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“Possible Contribution of Cochlear Compression to Amplitude Modulation Detection”

ABSTRACT:

The most obvious perceptual consequence of cochlear hearing loss is a reduction in sensitivity to weak sounds, and the typical strategy of hearing aids is to amplify frequencies with hearing loss. However, even with this amplification, speech understanding in noisy environments is still a major obstacle for individuals with cochlear hearing loss, suggesting that mechanisms other than reduced audibility must contribute to speech in noise problems in the hearing impaired (HI). The normal auditory system is compressively nonlinear enabling the system to process the wide dynamic range of sound level in our environment. However, the impaired system becomes less compressive (i.e., more linear). Due to lack of compression, HI individuals perceive the change of sound intensity to be much larger compared to NH individuals, a phenomenon often referred to as “loudness recruitment”. Consequently, perception of amplitude fluctuations of sound is exaggerated. Information of amplitude fluctuations of speech over time (temporal information) is critical for speech understanding (e.g. cochlear implant). The ability to encode the temporal information of speech (i.e. temporal processing) might be influenced by cochlear compression. I will present some evidence supporting this hypothesis from a combination of different psychophysical experimental paradigms and measurements of otoacoustic emissions (OAEs) obtained using amplitude modulated sounds.