

Brain activity functional analysis of the FMRI in MDD patients between Stroop and emotion tests

We analyzed data for the three functional states: emotion, and stroop. To assess the significant changes between the obtained correlation matrices for the groups, the network-based statistics method [Zalesky A, Cocchi L, Fornito A, Murray MM, Bullmore E (2012) Connectivity differences in brain networks. *NeuroImage*. 60(2):1055–1062] and the false discovery rate [Genovese CR, Lazar NA, Nichols T. Thresholding of statistical maps in functional neuroimaging using the false discovery rate. *Neuroimage*. 2002 Apr; 15(4):870-8. doi: 10.1006/nimg.2001.1037. PMID: 11906227] with significance level of $p=0.025$ and 100000 permutations were used. Among the resulted significant connectivity top 30 of connections were taken and presented in the Table 1. Respective connectograms are shown in Figs. 1–3.

Table 1. Top 30 of the significant connections for functional tests in MDD group.

1	Cerebellum45R	PrecentralL	42,5
2	Vermis3	LingualL	38,6
3	Vermis45	PrecentralL	36,3
4	Cerebellum6L	PrecentralL	34,2
5	Cerebellum6R	ParietalSupL	30
6	Cerebellum45R	ParietalSupL	27,1
7	Cerebellum6R	PrecentralL	25,2
8	Vermis45	ParietalSupL	25,1
9	Cerebellum6R	OccipitalMidL	23,6
10	Cerebellum6L	ParietalSupL	22,2
11	Cerebellum45R	PostcentralL	22
12	OccipitalMidL	LingualR	21,7
13	ParietalSupL	HippocampusL	21,3
14	Vermis45	PostcentralL	20,5
15	Vermis6	OccipitalMidL	19,2
16	Cerebellum45R	OccipitalMidL	18,1
17	AngularL	HippocampusL	18
18	Vermis3	LingualR	17,9
19	Cerebellum3L	OccipitalMidL	17,7
20	ParietalInfL	HippocampusL	17,1
21	Cerebellum45L	PrecentralL	16,9
22	LingualL	PrecentralL	16,5
23	Cerebellum6R	PostcentralL	16,2
24	Cerebellum45L	ParietalSupL	16
25	Cerebellum45L	ParietalInfL	15,9
26	Cerebellum45L	AngularL	15,3
27	FusiformL	CuneusL	14,9
28	Cerebellum45L	PostcentralL	14,6
29	ThalMDmL	Cerebellum45R	14,5
30	Vermis45	ParietalInfL	13,9

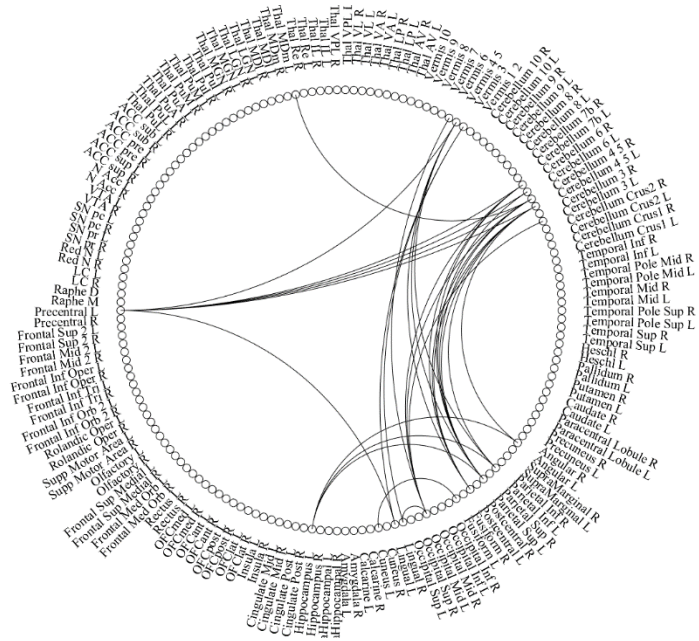


Fig. 1. Top 30 of the significant connections (MDD group).

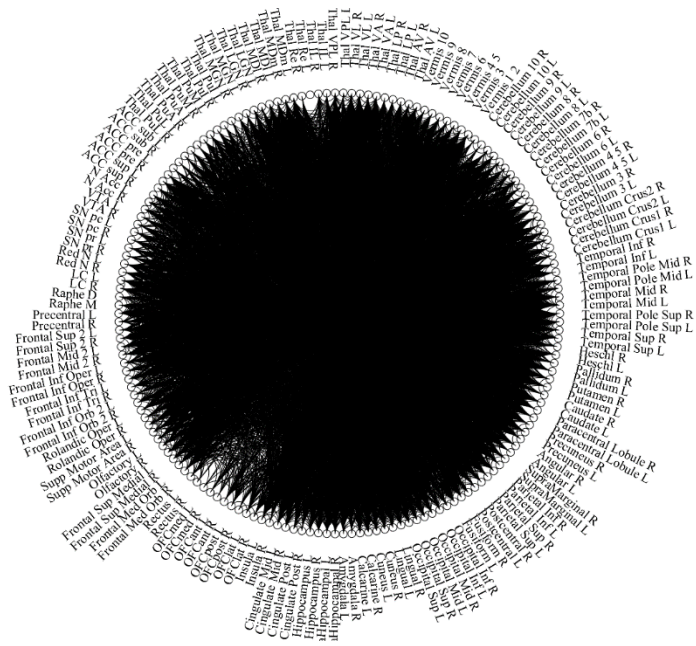


Fig. 2. Connectogram of significant connections by NBS in MDD group (165 nodes 5424 connections)

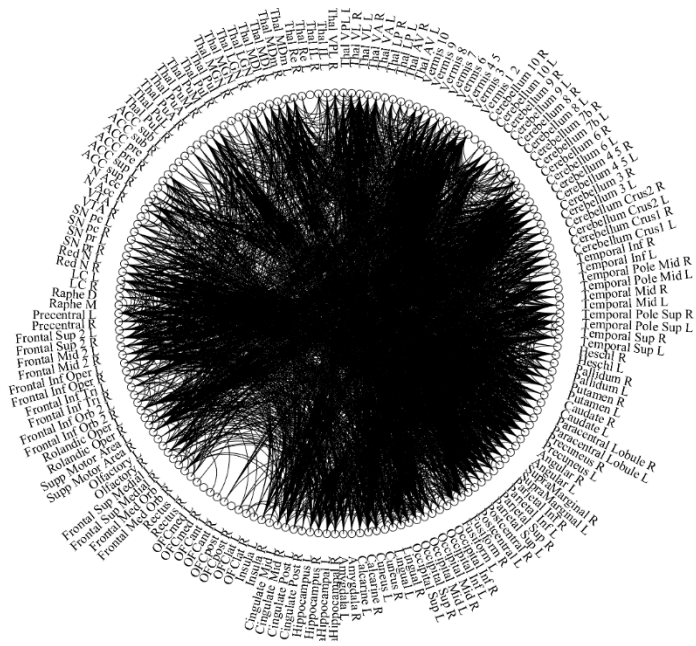


Fig. 3. Connectogram of significant connections by FDR in MDD group (162 nodes 2475 connections)

Node network measures were calculated:

weighted undirected eigenvector node centrality [Newman, MEJ (2002). The mathematics of networks.];

node strength [Rubinov and Sporns (2011) NeuroImage; M. Rubinov, UNSW (2011)];

weighted undirected clustering coefficient [Costantini & Perugini (2014) PLOS ONE 9:e88669];

Obtained results were tested with the Mauchly's sphericity test. After that, we performed ANOVA with Greenhouse-Geisser correction on respective data of control and depression disorder groups. Net means did not show significant difference for the node centrality (control: $F_{2,165} = 0.107$; $p = 0.753$; MDD: $F_{2,165} = 1.323$; $p = 0.265$), however node strength (control: $F_{2,165} = 359.14$; $p < 0.001$; MDD: $F_{2,165} = 457.05$; $p < 0.001$) and clustering coefficient mean values (control: $F_{2,165} = 41.52$; $p < 0.001$; MDD: $F_{2,165} = 462.31$; $p < 0.001$) show significant difference both in healthy subjects and depression group.