By Larry Medwetsky

Mobile Device Apps for People with Hearing Loss

Expanding the Horizons of Hearing Access

Here are some amazing apps for people with hearing loss that are now available for download to smartphones, tablets, and the Apple Watch.

In the July/August 2015 *Hearing Loss Magazine*, I wrote an article concerning hearing aid connectivity. This technological advance has allowed hearing aid users to connect their hearing aids directly by Bluetooth® or indirectly through an intermediary device to external sound sources like a cell phone or television. Connectivity can also allow hearing aid wearers to hear others across the room as if they were speaking right next to them. This is made possible through the use of the paired device as a remote microphone.

In this article I will write about other significant advances for those who have a hearing loss; that is, the myriad of applications—"apps"—which have been developed for individuals with hearing loss for download to smartphones or tablets. It is estimated there are more than one billion users of tablets worldwide. By 2016 there will be more than two billion owners of smartphones. Much of the popularity of apps can be attributed to their lower cost than comparable commercial products. With a simple download of these apps, people with hearing loss have the ability to transform their smartphone or tablet for various hearing-related applications.

Apps by Their Function

In this article, I have categorized the types of apps available by their functional purpose. Refer to the end of this article for a list of apps in these categories as well as the cost for downloading them. You might also want to search these category keywords online to find more offerings.

Please note that I have not purchased or tested most of the apps I will be discussing nor is my mention of any of these products meant to imply any form of endorsement. I have however, researched and compiled a list of apps and used their website descriptions. There

are some app categories where I will note caveats to their usage based on my knowledge and experience.

Mobile Device Apps Serving as a Hearing Screening Device

Hearing screenings typically use calibrated audiometers for the purpose of identifying whether one has a hearing loss, and possibly the extent of a hearing loss via air conduction pure tone threshold testing. Recently, software for conducting hearing screenings/air conduction threshold testing has been available for download to smartphones or tablets. Two uses for this type of app include: for hearing professionals to conduct hearing screenings in remote or low-income areas; and, for consumers who suspect they might have a hearing loss to conduct their own initial screening.

In Third World countries, this software is used as a mobile hearing screening device to easily screen a lot of people who might not have access to hearing screening. Professor De Wet Swanepoel from the University of South Africa along with colleagues from other countries have developed ***hear*Screen**™, a mobile hearing screening app, to conduct hearing screenings in community-based programs in South Africa. In conducting these hearing screenings, headphones were calibrated (the software was programmed to ensure the desired output levels), and real-noise monitoring was done to ensure that background noise would not interfere with the reliability of the results obtained. In their field studies, Dr. Swanepoel and his colleagues found that they were able to obtain results comparable to those obtained in an audiologist's office.

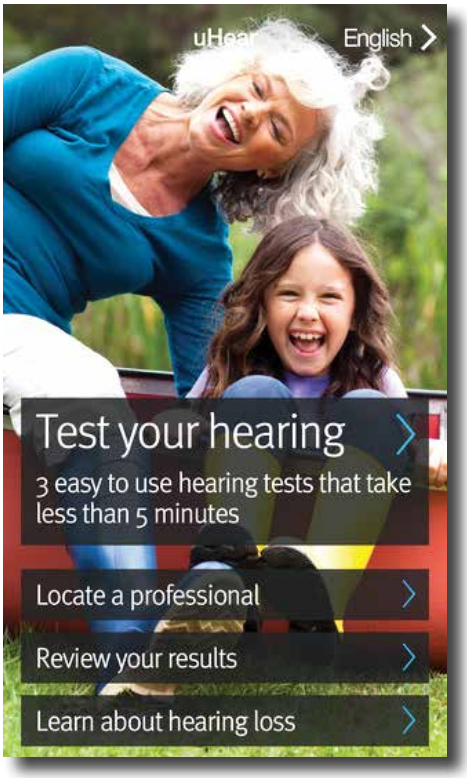
In a paper examining hearing health care apps for mobile devices, Na (2015) indicated a number of factors that need to be considered when using mobile technology to conduct hearing screening/testing. These include:

- the frequency response of the headphones used can affect the accuracy of the hearing screening.
- the accuracy of app-based hearing measurements depends upon the calibration of the headphones before administration of the test and the amount of noise in the background environment. If not addressed, the latter can often result in raised hearing thresholds when conducting a hearing screening. This might, in turn, lead to a false referral for a comprehensive hearing test.

To determine the exact level of the background noise requires a Sound Level Meter (SLM) app that can ensure the output meets a target standard within an acceptable level. In my review of many of the hearing screening apps currently available, most of these do not incorporate or suggest calibration, nor do they discuss the type of headphone that should be used. Consequently, if one does not address these issues, one has to be cautious relative to the results obtained, as they might result in inaccurate findings.

However, I did note some hearing screening apps that do incorporate a calibration process as well as a means of addressing any background noise present. The ***hear*Screen**™ app by Swanepoel and colleagues is now commercially available to the public, while an app developed by Na and colleagues also shows much promise. Note that the ***hear*Screen**™ app must be purchased with the Sennheiser headphones for which it has been designed. In addition to these aforementioned apps, a number of hearing aid manufacturers, including Starkey and Unitron, also offer downloadable hearing screening apps though from what I can tell they do not incorporate any calibration process.

An alternative for individuals who do not feel they have the technological know-how to run a mobile app, or are not ready to schedule an appointment with an audiologist, is hearing screening offered in the community from service organizations such as the Lions Club and Sertoma or various hearing health-related practices.



Example of a hearing screening app (uHear 2.0 hearing screening software from Unitron). Photo courtesy of Unitron.

Amplifier Apps

Recently, apps have become available to transform a mobile device into a personal sound amplifier. Amplifier apps typically use the microphone of the mobile device to pick up sounds and then apply processing to the incoming signal so that the individual can hear more clearly and easily. There are a wide variety of amplifier apps; however, some of these only increase the overall volume, while others provide similar volume-control options found within a basic hearing aid. The more comprehensive apps also include options that can focus on sounds that are far away or those that are close up, while some of the sites also claim their apps can decrease background noise.

I will first describe some of the many apps that are available for download, starting with the simpler ones. I will then offer my opinion as well as discuss a number of caveats to their general usage.

TV Louder is one of the simplest amplification apps. All one has to do

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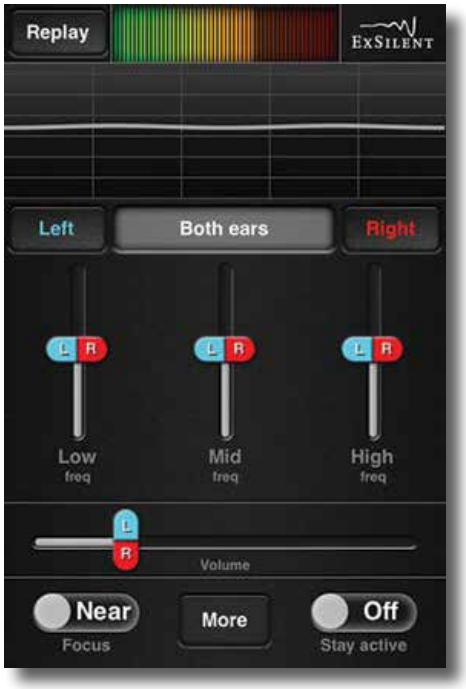
is plug in the headphones and tap the program-on button. To adjust the volume to one's comfortable listening level, one adjusts the volume on the side of the mobile device.

HearYouNow consists of a simple interface where the overall volume can be adjusted per ear; the user can also adjust the volume in three separate frequency bands (low, medium and high frequency range) and there is a focus feature that allows you to hone in on a conversation held close by or farther away from you.

BioAid has been designed to enhance sound clarity and regulate the loudness of ambient noise. According to the website, one does not need a hearing test prior to using this app. Instead, the user chooses between different settings associated with six basic audiogram shapes and the listener chooses the one that sounds best. The user also has control of the overall sound level and can vary the level in which background sounds can be suppressed.

Hearing Aid Replay Lite's main features include: a volume control; a balance control to adjust left or right ear volume; an equalizer to adjust the degree of amplification across frequencies, which in turn, allows the user to create two saved profiles; and an option to reduce background noise. The app is always in a recording mode, thus, one can play back the last 30 seconds if the user has missed any key information.

In the above cases, the amplifier apps provide either an overall linear boost of amplification; require the user to choose from various amplifier settings; or, allow for adjusting the degree of amplification across frequencies via the use of an equalizer (i.e., in separate frequency bands, the user has the ability to alter the degree of amplification provided within each band). However, none of these apps require entering thresholds based on an actual audiogram.



Example of an amplifier app (HearYouNow amplifier app from ExSilent). Photo courtesy of ExSilent.

Recently, a new app has come on the market, whereby the manufacturer indicates that it is the world's first USA Food and Drug Administration (FDA) registered medical standalone software hearing aid. The **Jacoti ListenApp** has been designed to assist individuals with mild-to-moderate hearing loss and is audiogram-based (i.e., the hearing testing must be conducted by a hearing professional). The app consists of: left and/or right ear programming; four different settings—natural sound, speech, music and movie listening modes; and an overall volume control all of which are set by the consumer.

In addition to the amplifier apps discussed above, there is an additional option that can be used to enhance the capability of a mobile device when used as a hearing amplifier. I first became aware of this when reading an article by HLAA Board member, Richard Einhorn (*Hearing Loss Magazine*, May/June 2012). To improve his ability to hear in noise, rather than relying on the built-in microphone of his smartphone, Mr. Einhorn purchased and attached a directional microphone to the audio jack of his iPhone. Directional microphones pick up sounds more easily from in front of the listener than from other directions making it easier to hear a speaker in the presence of background noise—as long as the speaker is located in front of the directional microphone). There are many directional microphones in the marketplace that can be used in conjunction with a smartphone, although obviously some are better and more expensive than others.

In reviewing the various apps, it is clear that many of them can assist individuals with hearing loss. Candidates for such apps include individuals:

- who have a mild hearing loss for whom hearing aids are not yet appropriate or necessary because they just need some additional amplification,
- for whom finances are a major concern or they are not ready to commit to the expense entailed by hearing aids,
- who live in poor areas of the world,
- who might be sedentary, such as individuals residing in a nursing home who can't get out to get their hearing tested, or,
- who simply are just not ready to try a hearing aid.

The Facts about PSAP

Personal Sound Amplification Devices (PSAP) are defined by the U.S. Food and Drug Administration as "wearable electronic products that are intended to amplify sounds for people who are not hearing impaired." Until recently, these devices consisted of portable amplifying systems, but with the advent of downloadable amplifying software this category has broadened to include mobile devices with amplifier apps.

Consequently, guidelines from the FDA indicate that advertising on websites should not imply that these devices are for individuals with hearing loss, unless specifically approved by the FDA—such as the Jacoti ListenApp. However, because these are guidelines

Understanding the Terms

Air-conduction thresholds—the lowest level that an individual can hear a pure tone stimulus through headphones or earphones.

Audiometer—the electronic piece of equipment employed by a hearing health care professional to assess the hearing thresholds and speech awareness and/or processing ability of an individual.

Calibration—the process of determining that an audiometer produces the desired signals, at the proper intensities.

Pure tone—a sound that has only one frequency.

Threshold of hearing—the lowest level that a particular sound's presence can be perceived by an individual more than half the time.

and not enforceable regulations, many manufacturers seem to have taken liberty with following this.

Caveats with PSAP

- I feel that prior to using a mobile PSAP application, an individual should receive a comprehensive hearing test to not only ascertain one's thresholds, but to also ensure there are no possible underlying medical contraindications present. If so, then the individual should see their primary care or ear, nose and throat doctor for assistance.
- Reviews have shown that many amplifier apps are not very good because they reveal significant sound delays and/or poor sound quality). They might also present sound at very loud levels that could be damaging to one's ears (Atcherson, 2012).
- Amplification provided through mobile apps is quite limited compared to the excellent hearing aid products in the marketplace. Thus, they may be useful in quiet environments, but if one is looking to address hearing in a variety of listening settings, these simplistic amplifier app systems leave much to be desired.
- Perhaps most importantly, I have always felt that the purchase of hearing aids is only the starting point, and that it is the skill and commitment of the audiologist in working with a client over time and multiple sessions that ultimately results in the best fitting possible. If the only goal is to achieve an increase in overall volume level, then the individual will likely derive benefit and satisfaction from the mobile app. However, if one is truly having difficulty hearing in many listening situations, then simply downloading an amplifier app is unlikely to provide the desired results.

Therefore, prior to downloading an app it is important to review these apps carefully. If you are truly seeking a starter system to use primarily in quiet settings and have been cleared medically, then this can be a way to go—especially if the price tag varies from free to low cost.

Hearing Aid Remote Apps

As mentioned earlier, mobile devices can now be paired to hearing aids via Bluetooth® or some other transmission mode. Among the options that this pairing allows is the ability of a smartphone or tablet to serve as a remote control device to adjust hearing aid settings (for example: left/right volume, program memory). Some manufacturers, like Siemens

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Smartphone Apps for People with Hearing Loss

For the website addresses for the apps listed below, go to the online version of this article at hearingloss.org>HearingLossMagazine>Current Issue. Click on Dr. Medwetsky's article and you will see the live links at the end.

Hearing Screening Apps

Hearing-Check (iPhone)
Free

***hear*Screen™ (Android)**
No information on cost

Play it Down (iPhone)
Free

Siemens Hearing Test (iPhone)
Free

Starkey SoundCheck (Android and iPhone)
Free

Test Your Hearing (Android)
Free

Unitron uHear (iPhone)
Free

Amplifier Apps

BioAid (iPhone)
Free

HearYouNow (iPhone)
Free

Hearing Aid Replay Lite (Android)
Cost $3.30

Jacoti ListenApp (iPhone)
Free

TV Louder (iPhone)
Free

Hearing AId Remote Apps

ReSound Smart (Android and iPhone)
Free
Starkey

Apps *continued from page 23*

and ReSound, use an intermediary to connect a smartphone or tablet wirelessly with their hearing aids.

By downloading the manufacturer's respective app to the mobile device, it converts the screen of the mobile device to a remote control. ReSound and Starkey have developed hearing aid lines that allow for direct connectivity via Bluetooth® transmission of the smartphone or tablet, and they have even developed apps that allow the Apple Watch to serve as a remote control for their hearing aids. For example, the ReSound Linx and Starkey Halo apps for the Apple Watch allow users to adjust preferred volume levels, and change audio profiles as they move through different sound environments.

Summary

I have discussed some of the amazing apps for individuals with hearing loss that are now available for download to smartphones, tablets, and the Apple Watch. The low cost and functionality of these apps make them attractive options for individuals who are seeking to conduct a hearing screening or looking for a basic hearing amplifier. Some caveats to their general use were mentioned, but if you are within one of the categories I mentioned in which people with hearing loss can benefit from such applications, then it may be worth your while to do so.

In the next issue of *Hearing Loss Magazine*, I will conclude this two-part article by discussing other downloadable applications. These include apps for captioning, hearing assistive technology, tinnitus relief, and more. I hope that many of you will take advantage of some of the apps discussed in these articles. ***HLM***

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DOWNLOADALE APPS FOR CAPTIONING, HEARING ASSISTIVE TECHNOLOGY AND MORE

Hearing Screening Apps	Operating System	Website	Cost
Hearing-Check	iPhone	https://itunes.apple.com/us/app/hearing-check/id485312957?mt=8	Free
hearScreen™	Android	hearscreen.co.za Email info@hearscreen.co.za	Cost not provided
Play it Down	iPhone	http://playitdown.org/	Free
Siemens Hearing Test	iPhone	https://itunes.apple.com/us/app/siemens-hearing-test/id394674665?mt=8	Free
Starkey SoundCheck	Android and iPhone	https://play.google.com/store/apps/details?id=soundcheckmono.androidapp https://itunes.apple.com/us/app/sound/id427587943?mt=8	Free
Test Your Hearing	Android	https://play.google.com/store/apps/details?id=net.epsilonzero.hearingtest&hl=en	Free
Unitron uHear	iPhone	http://unitron.com/uhearapp	Free
Amplifier Apps			
BioAid	iPhone	bioaid.org.uk/project	Free
HearYourNow	iPhone	https://itunes.apple.com/us/app/hearyounow-your-personal-sound/id569522474?mt=8	Free
Hearing Aid Replay Lite	Android	https://play.google.com/store/apps/details?id=com.ls.iris.apps.hearingaid	$3.30
Jacoti ListenApp	iPhone	https://itunes.apple.com/gd/app/jacoti-listenapp/id720203800?mt=8	Free
TV Louder	iPhone	https://itunes.apple.com/us/app/tv-louder/id795853896?mt=8	Free
Hearing Aid Remote Apps			
ReSound Smart	Android and iPhone	resound.com/en-US/hearing-aids/apps/smart-app play.google.com/store/apps/details?id=com.resound.smart https://itunes.apple.com/us/app/resound-smart/id816203976?mt=8	Free
Starkey	iPhone copy did state	http://starkey.com/blog/2015/04/halo-and-apple-watch-now-compatible	No info