Examining feedback and feedforward speech motor control in acquired apraxia of speech using auditory F0 and F1 perturbation.

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Abstract
Purpose: Apraxia of speech (AOS) has explained as a feedforward motor control disorder, impairing learning/activation of predictive speech motor commands. Alternate hypotheses are that AOS is a feedback control, or both feedback and feedforward control disorder. These hypotheses are examined using established pitch (F0) and first formant (F1) perturbation protocols.

Method: Experiment I included 20 controls and 12 AOS cases. F0 was perturbed up/down by 100 cents during vocalization of “ah”. Response magnitude and latency were measured. Experiment II included 10 controls and 9 AOS cases. F1 was measured in 3 C13V1 words across five phases: (1) BASELINE with masking: normal feedback with noise-masked trials interlaced, (2) BASELINE without masking, (3) RAMP: upward F1 perturbation incremented to 30%, (4) HOLD: 9 trial blocks, alternating 15 trials with 30% F1 perturbation and 15 masked trials, and (5) END: masking only.

Results and Discussion: Exp I: Compensatory response to F0 perturbation in AOS was not significantly different to controls, supporting intact feedback control. Exp II: AOS cases were significantly more variable than controls in BASELINE without masking but not in BASELINE with masking. Controls demonstrated compensation but return to baseline in the END phase. F1 variability complicates interpretation of AOS perturbation response.