Assessing the efficacy of hearing-aid amplification using a phoneme test

Consonant-vowel (CV) perception experiments provide valuable insights into how humans process speech. Here, two CV identification experiments were conducted in a group of hearing-impaired (HI) listeners, using 14 consonants followed by the vowel /ɑ/. The CVs were presented in quiet and with added speech-shaped noise at signal-to-noise ratios of 0, 6, and 12 dB. The HI listeners were provided with two different amplification schemes for the CVs. In the first experiment, a frequency-independent amplification (flat-gain) was provided and the CVs were presented at the most-comfortable loudness level. In the second experiment, a frequency-dependent prescriptive gain was provided. The CV identification results showed that, while the average recognition error score obtained with the frequency-dependent amplification was lower than that obtained with the flat-gain, the main confusions made by the listeners on a token basis remained the same in a majority of the cases. An entropy measure and an angular distance measure were proposed to assess the highly individual effects of the frequency-dependent gain on the consonant confusions in the HI listeners. The results suggest that the proposed measures, in combination with a well-controlled phoneme speech test, may be used to assess the impact of hearing-aid signal processing on speech intelligibility.