

Session 2pNSb

Noise and Psychological and Physiological Acoustics: Mobile Technology Solutions for Hearing Loss Prevention

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Chair's Introduction—3:30

Invited Papers

3:35

2pNSb1. Accurate mobile noise measurements: Challenges for the app developer. Benjamin Faber (Faber Acoust., LLC, 277 S 2035 W, Lehi, UT 84043, ben@faberacoustical.com)

The ubiquity of mobile computing devices, their connection to the cloud, and their media-centric nature makes them attractive for wide scale acquisition of acoustical information, including human noise exposure in various environments and at various times. One concern in harnessing the potential of such a network of devices is ensuring that each device is able to acquire the desired acoustical information with sufficient accuracy. It is possible to make accurate acoustical measurements, as long as care is taken to ensure that the hardware, software, and users all work together to ensure success. System software, signal acquisition hardware, microphones, the mobile devices and the people who use them each present certain issues and challenges to the process of making accurate and reliable acoustical measurements. Various of these issues and challenges will be presented and discussed from an app developer's perspective.

3:55

2pNSb2. Use of smartphone sound measurement apps for occupational noise assessments. Chucri A. Kardous (National Inst. for Occupational Safety and Health, 1090 Tusculum Ave., Cincinnati, OH 45226, ckardous@cdc.gov) and Metod Celestina (EA LAB, Ljubljana, Slovenia)

NIOSH conducted two studies to examine the accuracy of smartphone sound measurement applications (*apps*). The first study examined 192 sound measurement *apps* on the Apple (iOS) and Google (Android) platforms. Only 10 iOS *apps* met our selection criteria for functionality, measurement metrics, and calibration capability. The studies compared the performance of the *apps* with a reference microphone and with a professional type 1 sound level meter and a type 2 noise dosimeter. The results showed 4 iOS *apps* with means of differences within ± 2 dB(A) of the reference microphone. The Android-based *apps* lacked the features and functionalities found in iOS *apps* and showed a wide variance between the same *app* measurements on different devices. A follow-up study of the 4 iOS *apps* using calibrated external microphones (MicW i436 and Dayton Audio IMM-6), showed an even closer agreement with professional meters. Overall, the studies suggest that certain *apps* may be used for some occupational noise assessments but only if properly calibrated and used within the hardware limits of the mobile devices. NIOSH and EA LAB are collaborating to develop an occupational sound measurement *app* for iOS devices in an effort to improve awareness of the noise hazards in the workplace.

4:15

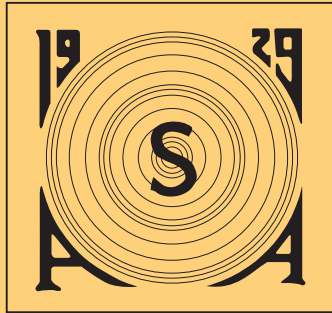
2pNSb3. Acoustic requirements for audiometric testing and hearing protector fit-testing with mobile platforms. William J. Murphy (Hearing Loss Prevention Team, Centers for Disease Control and Prevention, National Inst. for Occupational Safety and Health, 1090 Tusculum Ave., Mailstop C-27, Cincinnati, OH 45226-1998, wjm4@cdc.gov)

Mobile technology platforms present new challenges for implementing hearing loss prevention programs. Laptop computers, smartphones, and tablets have capabilities to generate 16-bit and sometimes 24-bit audio stimuli for hearing tests. For testing hearing at threshold, the noise floor of the sound card of the computer can pose a limitation. During the development of sound compression standards (e.g., MPEG, AAC, MP3), 24-bit resolution and 96 kHz sampling is necessary to encompass the requirements for dynamic level the frequency range of human hearing. However, hearing screening and fit-testing can be accomplished with 44 kHz sampling rates. However, the bit resolution deserves careful treatment to ensure that output is accurate. This paper will describe features for mobile applications for audiometric testing and hearing protector fit-testing. Several external DAC platforms on Windows 7 based laptops along with a small sample of iOS and Android devices have been tested and demonstrate differing levels of performance. Linearity of the systems and output levels for a standard audiometric headphone will be presented.

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