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Evaluation of noise reduction algorithms in hearing aids with the Acceptable Noise Level Test (ANLT)

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Commonly, single microphone noise reduction algorithms are evaluated using speech intelligibility tests in noise. The desired result is an improvement of the speech reception threshold (SRT) when activating the noise reduction algorithm. Unfortunately, many studies show no or only minor advantages of the algorithms in the chosen test conditions. One possible explanation of these disappointing results might be the signal-to-noise ratio (SNR). While the SRT is typically located at negative SNRs, noise reduction algorithms seem to work more effectively at positive SNRs. Therefore, we applied a different approach to evaluate the benefit of those algorithms by using the Acceptable Noise Level Test (ANLT).

The ANLT is a two-step procedure. At first, speech in quiet is adjusted to the individual Most Comfortable Level (MCL). In a second step, background noise is added to the speech and adjusted to its individual upper limit of comfort. The ANL is defined as the difference in dB between the subject's MCL for speech in quiet and the adjusted noise level that the subjects rated as acceptable. Results of the ANL range between -2 and 30dB with a mean of 10-11dB.

Based on our investigations, it can be concluded that the ANL is suited to determine the benefit of noise reduction algorithms by comparing the adjusted noise level when activating and deactivating the respective processing. In addition, the results are influenced by changes in sound quality which are introduced by the algorithms themselves. Outcomes of the ANL are being compared to the Oldenburg Sentence Test, the Just Follow Conversation Test (JFC) and subjective paired comparisons.

