Data-Driven Approach for Auditory Profiling and Characterization of Individual Hearing Loss

Pure-tone audiometry still represents the main measure to characterize individual hearing loss and the basis for hearing-aid fitting. However, the perceptual consequences of hearing loss are typically associated not only with a loss of sensitivity but also with a loss of clarity that is not captured by the audiogram. A detailed characterization of a hearing loss may be complex and needs to be simplified to efficiently explore the specific compensation needs of the individual listener. Here, it is hypothesized that any listener's hearing profile can be characterized along two dimensions of distortion: Type I and Type II. While Type I can be linked to factors affecting audibility, Type II reflects non-audibility-related distortions. To test this hypothesis, the individual performance data from two previous studies were reanalyzed using an unsupervised-learning technique to identify extreme patterns in the data, thus forming the basis for different auditory profiles. Next, a decision tree was determined to classify the listeners into one of the profiles. The analysis provides evidence for the existence of four profiles in the data. The most significant predictors for profile identification were related to binaural processing, auditory nonlinearity, and speech-in-noise perception. This approach could be valuable for analyzing other data sets to select the most relevant tests for auditory profiling and propose more efficient hearing-deficit compensation strategies.

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Corresponding author: Sanchez Lopez, R.
Contributors: Sanchez Lopez, R., Bianchi, F., Fereczkowski, M., Santurette, S., Dau, T.
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