Appendix 1 to Wang S, Gong G, Zhong S, et al. Neurobiological commonalities and distinctions among three major psychiatric disorders: a graph theoretical analysis of the structural connectome. *J Psychiatry Neurosci* 2019.

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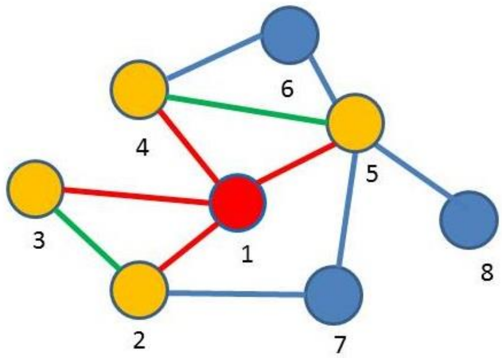
Supplementary materials

Figure S1. G_i and L_{ij}



G_i denotes the subgraph composed of the nearest neighbors of node i. For example, G_1 contains the nodes which have direction connections(the red edges in the paragraph) to node 1 and the connections between them (the red edges and the green edges).

G denotes the whole network.

L_{ij} denotes the shortest path length between two node i and j, which is the smallest sum of the edges throughout all the possible paths in the graph from i to j, for example: L_{13}=1, L_{18}=2, L_{38}=3…

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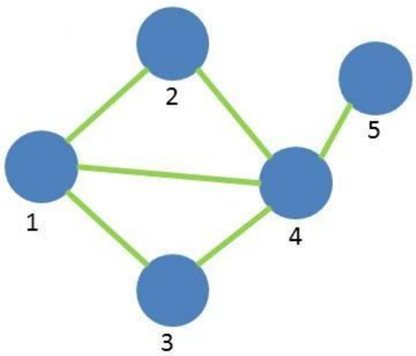
Figure S2. E_{glob}

Global Network Efficiency (E_{glob}) is described as the mean of the inverse of the shortest path length for all the nodes in the network. For a given network G with N nodes:

$$E_{glob}^{G} = \frac{1}{N(N-1)} \sum_{i \in G} \sum_{j \neq i \in G} \frac{1}{L_{ij}}$$

The E_{glob} reflects the capacity to facilitate parallel information transferring of the whole network.



For example, to calculate E_{glob}

$L_{12} = 1, L_{13} = 1, L_{14} = 1, L_{15} = 2,$

$L_{23} = 2, L_{24} = 1, L_{25} = 2,$

$L_{34} = 1, L_{35} = 2$

$L_{45} = 1$

$L_{21} = 1, L_{31} = 1, L_{41} = 1, L_{51} = 2,$

…

$$E_{glob} = \frac{1}{N \times (N-1)} \times \left(\frac{1}{L_{12}} + \frac{1}{L_{13}} + \frac{1}{L_{14}} + \ldots + \frac{1}{L_{54}}\right)$$
$$= \frac{1}{5 \times (5-1)} \times \left(\frac{1}{1} + \frac{1}{1} + \frac{1}{1} + \ldots + \frac{1}{1}\right)$$
$$= 0.8$$

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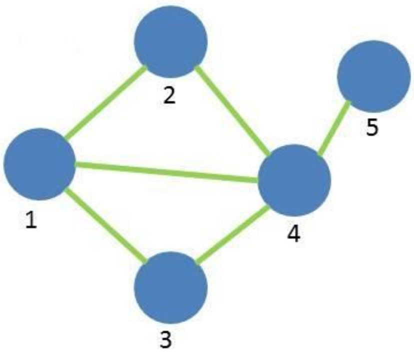
Figure S3. Eloc

The local efficiency of node i ($E^{G_i}_{loc}$) is defined as the global efficiency of G_i. The local efficiency of network (E^{G}_{loc}) is the mean of local efficiencies ($E^{G_i}_{loc}$) for all the nodes in the network, as below:

$$E^{G}_{loc} = \frac{1}{N}\sum_{i \in G} E^{G_i}_{loc}$$

N is the number of nodes of the network G

E^{G}_{loc} corresponds to the ability to tolerate faults of the whole network, i.e., if any node i in the network is destroyed, this ability can ensure the nodes of G_i still communicate information effectively with each other.



For example, to calculate E_{loc}

$$E^{G_1}_{loc} = \frac{1}{N^{G_1}\times(N^{G_1}-1)} \times \left(\frac{1}{L_{23}}+\frac{1}{L_{24}}+\frac{1}{L_{32}}+\frac{1}{L_{34}}+\frac{1}{L_{42}}+\frac{1}{L_{43}}\right)$$
$$= \frac{1}{3\times(3-1)} \times \left(\frac{1}{2}+\frac{1}{1}+\frac{1}{2}+\frac{1}{1}+\frac{1}{1}+\frac{1}{1}\right)$$
$$= \frac{5}{6}$$

$E^{G_2}_{loc} = 1 \quad E^{G_3}_{loc} = 1 \quad E^{G_4}_{loc} = \frac{2}{3} \quad E^{G_5}_{loc} = 0$

$$E_{loc} = \frac{1}{N} \times \left(E^{G_1}_{loc} + E^{G_2}_{loc} + E^{G_3}_{loc} + E^{G_4}_{loc} + E^{G_5}_{loc}\right)$$
$$= \frac{1}{5} \times \left(\frac{5}{6}+1+1+\frac{2}{3}+0\right)$$
$$= 4.2$$

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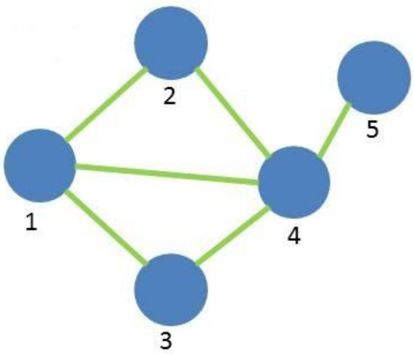
Figure S4. Enodal

The nodal efficiency (E_{nodal})of a given node i is defined as the average inverse of the shortest path length between node i and all other nodes in the network, that is:

$$E_{nodal}^{G}(i) = \frac{1}{N-1} \sum_{i \neq j \in G} \frac{1}{L_{ij}}$$

N is the number of nodes of the network G

It represents the capacity of node i to communicate information with the other nodes in network.



For example, to calculate $E_{nodal}(1)$

$L_{12} = 1$

$L_{13} = 1$

$L_{14} = 1$

$L_{15} = 2$

$$E_{nodal}(1) = \frac{1}{(N-1)} \times \left(\frac{1}{L_{12}} + \frac{1}{L_{13}} + \frac{1}{L_{14}} + \frac{1}{L_{15}}\right)$$

$$= \frac{1}{(5-1)} \times \left(\frac{1}{1} + \frac{1}{1} + \frac{1}{1} + \frac{1}{2}\right)$$

$$= 0.875$$