

Compensatory responses to unexpected jaw loading during speech  
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Observations were made of articulator and formant trajectories during speech perturbed by unexpected mechanical loads applied to the jaw. Subjects produced multiple repetitions of the phrase "see X avis", where X was one of "raw", "rob" or "rod". Perturbation forces were applied using a jaw-coupled robot, and triggered using a thresholding criterion applied to realtime tracking of the initial low to high transition in the first formant. Perturbations were delivered one out of every five repetitions, selected at random, with half applied upwards and half downwards, and forces sustained throughout the remainder of the utterance. EMMA sensors located on the anterior midsagittal surface of the tongue in addition to lower mandibular and upper lip sensors were used to track articulator positions. Audio and surface EMG (masseter, ABD, and OOS) were collected concurrently. Formants show initial deviation from control trajectories and then recovery that begins approximately 75ms after the onset of perturbation. Formant compensation in most instances is nearly complete even though jaw position does not recover its unperturbed trajectory. Perturbed tongue sensor trajectories are strongly distinguished by coda type, but show a pattern converging on the unperturbed tongue shape consistent with the tongue's presumed role in effecting formant recovery.