More on Complexity

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The world becomes stranger, the pattern more complicated

—T.S. Elliot, Four Quartets

There was a time when the complexity of hearing aid fitting was confined to questions about optimal frequency response and where to set the output limiter. But those days are long gone. A young audiologist of my acquaintance can scarcely believe that giants of the field once hotly debated whether the frequency response of an aid should be tailored to the shape of the audiogram or whether a relatively flat response would do just as well for everyone. The many technological advances in amplification that we now enjoy, especially those derived from digital signal processing, have greatly minimized problems that seemed important years ago; at the same time, they have created enough new questions to keep the grant agency mail clerks up to their ears in new applications for years to come.

Two technological innovations in particular, directional hearing aids and compression amplification, have stimulated multiple research questions. In this issue of JAAA, two papers speak to the ever-growing complexity of the issues generated by these two sophisticated innovations. In the article “Effect of Age on Directional Microphone Hearing Aid Benefit and Preference,” Yu-Hsiang Wu of the University of Iowa asks to what extent the participant’s age might be a factor in the benefit provided by directional microphone technology, and in the paper entitled “Short and Long Compression Release Times: Speech Understanding, Real-World Preferences, and Association with Cognitive Ability,” Robyn Cox and Jingjing Xu of the University of Memphis sort out the associations among compression release times (RTs), speech understanding, cognitive abilities, real-time preference in daily life, and the extent to which laboratory measures can predict such preferences.

In the Wu study, 24 adults, ranging in age from 36 to 79 yr, were fit with aids that could be switched from omnidirectional to directional microphones. Directional benefit was assessed in two phases; a laboratory study and a field study. In the laboratory study, auditory and audiovisual speech-in-noise tests were presented in a background of either speech-shaped noise or multitalker babble. In the field trial, participants used a paired-comparison technique to record preferences in a paper-and-pencil journal for four weeks. Results echoed findings from many amplification efficacy studies over the past several years: laboratory findings were inconclusive, but real-world listening showed an age effect. In the author’s words, “older age was associated with a lower directional preference.” There seems to be an elusive factor associated with aging that has yet to be captured by our behavioral speech-in-noise laboratory testing.

Investigators Cox and Xu took a similar approach in their study of the interactions among speech understanding, cognitive abilities, and short versus long compression processing RT. Twenty-four middle-aged and elderly participants (41–89 yr) were tested in the laboratory, fit with aids that could be switched between long and short RTs, then sent out on a four-week field trial to compare their reactions to the two conditions via three outcome questionnaires. Speech understanding was measured with two instruments, cognitive ability with six instruments. Results showed that about two-thirds of the participants preferred the long RT condition, while the remaining one-third preferred the short RT condition. Interestingly, neither cognitive ability nor aided speech understanding scores predicted this preference divide. There was, however, a significant interaction among cognitive status, RT, and speech understanding scores. For those in the high-scoring cognitive group, RT had no significant effect on speech understanding scores, but for those in the low-scoring cognitive group, speech scores were significantly poorer in the long RT condition. The authors speculate that the optimal RT for individuals with lower cognitive abilities might depend on the redundancy of the speech test materials. This finding joins a growing body of data on the importance of cognitive variables in any attempt to understand how hearing aid users in general, and elderly persons in particular, actually benefit from amplification.

These two studies, similar in overall concept and design, continue to reflect an apparent disconnect between speech understanding scores measured in the laboratory and outcome data from real-life field trials. Is it possible that the constraints imposed by our desire to precisely control every dimension of the speech-in-noise paradigm in the laboratory limit our ability to capture the complexity of listening in real life? Just a thought.

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