Preferred Aided Listening Levels for Music in the Soundfield

Jason Galster, Ph.D., Krishna Rodemerk, Au.D., Kelly Fitz, Ph.D.
Starkey Hearing Technologies, Eden Prairie, MN

Summary
This observational study documented preferred aided listening levels (PLLs) among a sample of participants with hearing loss when listening to music playback in a stereo soundfield.

All participants were fit bilaterally with six different hearing aids. Hearing aids were prescribed to a music listening program as specified by the hearing aid company. Participants manually controlled loudspeaker playback levels for all combinations of three music samples and hearing aid pairs.

Group average PLLs were similar across music samples and hearing aids. Inter-individual differences were large, reaching levels of 30 dB SPL. Intra-individual differences were comparatively small. A significant negative correlation was observed between in situ hearing aid output and PLL for the frequency region falling between 2000 and 4000 Hz.

Methods

Ten participants with hearing loss were recruited, each participant expressed interest in music listening. Individuals’ hearing loss is shown in Figure 1.

All participants were fit bilaterally with premium hearing aids from six hearing aid companies. During testing, all hearing aids were manually adjusted to the available music listening memory. All signal processing and gain parameters were left at default settings for the participant’s audiometric and demographic profile.

Participants were seated in a sound treated booth with a stereo speaker array oriented directly in front of them, left and right speakers were positioned at +/-45°. Three music samples, each representing a different music genre, were presented at an initial level of 65 dB SPL. Participants were given manual control over loudspeaker playback levels with a rotary volume control (Griffin PowerMate). Playback levels were adjusted to PLL using a bracketing method similar to that described by Recker and Edwards (2013).

Music samples:
- Brandenburg Concerto, J.S. Bach: Classical
- Don’t Know Why, Norah Jones: Female vocals
- The Way You Look Tonight, The Dave Brubeck Quartet: Jazz

Methods Continued

Figure 1. Participant thresholds (dB SPL), averaged between left and right ears, are shown as a function of frequency (Hz). Colors are held constant for individuals’ data in all figures.

Figure 2. Real-ear aided response (dB SPL) is shown as a function of frequency (Hz) for six different hearing aids. Solid lines show the average response for each hearing aid, dots show individual data. Measurements were made with a pink noise presented at 75 dB SPL. All hearing aids were left at default settings for the music prescription.

Results

Preferred Listening Levels

Brandenburg Concerto

Figure 3. PLLs (dB SPL) are shown for 10 participants. PLLs were identified for three music samples while wearing each of six different hearing aids.

Within each hearing aid type, average PLLs were similar for all three music samples. Inter-individual PLL within a hearing aid type varied by as much as 30 dB between listeners. Within a participant PLL variation was comparatively small.

While there are trends for some hearing aids to show a similar range of preference when listening to music at a fixed level (i.e., a live concert). From the perspective of audiologic management, this highlights the importance of providing hearing aid volume control to patients that report frequent music listening.

Our observations suggest that inter-individual preference for music listening level varies greatly. The extent of variation is greater than could be managed by traditional methods of automatic gain control. It is reasonable to expect that listeners with hearing aids may show a similar range of preference when listening to music at a fixed level (i.e., a live concert). From the perspective of audiologic management, this highlights the importance of providing hearing aid volume control to patients that report frequent music listening.

Acknowledgements


The authors thank Ryan Irey for his support in data analysis and reporting.