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Steady State Gain Reduction produced by Amplitude Modulation Based Noise Reduction in Digital Hearing Aids

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Background: Noise reduction systems are important features of digital hearing aids. Different brands of hearing aids use different strategies to achieve noise reduction. How gain parameters are adjusted may not only depend on properties of the input signal, but also on the audiogram of the user.

Aims: The aim of this study is to compare noise reduction systems of 12 high end digital hearing aids in terms of steady state gain reduction as a function of frequency.

Method: To investigate the gain reduction of the hearing aids, they were programmed for different hearing losses and subjected to different test conditions. The test conditions differed in signal-to-noise ratio of the input signal and the level of the input signal. We measured for each test condition the output produced by the hearing aids in a 2 cc coupler and calculated the gain reduction achieved relative to a test condition with clean speech as input signal.

Results: Of the 12 hearing aids we investigated, 3 reduced the gain in the low - and high frequency bands and 3 in all bands. 2 hearing aids showed no reduction at all. Of the rest, 2 showed gain reduction in the low - and mid frequency bands, one hearing aid in the low frequency band only, and one hearing aid in the mid - and high frequency bands. The gain reduction of 6 out of 12 hearing aids was independent of input level or type of hearing loss. In 5 hearing aids gain reduction was dependent on input level and in 2 of those the gain reduction was also dependent on the audiogram. So, in only one hearing aid dependence of gain reduction on only audiogram configuration was found. The total reduction achieved by the hearing aids ranged from 0-15 dB, depending mainly on signal-to-noise ratio.