Constructing a Network Model for Praxis: A Combined Literature and Data Analysis

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Introduction
Praxis is the ability to plan a skilled or learned movement and is dependent upon a series of neuron tracts connecting different parts of the brain. These networks are of particular interest to neurosurgeons who risk disconnecting key areas from one another in surgery. Recent technological advances have allowed for identification of these tracts in MRI images. We have reviewed information in the established literature and utilized tracking software to construct the anatomical basis for praxis.

Methods
The literature review consisted of fMRI data and lesion studies. Data from fMRI and lesion studies were used to construct the network model for praxis if it related a function associated with praxis to a specific region of interest. The results of this literature review were then used to create a network model for each type of apraxia, including speech, ideomotor, tactile, limb-kinetic, conceptual, and verbal-motor dissociation apraxia. The tracts connecting relevant areas identified in the literature were then identified using DSI studio with MRI data from the Human Connectome Project.

Results
Proposed Praxis Network

Connections of the Somatosensory and Praxis Networks

Connections of the Motor and Praxis Networks

Connections of the Visual, Auditory, and Praxis Networks

Conclusions
Diffusion spectrum imaging is a useful tool in depicting white matter tracts that connect specific regions of interest. The data from DSI can be utilized to better understand established networks, as well as to develop hypotheses about potential networks. Current fMRI data and lesion studies were used to determine the proposed praxis network, involving middle temporal gyrus, supramarginal gyrus, angular gyrus, and inferior frontal gyrus as essential regions to the network. DSI imaging indicates that the superior longitudinal fasciculus most likely acts as the primary white matter tract involved in the communication between these regions. Further literature was reviewed to determine potential sites of connection between the proposed praxis network and established networks. DSI imaging suggests that the precuneus could be an important region of connectivity between the somatosensory, visual, auditory, motor, and praxis networks.

References

1. Middle Temporal Gyrus
2. Angular Gyrus
3. Supramarginal Gyrus
4. Inferior Frontal Gyrus