INTRODUCTION

Speech understanding in conditions with poor signal-to-noise ratio can be challenging even for normal-hearing individuals. Such individuals often encounter listening difficulties in restaurants, sporting events or entertainment venues. Poor signal-to-noise ratio (SNR) can be a result of reverberant environments, increasing distances from the speaker of interest or increased background noise. The benefit of this technology in individuals with unilateral hearing loss, autism spectrum disorders and auditory processing disorders has been well established when used with a single talker (Rance et al., 2017; “Roger Focus for school children,” 2014). The purpose of this study was to verify the benefits of Roger Focus receivers in individuals with normal hearing when listening to a group of speakers.

METHODS: SPEECH RECOGNITION TEST

Speech recognition-in-noise was measured for 10 normal hearing adults in the age range of 18-40 years who were attending a week-long auditory rehabilitation conference. The Hearing In Noise Test sentences (Nilsson et al., 1994) were presented in restaurant noise at 0, -5, and -10 dB SNR. Simulating a dining experience, the participant faced 5 speakers (Fostex 6302 BE3) spaced equally around a four-foot circular table. The stimuli were presented from a laptop (Toshiba) and a soundboard (Focusrite Scarlett 1820) using Cubase software. Restaurant noise was presented via a Toshiba netbook through two speakers (HDMX Jam) on either side of the participant. Participants were fit with bilateral Roger Focus receivers and allowed to select the optimal gain setting. A practice list of 10 sentences were completed prior to the start of the test. The participant wore a Roger Pen connected to a Roger Mylink receiver worn by the examiner to facilitate scoring responses in the background noise. Speech recognition was measured with and without the Roger Focus receivers.

The improvement in scores when using Roger Focus compared to no technology at 0, -5, and -10 dB SNR was 8.79%, 13.40%, and 14.15%, respectively. Following arcsine transformation to account for unequal variance in percent correct data (Sherbecoe & Studebaker, 2014), a two-factor repeated measures ANOVA was performed for the scores from three SNR conditions with and without technology. There was a significant effect of SNR condition (df=2; p<0.05) and technology (df=1; p<0.05), but no significant interaction effect (df=2; p>0.05). Follow-up t-tests revealed that performance at all three SNRs was significantly different from each other (p<0.05).

METHODS: SPEECH RECOGNITION TEST

The average values for the Electroacoustic analysis are shown in Table 1. The variability across devices was within acceptable clinical expectations.

METHODS: ELECTROACOUSTIC ANALYSIS

The Phonak ear of interest or increased background noise. The benefit of this technology in individuals with unilateral hearing loss, autism spectrum disorders and auditory processing disorders has been well established when used with a single talker (Rance et al., 2017; “Roger Focus for school children,” 2014). The purpose of this study was to verify the benefits of Roger Focus receivers in individuals with normal hearing when listening to a group of speakers.

RESULTS: ELECTROACOUSTIC ANALYSIS

Table 1. Mean values from the electroacoustic measurements of 20 Roger Focus receivers. Note: HFA=High Frequency Average. OSPL=Output Sound Pressure Level.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Gain (dB)</td>
<td>15.98</td>
<td></td>
</tr>
<tr>
<td>Equivalent Input Noise (dBSPL)</td>
<td>25.46</td>
<td></td>
</tr>
<tr>
<td>Total Harmonic Distortion (%)</td>
<td>0.46</td>
<td>0.37</td>
</tr>
<tr>
<td>HFA (dBSPL)</td>
<td>77.61</td>
<td></td>
</tr>
<tr>
<td>OSPL90 (dBSPL)</td>
<td>104.19</td>
<td></td>
</tr>
</tbody>
</table>

RESULTS: SPEECH RECOGNITION TEST

The University of Texas at Dallas

Figure 2. A diagram representing the task arrangement used for speech-recognition testing. Note. Adapted from Land & Thibodeau (2017).

Figure 4. Average speech-recognition scores obtained at different SNR levels with and without technology. Error bars marked on the graph indicate standard deviation in each test condition. Note: SNR=Signal-to-Noise Ratio

CONCLUSION

It was concluded that the use of Roger Focus by adults with normal hearing can provide significant benefits in noisy situations. They might be motivated to use the Roger Focus as bilateral ear-level receivers for phone calls, listening to music, or for better speech understanding in background noise. Knowledge of the benefits received with this technology in noisy group settings would help audiologists provide recommendations those with normal hearing who seek solutions for communication in noise. Future research can focus on the effect of age of participant and their performance in speech in noise.

LIMITATIONS

- Limited sample size
- Variability in gain provided by each receiver due to user-control of gain settings.
- Participants in the study were selected based on convenience sampling

REFERENCES


ACKNOWLEDGMENTS

This study was part of a larger research study on the benefits of wireless technology. Gratitude is expressed to Phonak for providing the equipment and to all the participants of the study.