

Network localization of tics: Evidence from coordinate and lesion network mapping

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Background:

Neuroimaging studies implicate widespread cortical and subcortical abnormalities in Tourette Syndrome (TS), however, due to the neuroanatomical heterogeneity of these findings, it remains unclear which brain regions are key to TS symptomatology. The aim of this study was to localize a network of brain regions associated with tics, utilising published coordinates of neuroimaging abnormalities in patients with TS and cases of tics caused by focal brain lesions.

Methods:

We used two network localization techniques termed ‘coordinate network mapping’ and ‘lesion network mapping’, which leverage a large dataset of normative resting-state scans ($n = 1000$), to assess whether structural abnormalities in idiopathic TS and tic-inducing lesions, respectively, map to a shared network. This allowed us to identify a neural network associated with idiopathic and secondary tic symptoms, as well as commonalities between these networks.

Results and Conclusions:

Our analyses showed that seemingly heterogeneous structural neuroimaging findings in patients with TS map to a common network, involving structures within the cortico-basal-ganglia-thalamo-cortical circuit. We further demonstrated that this network identified in TS and a network for tic-inducing lesions converge in the thalamus, caudate, putamen, external segment of the globus pallidus (GPe) and occipital lobe, revealing a sub-network which may mediate tics as shared symptoms between idiopathic and acquired tics.