

Effects of Planning and Preparation on Behavioral and ERP
Correlates of Speech Motor Control
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Speech production and motor control is a highly complex task that requires planning, preparation, execution and control of a large body of muscles to produce goal-directed movements that serve the purpose of vocal communication. The internal forward model theory explains that the human brain internally predicts the sensory consequences of produced speech sounds and incorporates them with auditory feedback information to monitor and control speech. Recent evidence have suggested that planning and preparation for specific motor tasks modulate internal feedforward predictions and subsequently affect motor control. In the present study, we tested the hypothesis that planning and preparation for a vocal pitch modulation task would affect speech and neural responses to pitch perturbations in the auditory feedback. Subjects were instructed to maintain a steady vocalization of a vowel sound and change their voice pitch in upward and downward directions following the onset of a visual cue. During the preparatory period of sustained vocalizations, upward and downward pitch-shift stimuli randomly perturbed the speech auditory feedback. Results of our preliminary analysis indicated modulation of both vocal and ERP responses to pitch-shifted auditory feedback during preparatory period by the cued vocal task. We found increases in the magnitudes of the compensatory vocal responses and the N1 component of ERPs when the cued vocal task was congruent with the direction of pitch shift in speech auditory feedback compared with incongruent direction or no vocal pitch change (control). These results emphasize the importance of the role of motor planning and preparation on the mechanisms of speech motor control. Findings of the present study provide new insights into the behavioral and neural correlates of speech production and motor control.