Evaluation of peripheral compression and auditory nerve fiber intensity coding using auditory steady-state responses - DTU Orbit (08/11/2017)

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The compressive nonlinearity of the auditory system is assumed to be an epiphenomenon of a healthy cochlea and, particularly, of outer-hair cell function. Another ability of the healthy auditory system is to enable communication in acoustical environments with high-level background noises. Evaluation of these properties provides information about the health state of the system. It has been shown that a loss of outer hair cells leads to a reduction in peripheral compression. It has also recently been shown in animal studies that noise over-exposure, producing temporary threshold shifts, can cause auditory nerve fiber (ANF) deafferentation in predominantly low-spontaneous rate (SR) fibers. In the present study, auditory steadystate response (ASSR) level growth functions were measured to evaluate the applicability of ASSR to assess compression and the ability to code intensity fluctuations at high stimulus levels. Level growth functions were measured in normal-hearing adults at stimulus levels ranging from 20 to 90 dB SPL. To evaluate compression, ASSR were measured for multiple carrier frequencies simultaneously. To evaluate intensity coding at high intensities, ASSR were measured using a single carrier frequency at four modulation depths between 25 and 100%. The data showed that ASSR level growth functions exhibited compression of about 0.25 dB/dB. For levels above 60 dB SPL, the slope showed higher variability for the different modulation depths across subjects than for lower levels. The results indicate that the slope of the ASSR level growth function can be used to estimate peripheral compression simultaneously at four frequencies below 60 dB SPL, while the slope above 60 dB SPL may provide information about the integrity of intensity coding of low-SR fibers.

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