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Verification of the hearing aid output using ecologically valid sounds in the lab (MPOver)

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Background: Optimizing hearing aid output has been an intermittent goal of hearing aid fitting for many years. Despite the technological and prescriptive breakthroughs, hearing aid users continue to be only moderately satisfied with the outcomes in terms of loudness discomfort and annoyance by loud sounds.

Method: We developed a Matlab program called MPOver (Maximum Power Output Verification) to establish a quick and valid hearing aid output verification tool using narrowband and ecologically valid sounds in the lab. Based on comprehensive sound analyses we selected four typical sounds (frying, party noise, bus engine, vacuuming) for the broadband test module. These environmental sounds and a set of narrow band noises (1.5, 2, 3, 4, 6 kHz) were presented by a loudspeaker from the front with ascending levels in 5 dB steps from 75 to maximum 90 dB until the subjects indicated unacceptable loudness on a touch screen. Several versions of MPOver were accomplished with 151 hearing aid users. The test results were correlated with the loudness discomfort (both general and gradual) experienced with hearing aids in everyday environments.

Results: Statistical analysis of the data based on a logistic regression model reveals that a prediction of loudness discomfort is likewise possible either with the set of broadband noises or with the narrowband noises if loudness discomfort in the field is assessed by asking 'How bothered are you by loud sounds (on a scale 1…5)'. Particularly, the 1500 Hz narrowband noise contributes strongly to the prediction. If the wording is 'Have you experienced any loudness discomfort (yes/no)' with this lab test no prediction is possible.

Conclusions: A quick lab test can be developed to identify hearing aid users complaining about loudness discomfort with their hearing aids.

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