Summary: The lack of a physiological definition of “vocal fatigue” is a central problem in prevention research that seeks to identify effects of voice effort and acoustic signs of potential vocal fold lesions. This report presents a three-part synthesis of electromyographic (EMG) and acoustic observations from a study that served to define physiological features of vocal fatigue. The study used a technique of EMG to show that, contrary to views that laryngeal tissues are largely nonfatiguable, voice effort induces spectral compression in the contraction potentials of glottal adductors typically associated with muscle fatigue. In subsequent analyses, these observable attributes served to identify, in seven subjects with widely differing profiles, consistent signs of voice tremor and effects of vocal loading on the voice apparatus. Given the novel character of this criterion-based approach, the first part (section “The Rationale of Electromyographic Observations of Fatigue”) describes the EMG technique and its usefulness in observing in vivo effects of vocal loading. The second part (section “Acoustic Signs of Fatigue in Muscles Involved in Voicing”) summarizes the results of a test that served to determine whether the identified signs of tremor reflect muscle fatigue induced by voice effort or by “general fatigue” associated with waking hours. The third part (section “Compensatory Stabilization of Tremor and Effects of ‘Critical Fatigue’”) presents the results of analyses of compensatory effects in three laryngeal muscles by reference to EMG observations of one subject in conditions of vocal loading. Taken together, the results illustrate the benefits of an approach based on objective criterion changes in muscle fatigue and show that valid tremor signs may, nonetheless, be sporadic, given the varying compensatory behavior of muscles in fatiguing conditions.