INTRODUCTION

Today, more than ever before, patients are using their smartphones in tandem with their hearing aids. The ability to stream music and mobile phone calls is becoming ubiquitous with advancing hearing aid technology. In 2018, Starkey® released our fourth Made for iPhone® family with Livio® AI. The research question for this study was:

Which commercially available hearing aid has the most preferred streamed audio sound quality amongst a selection of seven different hearing aid systems when connected to an iPhone?

To address this question, we recruited 18 participants with normal hearing to perform an online listening task with over-the-ear headphones. The participants were asked to compare the sound quality of music and phone call recordings made using seven different hearing aid systems and then indicate their preference as well as provide the strength of their impression.

METHODS

Seven sets of receiver-in-the-ear (RIC) hearing aids from various manufacturers and two pairs from Starkey (Halo™ iQ and Livio AI) were used for this study. The selected devices were the most recent RIC 312 hardware platforms available from each manufacturer as of June 2018. All hearing aids were programmed to the default fitting prescription for a flat 50 dB HL hearing loss using the manufacturer’s software. All features, including frequency lowering and environmental classification/adaptation, were left at best fit [default] settings for an experienced hearing aid wearer.

Participants were asked to provide their sound quality preference for streamed audio between the different hearing aid systems. To do so, recordings of the streamed audio were made by placing the programmed hearing aids in the ear canals of an acoustic mannequin (Knowles Electronics Mannequin for Acoustic Research; KEMAR) coupled to occluded earbuds. These recordings were subsequently presented to the participants via an online listening task.

To make each recording, each set of hearing aids was paired with the same iPhone 6S. For phone call streaming, a phone call was made from the iPhone and was streamed to the hearing aids and recorded through KEMAR’s couplers. For the music recording, the hearing aids were paired to the iPhone and controlled through the native iOS application such that the microphone was set to 64 percent for all six* sets of devices which streamed the theme song from Rocky from YouTube [https://www.youtube.com/watch?v=DhIPAdj38rHc].
The user interface shown in Figure 1 was used for the online listening task. Listeners were blinded to the presentation order of the seven hearing aid sets. Participants listened to each recording and ranked their preference by sliding each box up or down and providing each recording a numeric score (0 to 100 according to their preference). The task was completed two times, once for streamed phone call and once for streamed music.

**RESULTS AND DISCUSSION:**

**Phone Call Results.** Figure 2 shows the number of times the participants ranked each manufacturer in 1st – 7th place. Starkey Livio AI was ranked 1st place most often (10 times). Figure 3 shows the average (n=18) absolute ratings across manufacturers. Starkey Livio AI had the highest average rating (56.5) when compared to the other manufacturers.
**Music Ranking Results.** Figure 4 shows the number of times the participants ranked each manufacturer in 1st – 6th place for music streaming. Starkey Livio AI was ranked 1st place most often (9 times). Figure 5 shows the average (n=17) absolute ratings across manufacturers. Starkey Livio AI had the highest average rating (68.4), when compared to the others.

**CONCLUSION**

A preference listening task was performed in order to address the question:

*Which commercially available hearing aid has the most preferred streamed audio sound quality amongst a selection of seven different hearing aid systems when connected to an iPhone?*

Analysis of the data collected revealed that Starkey’s Livio AI was rated the highest in terms of preference for phone call and music streamed audio when compared to six other flagship hearing aids.

**REFERENCES**

1. Rocky theme song was streamed from You Tube: https://www.youtube.com/watch?v=DhlPAj38rHc (Retrieved 2018, August 1).

*One of the manufacturers’ hearing aids does not stream music from the iPhone and as such was not included in the iOS Music streaming listening task. In addition, these same hearing aids only stream phone calls to one ear at a time, but the binaural set was included in this study anyway to mimic how it streams phone calls in the field. IOS is a trademark or registered trademark of Cisco in the US and other countries and is used under license.