



Spectrotemporal modulation detection as a predictor of speech understanding in noise for hearing-impaired listeners

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Sensorineural hearing loss (SNHL) results in poor speech understanding in noise. Because this deficit likely represents a combination of audibility loss, suprathreshold distortion in cochlear or brainstem processing, and cognitive deficits, a speech test alone is insufficient to differentiate cognitive processes from distortion. This talk details a series of studies focused on the development of a test of spectrotemporal modulation (STM) sensitivity to assess the suprathreshold distortion component. We present three key results that provide insight regarding the distortion mechanisms underlying impaired speech perception. First, SNHL causes STM-processing deficits, but only for certain combinations of spectral-modulation (high densities, 2 cycles/octave and above), temporal-modulation (low rates, below 12 Hz), and carrier (low frequencies, 2 kHz and below) parameters. Second, STM sensitivity accounts for variance in speech-understanding scores beyond that captured by the audiogram, but only when the STM noise carrier includes frequencies below 2 kHz. Third, detection thresholds for moving and stationary spectral ripples are highly correlated to one another and are similarly predictive of speech-understanding scores. The first two results are consistent with a distortion mechanism related to temporal fine-structure (TFS) processing, which has been proposed as a mechanism for the detection of moving spectra (i.e., frequency modulation) for low carrier frequencies and modulation rates. However, the fact that the same results hold for stationary ripples suggests a mechanism related to poor frequency selectivity at 2 kHz and below – unless TFS information also underlies the detection of stationary spectral ripples at these frequencies. [The views expressed in this abstract are those of the author and do not reflect the official policy of the Department of Army/Navy/Air Force, Department of Defense, or U.S. Government.]