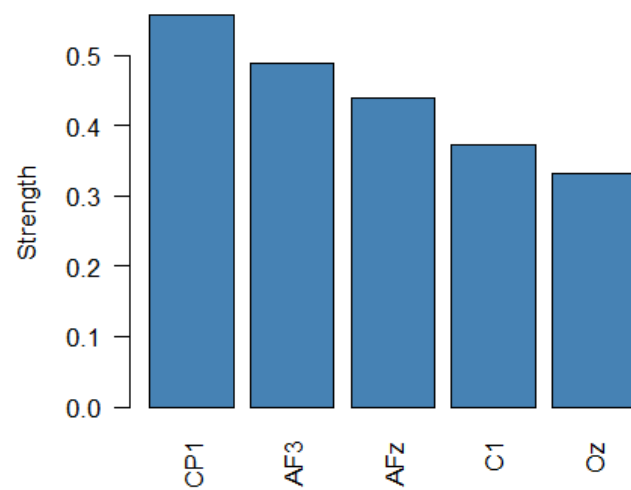
Top 5 Hubs: alpha_thinking



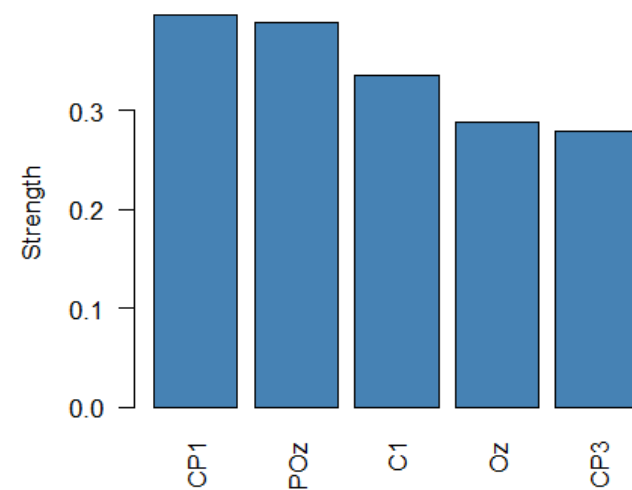
Top 5 Hubs: beta_med1



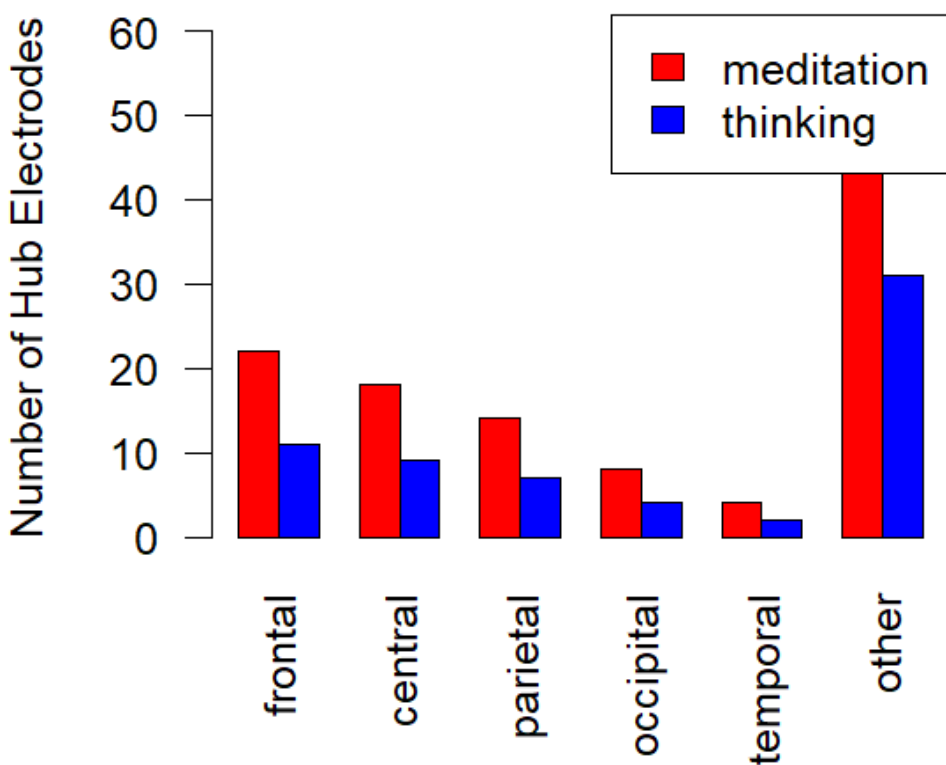
Top 5 Hubs: beta_med2



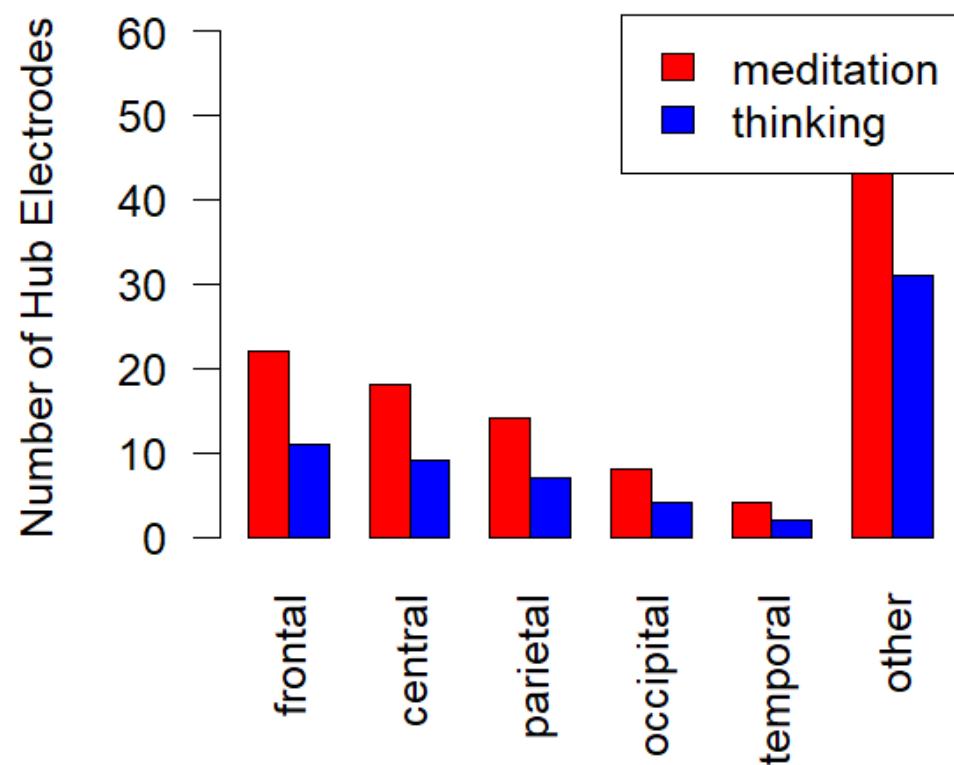
Top 5 Hubs: beta_thinking



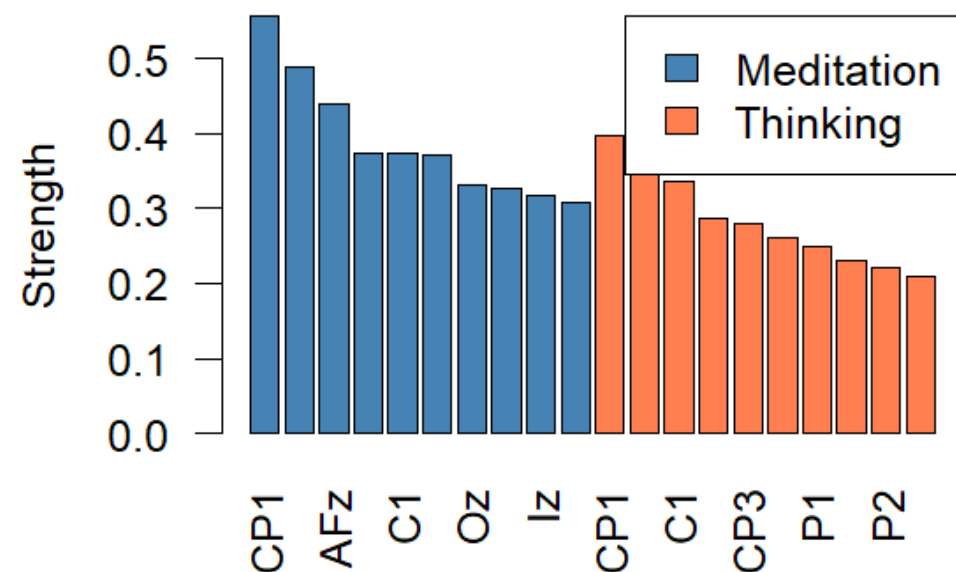
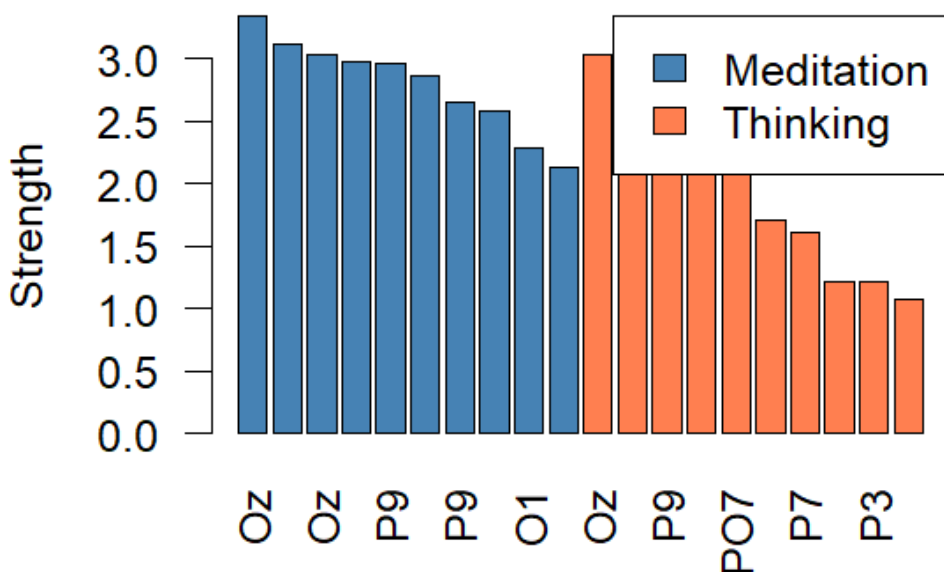
Alpha Band: Hub Distribution by Region



Beta Band: Hub Distribution by Region



Alpha Band: Top 10 Hubs (Meditation vs Thinking) **Theta Band: Top 10 Hubs (Meditation vs Thinking)**



	electrode	degree	strength	betweenness	band	state	region
1	Oz	41	3.352143	0.004608295	alpha	meditation	occipital
2	Iz	40	3.116827	0.035842294	alpha	meditation	occipital
3	O1	40	2.973023	0.030721966	alpha	meditation	occipital
4	P9	39	2.964921	0.028161802	alpha	meditation	other
5	PO7	37	2.580937	0.070148490	alpha	meditation	parietal

	electrode	degree	strength	betweenness	band	state	region
1	Oz	40	3.036548	0.06144393	alpha	meditation	occipital
2	Iz	39	2.864191	0.02252944	alpha	meditation	occipital
3	P9	38	2.660283	0.05529954	alpha	meditation	other
4	O1	34	2.283870	0.02201741	alpha	meditation	occipital
5	PO7	31	1.993972	0.03993856	alpha	meditation	parietal

	electrode	degree	strength	betweenness	band	state	region
1	Oz	39	3.040969	0.029185868	alpha	thinking	occipital
2	Iz	40	2.933939	0.052227343	alpha	thinking	occipital
3	P9	36	2.526062	0.039426523	alpha	thinking	other
4	O1	34	2.353857	0.007680492	alpha	thinking	occipital
5	PO7	33	2.153489	0.099334357	alpha	thinking	parietal

	electrode	degree	strength	betweenness	band	state	region
1	CP1	32	0.3726697	0.01177675	beta	meditation	central
2	Oz	35	0.3710249	0.07782898	beta	meditation	occipital
3	C1	29	0.3276061	0.05171531	beta	meditation	other
4	POz	30	0.3088569	0.08960573	beta	meditation	other
5	Iz	27	0.2876922	0.05069124	beta	meditation	occipital

	electrode	degree	strength	betweenness	band	state	region
1	CP1	35	0.5580702	0.07373272	beta	meditation	central
2	AF3	31	0.4884171	0.03379416	beta	meditation	frontal
3	AFz	28	0.4392792	0.03020993	beta	meditation	other
4	C1	24	0.3725560	0.04249872	beta	meditation	other
5	Oz	23	0.3325895	0.03020993	beta	meditation	occipital

	electrode	degree	strength	betweenness	band	state	region
1	CP1	35	0.3972899	0.06605223	beta	thinking	central
2	POz	37	0.3896768	0.10394265	beta	thinking	other
3	C1	30	0.3357180	0.08090118	beta	thinking	other
4	Oz	29	0.2875357	0.07219662	beta	thinking	occipital
5	CP3	26	0.2790269	0.01024066	beta	thinking	central