Designing and Testing Presets for OTC Hearing Aids

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SUBMISSION DETAILS

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Abstract Text Objectives:

Over-the-counter hearing aids (OTCs) must allow users to choose a setting that provides good audibility while balancing sound quality preferences. One approach is to use a limited set of gain-frequency configuration presets that are designed so that any user could find a preferred setting from among them. The optimal way to design these settings and the effects of design and number on preference and speech perception are unknown.

Design:

NAL-NL2 targets were calculated for audiograms representing the user population and used to design three groups (4, 16, and 32 presets) of gain-frequency configurations. An algorithm was used to find settings that could cover the maximum number of users for each preset group. Four presets could cover 82% and 16 presets could cover 97% of the user population within 5 dB of targets. The 32-preset group considered both targets and the known preference variations of hearing aid users away from targets and could cover 80% of users within 5 dB of their targets or their preferred variation on targets.

Participants (N=46) determined their preferred preset from each setting group using concurrent, double-elimination, blinded tournaments with A/B comparisons. Participants listened to the presets on an open-source hearing aid and selected their preferred setting for each match. The winners from each group then competed in a similar tournament along with the participant’s NAL-NL2 target settings. An overall winner was found for speech in quiet and in noise. Speech perception and

real-ear aided responses were performed for each preset winner and the NAL-NL2 fitting.

Results:

Participants favored the 32-preset setting, with the 16-preset setting ranked 2nd, the 4-preset setting ranked 3rd, and NL2 ranked last. Ranks did not differ significantly for speech-in-noise. For speech-in-quiet, ranks differed significantly, with settings from the larger preset groups ranking higher than the 4-preset setting or NL2. Although participants preferred the 32-preset setting, speech-in-quiet perception was significantly poorer with the 32-preset setting than the 4- or 16-preset setting, though the effect was small. No differences were observed for speech-in-noise perception. Preferred settings differed from NL2 in gain but not slope.

Conclusions:

For OTCs to be effective and provide user satisfaction, settings need to account for user preferences but balance the need to provide sufficient audibility. Designing presets using population coverage is an effective approach that results in settings preferred to NL2 without differences in speech perception. The optimal number of presets using this approach is around 16 presets.