Using auditory steady-state responses to evaluate auditory nerve integrity in normal-hearing and mild hearing-impaired listeners

Hearing impairment (HI) has traditionally been defined according to an increase in pure-tone threshold as measured by an audiogram. There is, however, emerging evidence that just evaluating threshold sensitivity does not fully characterize functional deficits in auditory processing. Recent animal studies have shown that noise over-exposure can cause loss of auditory nerve fiber (ANF) synapses — known as deafferentation (see Kujawa and Liberman (2015) for a review) — without causing hair cell loss. Furman et al., (2013) reported that deafferentation occurs predominantly to low-spontaneous rate (low-SR) fibers, which have higher thresholds and therefore respond to higher acoustic intensities. Consequently, these ANF synapse losses do not alter detection of thresholds, but do degrade the encoding of supra-threshold sounds. The loss of ANF synapses might be a primary neural degeneration that precedes both hair cell and ANF cell body loss (Kujawa and Liberman, 2015)

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