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Human speech and vocalization require active engagement of vocal motor control mechanisms governed by sensory feedback, volition and cognitive neural mechanisms. Various techniques (EEG, fMRI, MEG and ECoG) have been used to study neural mechanisms of voice control. In aggregate, these techniques point to a neural network that includes sensory feedback, motor output control, and more global processes involved in sensory motor integration. While sensory processing and motor output control are relatively easy to identify and study because of their close relationship to observable stimuli and motor output measures, more complex processes such as decision-making and memory recall are more difficult to localize anatomically and to relate to specific measures of neural function. Recent work in our lab has begun to study higher level neural processing related to voice control using EEG techniques. The focus of this talk will be on recent studies requiring subjects to alter their vocalization based on sensory feedback and instructions on how to respond vocally to changes in voice auditory feedback. ERPs elicited by sensory stimuli during cognitive-motor tasks show the classic P300 responses, characteristic of cognitive processing. These preliminary studies suggest new techniques that can be used to identify neural processing related to cognitive control of vocalization.

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