Functional boundaries within the cortical speech motor control network

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Neuroimaging has revealed a core network of cortical regions that contribute to speech production. However, the functional organization of this network remains poorly understood. Here we describe efforts to identify reliable boundaries around functionally homogenous regions within the speech motor control network. Data were pooled across multiple functional magnetic resonance imaging (fMRI) studies that featured a variety to speech tasks. Hierarchical clustering was applied to random samples of the pooled dataset to identify consistent functional boundaries across subjects and tasks. Significant boundaries were noted across the speech motor control network thereby improving our understanding of its functional organization. Boundary completion resulted in 129 functional regions of interest (fROIs). Within-region functional homogeneity and signal-to-noise ratio were higher in the fROIs compared to anatomical and randomly-generated ROIs. An fROI-based assessment of a contrast of speech conditions in persons who stutter was more sensitive than a typical vertex-wise analysis, revealing additional areas that responded differently across the two conditions. The fROIs may therefore improve our ability to detect subtle within- and between-group differences in speech-related brain activity.