

Abstract

Understanding speech in realistic noisy situations is one of the major complaints of hearing-impaired listeners. Currently, there is no broadly accepted and time-efficient individual measure about the performance in such situations considered within the process of fitting a hearing aid for prescribing amplification, or for specification of noise reduction strength. The Audible Contrast Threshold (ACT) test is a candidate to deliver such information. The ACT test is a psychoacoustic suprathreshold test that is clinically applicable and language-independent. It measures the detection of spectro-temporal modulations imposed on a noise carrier sound. This study reports on the first experiences with the ACT test and assesses the predictive value of the test for hearing aid fitting. 59 experienced hearing aid users were fitted with the same type of commercially available receiver-in-canal hearing aids. Insertion gain targets according to the NAL-NL2 fitting formula were verified using real-ear measurements with percentile analysis. ACT scores were assessed using an adaptive procedure aiming at the degree of modulation corresponding to 70% correct identification of the spectro-temporally modulated stimulus. Aided speech reception thresholds (SRTs) with the advanced settings in the hearing aids (e.g., noise reduction and beamforming) switched off were measured with the German Hearing-In-Noise Test (HINT) using a three-loudspeaker setup with frontal target speech and two rear competing talkers mixed with low-level stationary noise. The results showed that the ACT scores highly correlated with aided SRTs ($R = 0.594$, $p < 0.001$). Also, the binaural pure-tone average audiogram (BPTA) correlated significantly with aided SRTs ($R = 0.655$, $p < 0.001$). A simple linear combination of ACT scores and BPTA showed very good predictive value ($R = 0.748$, $p < 0.001$) for aided SRTs. Test-retest reliability of the ACT-test was high, as shown by a low average intra-individual standard error of 1.4 dB. Measurement time of one ACT measurement run was about 3 minutes including listener instruction. This indicates that the ACT score provides some complementary information to the audiogram, in terms of predicting aided speech-in-noise performance. This may be useful for getting a-priori information about the level of difficulty that a patient may still experience in a realistic speech-in-noise scenario with hearing aid amplification.