

Editorial

Acceptable Noise Level: A Clinical Measure for Predicting Hearing Aid Outcome



*Anna K. Nabelek
Guest Editor*

In a recent *JAAA* issue, Dr. James Jerger stated that we are in the age of outcome measures; these measures are essential in the assessment of hearing aid efficacy. While numerous efforts have been made to predict hearing aid outcome, an accurate method of predicting how people will utilize their hearing aids does not exist. Furthermore, it is not known why some individuals are better hearing aid users than others. The research we have been conducting at the University of Tennessee since 1991 concerns whether utilization of hearing aids can be predicted from measures available before hearing aids are fitted and worn.

Background noise is often indicated as a problem for hearing aid users. The effect of background noise is typically assessed in audiology by measuring speech perception scores at fixed signal-to-noise ratios (S/N). Unfortunately, these scores are poor predictors of hearing aid use. We hypothesized that perhaps what troubles hearing aid users is not reduced speech understanding in background noise but the presence of background noise itself. We further hypothesized that willingness to listen to speech in the presence of noise might be more indicative of hearing aid utilization than speech understanding in noise. We decided to measure this willingness as the maximum background noise level (BNL) that an individual is willing to accept when listening to speech presented at the most comfortable listening level (MCL). The difference between MCL and BNL is termed the “acceptable noise level” (ANL) and is expressed in dB. Therefore, an individual who accepts more background noise has a lower ANL than a person who accepts less noise. In our first study on ANL (Nabelek et al, 1991) (then called “tolerated speech-to-noise ratio”), we determined that good

hearing aid users accepted significantly more background noise than occasional hearing aid users or persons who stopped using their hearing aids entirely.

The findings of the first study with small groups of subjects (15 in each group) encouraged us to study the ANL as a potential measure for predicting hearing aid use in a larger population. The results for 191 subjects are presented in this issue of *JAAA* and indicate that ANL is a useful predictor of success with hearing aids. The successful hearing aid users were defined as listeners who were able to use their hearing aids whenever they needed them. The unsuccessful hearing aid users were those who used their hearing aids only occasionally in easy listening conditions or stopped using their hearing aids altogether.

The other papers in this special issue are extensions of the first, Nabelek et al. Freyaldenhoven, Smiley, et al posed an intriguing question regarding whether the ANL can be predicted from individual preference for background noise in everyday life. It is known that many people prefer some background sounds over total quiet during their work. Is that preference related to ANL? The study by von Hapsburg and Bahng demonstrated that the ANL can be assessed in languages other than English. Because some earlier ANL data were collected for monaural listening, Freyaldenhoven, Plyler, et al compared the ANLs for monaural and binaural hearing aid users and demonstrated that the results were not statistically different. There were, however, some individual differences that might be important for utilization of the ANL in clinical practice. Harkrider and Tampas demonstrated that for listeners with normal hearing, some brain responses were different for



Researchers from the Department of Audiology and Speech Pathology at the University of Tennessee. The department is housed in Neyland Stadium. Pictured from left to right: Joanna Tampas, James Thelin, Anna Nabelek, Robert Muenchen, Ashley Harkrider, Donna Fisher Smiley, Junghwa Bahng, Samuel Burchfield, Melinda Freyaldenhoven, Patrick Plyler, and Deborah von Hapsburg.

people with low than with high ANLs. The findings of this physiological study indicated that acceptance of background noise might be inherent to individuals. Perhaps your ANL stays with you for life, even as you develop hearing loss.

We believe that the ANL is a good predictor of success with hearing aids. The procedure is fast, requiring about two to three minutes, and can be accomplished with equipment readily available in most audiology clinics.¹ The method needs some refinement, especially in differentiating between part-time users and nonusers of hearing aids. However, it appears that success with hearing aids requires acceptance of background noise when listening to speech. The acceptance seems to be related to neural processing. New studies at the University of Tennessee provide more insight into this processing by listeners with normal and impaired hearing and were pursued and published by Tampas and Harkrider (2006). This and other current studies should lead to recommendations for proper auditory training and possible pharmacological interventions directed toward reduction of the ANL. Other possible interventions, currently investigated by our group, are hearing aids with various processing strategies and features. It is intriguing, for example, that for hearing aids with digital noise reduction, there is a lack of improvement in speech understanding but an improvement in listening comfort reported, a consequence of which appears to be increased

likelihood of using hearing aids when they are needed.

The research reported here has been an attempt to improve the care given to our patients, and we hope it is useful to our colleagues in providing a better understanding of how people react to background noise and why some people are unsuccessful in using hearing aids despite our best efforts as clinicians.

NOTE

1. Materials used in the acceptable noise level procedure can be obtained through Cosmos Distributing, Inc. None of the authors or coauthors featured in this issue have a financial interest in Cosmos Distributing, Inc.

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