Adaptation to dichotically presented spectral and temporal real-time perturbations of auditory speech feedback

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Speech production is influenced by sensory feedback, particularly by the auditory channel. If certain spectral or temporal aspects of the auditory feedback are perturbed in real-time during speech production, the speaker adapts production to compensate for the disturbance[1,2]. Auditory feedback is thought to affect speech production via processes in the right hemisphere.[3] Because, so far, only spectral feedback manipulations were investigated, it is unclear whether the observed right-lateralization reflects a right hemispheric specialization for feedback analyses in general[3] or a right hemispheric specialization for spectral processing[4]. We thus tested whether the adaptation to perturbations of spectral and temporal speech features lateralizes differently. German speakers' auditory feedback was altered spectrally (n=7) or temporally (n=9) during the production of CVC monosyllabic pseudowords. Spectral perturbations increased the vowels' F1 frequency, temporal manipulations decelerated the vowel[5] (20% over 40 trials in steps of 0.05%). Auditory feedback was presented dichotically (feedback manipulation only in one ear while the other ear perceived unperturbed feedback) or diotically (perturbed/unperturbed feedback in both ears). Participants decreased produced vowels' F1 over trials to compensate for the spectral feedback perturbation when perturbed auditory feedback was presented to both ears, or only to the left ear. In contrast, when only the right ear received spectrally altered feedback, no significant change in produced F1 frequency was observed. To compensate for the temporal feedback perturbation, participants shortened their vowel production over trials. For the temporal manipulation, compensation was greatest if altered auditory feedback was presented to both, or only the left ear. These results suggest that spectral features of self-produced speech are monitored more strongly by the right than by the left hemisphere. In contrast, the left more than the right hemisphere processes temporal features of auditory feedback.

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