

TITLE: Neuroimaging of the speech network

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ABSTRACT: Historically, the study of the neural underpinnings of speech has suffered from the lack of an animal model whose brain activity could be measured using invasive electrophysiological techniques. The development of non-invasive structural and functional neuroimaging techniques in the latter part of the 20<sup>th</sup> century has led to a dramatic improvement in our understanding of the network of brain regions responsible for speech production. Techniques for measuring regional cerebral blood flow, including positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), have illuminated the neural regions involved in various aspects of speech, including feedforward control mechanisms as well as auditory and somatosensory feedback control circuits. More recently, fMRI studies utilizing repetition suppression have been used to identify the neural representations used in different parts of the speech network, including the identification of a syllable representation in left ventral premotor cortex. Magnetic resonance imaging has also been used to investigate the anatomical structure of the speech network, providing crucial information regarding connectivity within the network as well as identifying anomalies in the sizes of neural regions and/or white matter pathways in speech disorders.