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Amplitude modulation depth discrimination in hearing-impaired and normal-hearing listeners

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The processing of amplitude modulations (AM) of sounds is assumed to be crucial for decoding and understanding of speech in humans. Since hearing-impaired (HI) listeners often suffer from severely hampered speech intelligibility, particularly in reverberant or noisy environments, they might also show degraded performance in AM processing tasks. However, several studies indicated a similar or even better performance in AM detection tasks for sensorineural HI listeners than for normal hearing (NH) listeners when reduced audibility was compensated. In addition to AM detection, this study investigates the differential processing of amplitude modulation depth in HI and NH listeners. AM-depth discrimination of a 4-, 8-, and 30-Hz sinusoidal AM, imposed on a 1- or 4-kHz pure-tone carrier, was measured. The AM of the standard ranged from being well detectable to near threshold. AM-depth discrimination thresholds strongly varied among HI listeners and were elevated in comparison to NH for high standard depths. A model of AM processing is suggested incorporating an individually adjusted simulation of the auditory periphery. To account for the data of HI listeners, however, the key element appeared to be an increased internal noise in the AM-depth domain. Consequences for speech perception are discussed.