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Dynamic Aspects of Articulating with a Virtual Vocal Tract in Dysarthria

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Broadening our understanding of the components and processes of speech sensorimotor learning is crucial to forwarding methods of speech neurorehabilitation. Several researchers have studied limb sensorimotor control using virtual environments to create novel sensorimotor working spaces. However, the study of novel sensorimotor learning has yet to be undertaken for the auditory-motor transformations that are important to speech sensorimotor learning. We present kinematic and acoustic data describing participant efforts to produced phonemes within an unfamiliar articulatory-acoustic working space using a virtual vocal tract. Typically-functioning participants and individuals with dysarthria were asked to produce diphthongs using an electromagnetic articulograph-driven speech synthesizer to provide participant-controlled auditory feedback. The aim of this work is to characterize performance similarities and differences within and between groups to generate hypotheses regarding future experimental manipulations that may support neurorehabilitation. Results suggest that, while talkers with dysarthria may display limited articulatory working space and dynamic constraints on articulation, it is not consistently true that typically-functioning talkers are less variable than talkers with dysarthria in novel sensorimotor learning. It is hypothesized that experimental protocols that perturb the acoustic sensitivity of articulatory movements may elicit compensatory increases in articulatory speed and range-of-motion for participants with dysarthria.