Towards precise and ecologically valid methods in hearing diagnostics and assessment of hearing devices

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Precise methods in audiological diagnostics and understanding the impact of threshold and suprathreshold deficits on the audiological outcomes are crucial for the individualized and successful treatment with hearing devices. Assessment of the benefit from hearing devices should include conditions that reflect the common communication situations.

This study aims at speech recognition of hearing-impaired listeners in acoustic conditions with increasing complexity, i.e., in well-controlled laboratory conditions like stationary or speech modulated maskers in comparison to acoustically more complex and ecologically valid scenes like cafeteria ambience. Furthermore, speech recognition thresholds in quiet and in noise are compared with predictions from the pure-tone thresholds in order to better understand the contribution of the individual loss in sensitivity and suprathreshold deficits to speech recognition in different acoustic conditions.

For aided speech recognition measurements, two prescription rules, NAL-NL2 and trueLOUDNESS, are compared in terms of speech recognition and loudness perception. Pure-tone threshold-based NAL-NL2 acts as a reference since it is widely used in commercial hearing devices. trueLOUDNESS is a new fitting rule that is based on the individual loudness perception.

The outcomes of speech recognition measurements with hearing-impaired listeners show significant correlations of unaided speech recognition thresholds across the “simple” laboratory masking conditions. The performance in these conditions, however, show no significant correlation with performance in realistic cafeteria scenes. The benefit from hearing devices, defined as the difference in speech recognition threshold between the unaided and aided condition, differs across maskers and shows no correlation between laboratory and cafeteria maskers. While NAL-NL2 and trueLOUDNESS result in a comparable benefit in terms of speech recognition, the loudness perception is restored better with the trueLOUDNESS prescription rule.

To conclude, the well-established laboratory acoustic conditions do not provide good predictions for unaided and aided speech recognition in acoustically complex scenes. trueLOUDNDESS provides a new alternative for existing prescription rules.