Principal Investigator: Michelle Molis

Title: Spectral dynamics and speech understanding by hearing-impaired people

MeSH Terms: hearing; hearing loss, sensorineural; speech perception

Objectives: The purpose of this program of research is to understand the perception of the dynamic spectral properties of speech by hearing-impaired listeners, with the long-term goal of improving speech understanding by these individuals in adverse listening conditions.

Plan: The proposed research compares the performance of normally-hearing and hearing-impaired listeners on measures of speech understanding in the presence of different types of signal distortion and speech understanding of signals with enhanced spectral dynamics. A computational model based on the amount of potential information available in speech will be used to quantify differences in speech intelligibility due to hearing status and stimulus characteristics.

Methods: Both normally-hearing and hearing-impaired listeners will serve as subjects. Experimental procedures will consist of tests identification accuracy and intelligibility for speech. Signals will be presented in quiet and in the presence of various types of background noise. In addition, normally-hearing listeners will be presented with signals that have been processed to simulate some of the effects of hearing impairment. All listener groups will complete experimental conditions with signals that have been processed to enhance spectral dynamics. Several functional measures of sensitivity to spectral change will also be obtained.

Findings to Date: This study has not started; there are no findings to report.

Clinical Relevance: Speech is an inherently dynamic signal and spectral dynamics are integral to perception of both consonants and vowels. The rate, direction, and extent of formant movements provide cues to consonant and vowel identity. The loss of peripheral auditory sensitivity, precise temporal processing, and frequency selectivity associated with hearing loss and aging will disrupt the perception of spectral dynamics. As a result, the reduction or elimination of dynamic spectral cues may impair speech understanding, especially in adverse listening conditions such as background noise or reverberation. The information obtained by this program of research will have possible implications for the development of new hearing aid processing strategies and rehabilitative auditory training programs that may enhance speech intelligibility and reduce listening effort in hearing-impaired veterans.

Relevance to VA Mission: Hearing loss is one of the most prevalent disabilities among Veterans. Communication difficulties can be a debilitating problem and source of great frustration for hearing-impaired Veterans with age-related or noise-induced hearing loss. Hearing disability can interfere significantly in vital communication between patients and their physicians and care-givers.