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Involvement of Auditory Cortex in Speech Production

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In addition to their role in speech perception, the auditory cortical areas of the superior temporal lobe are important for the formation and maintenance of motor commands for speech production. Using a combination of neural network modeling, neuroimaging, and auditory perturbation experiments, we have characterized the network of brain regions involved in auditory feedback control of segmental aspects of speech. This network involves auditory error cells in bilateral posterior superior temporal cortex which become active when the current auditory feedback mismatches the auditory target for the current speech sound. Projections from these auditory cortical areas to the right hemisphere ventral premotor areas, then on to primary motor cortex, transform perceived auditory errors into corrective movement commands for the speech articulators. The DIVA model of speech production produces a close quantitative fit to acoustic data collected during unexpected auditory perturbation of speech and during sensorimotor adaptation to sustained auditory perturbations. Neuroimaging results motivate a modification of the model to include right ventral premotor cortical areas in the auditory feedback circuit for speech production. [Work supported by NIDCD, NSF.]