in the absence of a principled justification to exclude a particular study, the best estimate of the underlying phenomenon should include all available data.

One caveat is that speech perception data and SGC counts were obtained, by necessity, at different points in time (pre- and post-mortem) and at intervals that varied greatly among patients (ranging from 1 to 93 months between last test and death in the Khan et al. study), which might weaken the hypothesized correlation. It is also possible that a relationship does exist, but only when a certain minimum threshold of SGCs is crossed.

To conclude, although the hypothesized relationship between SCGs and speech perception scores remains logically sound, a detailed analysis of all available data in our study failed to provide support for it.

Auditory Prostheses V: Music Perception & Binaural Hearing

PS 615

A Comparison of hearing aid music-listening programs on perceived sound quality of individual musical instruments by child and adult musicians

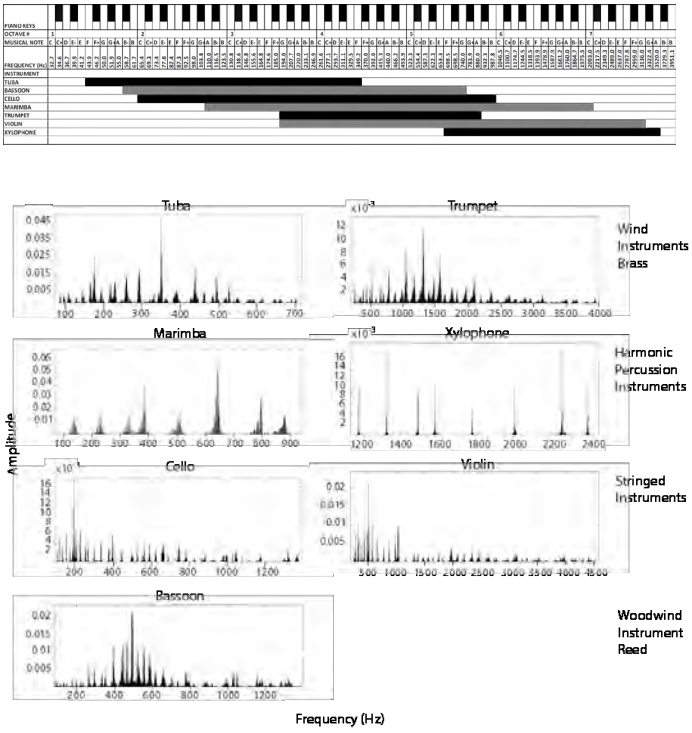
Patti M. Johnstone[1]; Jeffery Reinbolt[2]; Jeffery Pappas[2]; Jennifer Hausladen[1]; Marshall Chasin[3]; Tyler Phillips[1]; Kristen Thornton[1]; Karen Martin[1]
[1]University of Tennessee Health Science Center; [2]University of Tennessee Knoxville; [3]Musicians' Clinics of Canada

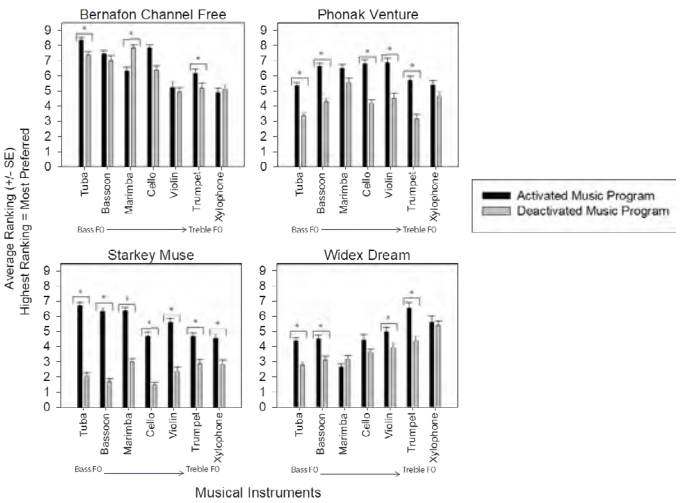
Objectives: Knowledge is limited about how to design hearing aids to optimize music listening for musicians who may spend hours each day playing an individual musical instrument. Some digital hearing aids have dedicated music programs (DMP) designed to enhance music listening. It is unknown if activation of such a DMP improves the subjective quality of amplified music for musicians. Research Aim: determine if child and adult musicians, in blind comparisons, would prefer live music recordings of individual musical instruments from hearing aids with an activated DMP as compared to deactivated.

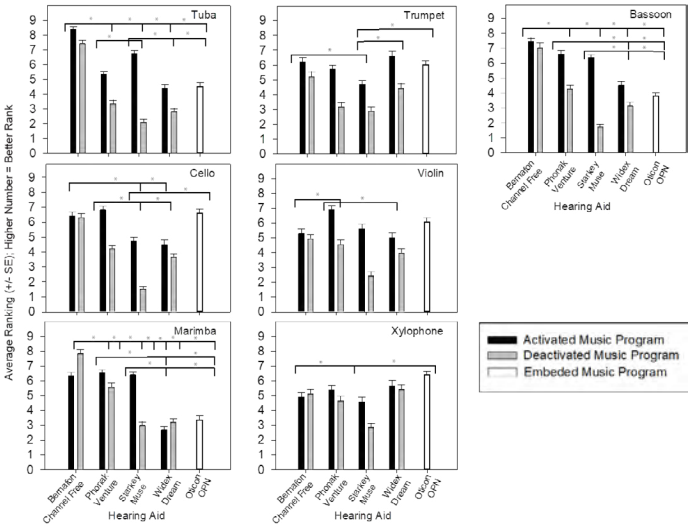
Design: 30 child (8–17 years) and 30 adult (18 –50 years) musicians with normal hearing participated. Seven different, single musical instruments were recorded through 5 different hearing aids, each fit to KEMAR® for a flat hearing loss with thresholds at 50 dBHL. Four of the hearing aids had a DMP and one did not. For those devices with DMPs, music recordings were made with the DMP activated and deactivated. On each trial, participants were asked to blindly judge the relative preference of randomly paired-comparisons of the music recordings. A QuickSort algorithm was used to efficiently sort and rank-order the preferred hearing aid outputs for each participant for each musical instrument. Participants were asked to subjectively rate their highest ranked choice for richness, pitch distortion, fidelity, and noise. Participants were asked to imagine how long they would be willing to wear their top-ranked hearing aid each day.

Results: A significant 3-way interaction between DMP Activation, Hearing Aid Make, and Musical Instrument was found. On average, participants reported that they would be willing to listen with their top-choice hearing aid 1-3 hours a day. However, the willingness to listen with their top-choice hearing aid correlated significantly and negatively with length of reported musical experience (adults), distraction of perceived noise, and/or pitch distortion (children and adults). A significant positive correlation existed between willingness to listen and perceived richness and/or fidelity of their top-choice hearing aid (children and adults).

Conclusions: Child and adult musicians prefer music recorded through a hearing aid with an activated DMP, however, this preference depends on the hearing aid make and musical instrument listened to at the time. For individual musical instruments with bass harmonics, musicians ranked ChannelFree® processing significantly higher than all other processing schemes. Music fidelity, richness, distraction of circuit noise, and pitch distortion are important factors that may influence musicians'; willingness to use a hearing aid.







PS 616

Effects of Music Training on Cochlear Implant Outcomes

Fawen Zhang[1]; Chun Liang[2]; Gabrielle Underwood[1]; Kelli McGuire[1]; Jing Xiang[3]; Chelsea Blankenship[4]
[1]University of Cincinnati; [2]University of Cincinnati, Shenzhen maternity and child healthcare hospital; [3]Cincinnati Children's hospital; [4]University of Cincinnati/ Cincinnati Childrens Hospital Medical Center

Background. For most cochlear implant (CI) users, pitch-based speech tasks and music perception are extremely challenging. Evidence has shown that music training enhances auditory perceptual skills such as frequency change detection and cognitive functions that can benefit speech perception. The objective of this project is to examine the effects of a short-term music training protocol on CI hearing outcomes. This study is expected to have important impact on post-implantation intervention and assessment in CI users. **Methods.** Nine post-lingually deafened adult CI users (age range: 31-64 years) who have used their CIs for at least 1 year participated in the study. Participants used Pandora program or similar music programs downloaded on their home computer or smartphone for music training. They were instructed to select music genres of their preference that have an emphasis on the melody. During the training, they were asked to pay attention to the music melody, rather than other musical elements and were encouraged to sing along mentally. Music training occurred during a time when the participant was not distracted. The training schedule was 40 minutes/day x 5 days/week x 4 or 8 weeks. They were required to log the training details. Direct audio input was used to send the training stimuli so that the untrained ears were not involved during training. The pre-training and post-training tests included: a questionnaire (Speech, Spatial and Qualities of Hearing Scale or SSQ), a psychoacoustic test of frequency change detection, speech tests (CNC words, Azbio sentences, and QuickSIN), and electroencephalographic (EEG) recordings. For the EEG and psychoacoustic test, the stimuli were a series of 1-sec 250 Hz pure tones containing different magnitudes of upward frequency changes at 0.5 sec after the tone onset (see method section in Liang et al., 2016). **Results.** Compared to the pre-training results, there was a significant improvement ($p<0.05$) in the performance on CNC (pre- vs. post-performance: 70.1% vs. 80.7%) and QuickSIN (16.9 vs. 12.4 dB SNR loss), as well as SSQ (4.6 vs. 6.2). The frequency change detection threshold (FCDT) was improved (2.63% vs. 1.33%), but the improvement did not reach statistical level due to the large variability. The ACC showed a larger amplitude for both 5% and 50% change and the percentage of present ACC for the 5% change increased after the training.

PS 617

Automatic Gain Controls Improve Sound Localization in Bilateral Cochlear-Implant Users

Casey Gaskins[1]; Chen Chen[2]; Amy Stein[2]; Olga A. Stakhovskaya[1]; Matthew Goupell[3]
[1]Department of Hearing and Speech Sciences, University of Maryland, College Park; [2]Advanced Bionics; [3]University of Maryland

Introduction:
Automatic gain controls (AGCs) in hearing-assistive devices limit the output gain to comfortable levels. In most devices used bilaterally, AGCs apply compression and gain independently across the ears, which distorts the natural binaural cues necessary to localize sound. Synchronization of AGCs for bilateral hearing-aid users have demonstrated improved speech intelligibility in the presence of competing noise. However, research on this topic is limited in bilateral cochlear-implant (CI) users. Since bilateral CI users mainly rely on interaural level differences (ILDs) to localize sound, the distortion of ILDs