Phonak
Field Study News

Benefits of Remote Support and Remote Control app solutions for parents and children

Pre-teens' and teenagers' use and interactions with the myPhonak hearing aid app were evaluated in a clinical study at Hearts for Hearing in Oklahoma. Eighteen participants, age 10-17 were recruited for this study which explored the adjustments, preferences, and environments in which the app was used. Results of this study contributed to the development of the new myPhonak Junior 1.0 app, which includes Remote Support and Remote Control features.

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Key Highlights

- Overall, the participants had a positive experience with the app and overwhelmingly preferred the Noise reduction, Speech Focus, and volume modifiers over the frequency equalizer and Dynamic modifier.
- Parents of children ages 7-17 were supportive of a pediatric app and were agreeable to giving their child access to remote control features.
- Real ear measures on both participants and KEMAR confirm the hearing aid fitting is not compromised with Noise reduction and Speech Focus adjustments.

Considerations for practice

- The new myPhonak Junior 1.0 app is compatible with Sky M, Naida P-UP, and Sky Link M devices.
- It includes only features that were identified as appropriate for children, school age and older.
- Parents and children should be counseled on the use of both the volume control and the advanced features, and how these impact audibility.

Introduction

As hearing aid technology has advanced and connectivity has become a higher priority for children and teens with hearing loss, it has become clear that an app which is appropriate for their needs is required. A previous study (Venkatesan & Carr 2019) and a 2016 focus group with parents have shown that the myPhonak app with both Remote Support and Remote Control options could be beneficial for both parents and children. In the study by Venkatesan & Carr (2019) previously disengaged teenagers who had unexplained missed or cancelled appointments with their audiologist responded positively to remote appointments and would recommend them to other young people. Finally, allowing children some flexibility in adjusting their own hearing aids could empower them and help them to become more self-aware of their own hearing needs.

In order to design a pediatric app which suits the needs of children two studies were conducted at Hearts for Hearing in Oklahoma focusing on (1) the use of the remote control and (2) the Remote Support aspects of an app. In these studies the myPhonak 3.0 app was used. A third study was conducted at the Phonak Audiology Research Center (PARC) which focused on technical measures to evaluate any differences in the Speech Intelligibility Index (SII) values with changes to the Noise reduction and Speech Focus modifiers.

This paper will focus mainly on Study 1 from Hearts for Hearing and the PARC lab results. The Remote Support study will be described in detail in another publication.

Methodology: Remote Control study

Eighteen children, ages 10-17 (mean = 14y) participated in this study. All participants were experienced hearing aid users, with at least 6 months of hearing aid use. Because Phonak Sky devices are not compatible with the myPhonak app, all participants were fit with either Bolero M90 or Audéo M90 devices, depending on hearing loss severity and current device preference/use. Hearing losses ranged from mild to moderate-severe.

The hearing aids were programmed to DSL v.5 pediatric, feedback tests were completed and the fitting was verified via real ear measurements using the Audioscan Verifit2.

The myPhonak 3.0 app was installed on each participant's phone and paired to the hearing aids. The participants had access to all of the modifiers on the myPhonak 3.0, which include volume control, frequency equalizers (Treble, Middle, and Bass), Noise reduction, Speech Focus, and Dynamic control (increasing soft inputs or decreasing loud inputs). During the first appointment, participants were oriented to the app, and received training on the modifiers. The participants were then given the app to control on their own and sent home for a one-week home trial. During the home trial they were instructed to experiment with the app and encouraged to create their own customized programs. Following the home trial, participants completed a structured interview about their experiences with the app. Real ear measurements were also performed on their saved programs.

Concurrently, 51 parents of infants, toddlers, and children aged 0-17, completed an online survey after viewing a video about the myPhonak app. Parents were asked about their child's access to smartphones or other Bluetooth® enabled devices, if they would want their child to have access to an app, and what features or controls they would feel comfortable including.

Results: Remote Control study

Creation of Custom Programs

A total of 76 custom programs were created by 17 participants, and were essentially equally divided among three categories: School, Home, and Social Activities (see figure 1). Overall, participants expressed a desire to manage comfort by reducing noise, or to improve a speech signal, i.e. from a teacher, friend, or coach.

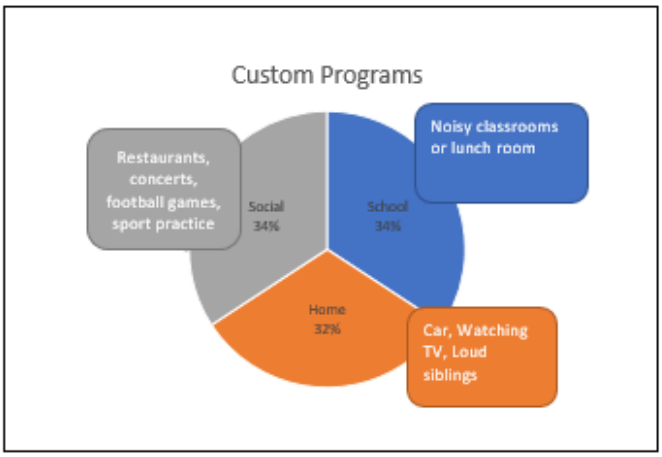

Figure 1. Classification and distribution of custom programs created by participants ages 10-17.

Adjustments

The most common adjustments for all environments were increases to Speech Focus and Noise reduction and both increases and decreases to volume. Approximately half of the custom programs had an adjustment to the Dynamic modifier, although several participants admitted they did not know what that modifier was, or felt it wasn't useful. The frequency modifiers were used the least, and participants tended to decrease the high frequencies, even in environments in which they expressed a desire to hear speech better. Figure 2 below depicts the adjustments made for the custom programs.

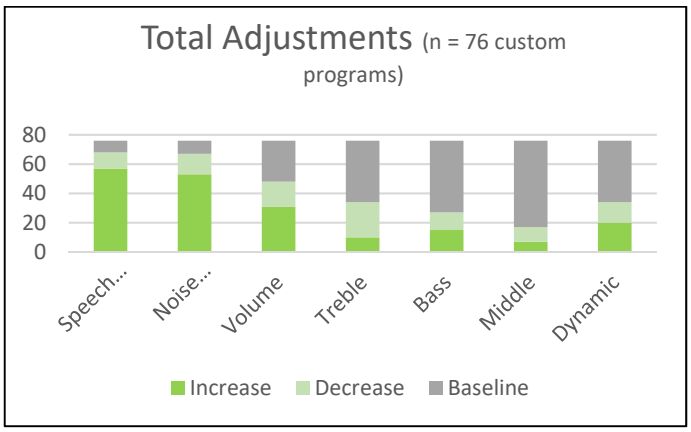

Figure 2. Adjustments made for all saved custom programs.

The pre-teens and teenagers in this study appeared to understand the function and typical use case for most of the modifiers, and used them appropriately. The exceptions to this are the Treble modifier and the Dynamic modifier. There were several instances in which high frequencies were decreased, even when the participant stated their signal of interest was speech, thus implying that use of the Treble modifier was not always understood nor was it appropriately used. Eight participants mentioned that the Dynamics slider was confusing, counterintuitive, or unnecessary. Only two mentioned that it was one of the most helpful modifiers.

Structured interview

At the conclusion of the study, the participants completed a structured interview about their overall experience with the app. All the participants had a positive experience with the app and found it easy to use. Overwhelmingly, participants liked the ability to change the settings, and found it most useful when they were in a noisy situation. Noise reduction, Speech Focus, and volume were mentioned as the most helpful, as seen in Figure 3, below.

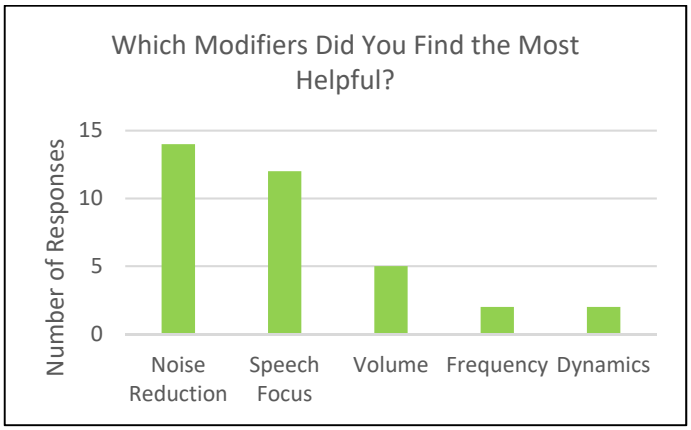

Figure 3. Sixteen participants answered the survey question. Fourteen participants stated the most helpful modifier was Noise reduction, followed by Speech Focus (12) and volume control (5). Two participants mentioned the frequency modifiers and Dynamics as being helpful. One participant stated none of the modifiers were helpful.

The participants also had access to the 'pre-sets' which are listed in the remote control main screen below AutoSense OS, and include "Restaurant", "Music" and "TV". During the structured interview, participants were asked the question "Which presets were the most helpful?". Out of the 17 participants that answered the question, 15 stated that after trying the presets, AutoSense OS was the most helpful. As one participant stated, "AutoSense was the only one I really used. It did the adjustments that I would have made. From there, I took what it did and built upon that." This example confirms that AutoSense OS is the most practical and appropriate option in the majority of circumstances, but there may be some instances in which the child or teen wants to adjust based on their preference or comfort.

Parents' opinion on Remote Control access

In the concurrent study, 51 parents of children between the ages 0-17 years completed an online survey. As the remote control features of the myPhonak Junior 1.0 are intended to be used by children age 7 -17, the following results include only responses from parents who had children in that age group (n = 35). There were 15 parents with children age 7-10, eight parents with children 11-12, and 12 parents with children age 13-17.

The majority of these parents indicated they would want their child to have access to the Remote Control feature. One parent said "Maybe", and one parent of a 10 year old child stated their child was developmentally delayed and therefore would not want their child to have access to the remote control. See figure 4.

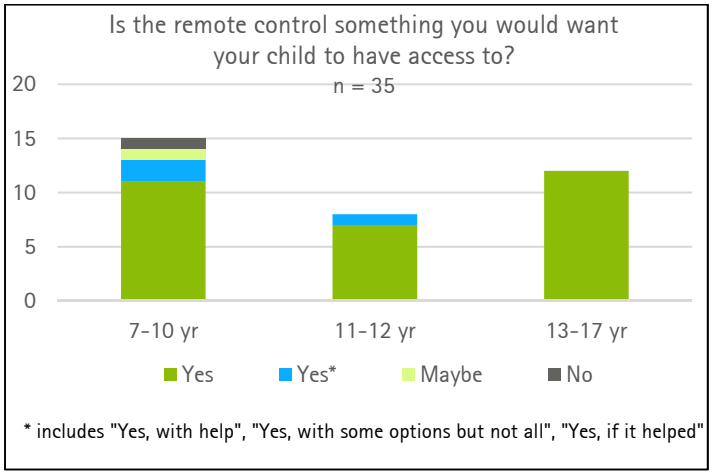

Figure 4. 33 parents with children age 7-17 agreed they would want their child to have access to the Remote Control app.

Parents felt the app would benefit their child, stating "I think he would wear the hearing aids more often and would have a greater sense of control", "It would be good for them to learn how to be more self-sufficient", "He would have more control of the sounds [that make] him uncomfortable in some situations" and "I feel like this will only empower him more".

Deviations from Automatic defaults

At the first appointment, prior to the home trial, real ear measures (REM) were obtained on each participant for the AutoSense OS base programs Speech in Quiet (SiQ), Speech in Noise (SiN), Speech in Loud Noise (SPiLN), Speech in Car (SiC) and Music.

The purpose was to analyze the differences in SPL between the AutoSense OS baseline programs and the custom created programs with only the modifiers available in the myPhonak Junior 1.0: volume, Noise reduction, and Speech Focus.

Because it is unknown how AutoSense OS was classifying the environment at the time the custom program was created, the SPL values of each custom program was compared to each of the individual's AutoSense OS baseline programs. For instance, the REM for a custom program that was labeled "Classroom" was compared to the SPL values of all the AutoSense OS programs, and the average deviation plotted in each box plot in figure 5. This process was completed for all the custom programs in which only volume, Noise reduction or Speech Focus was modified (n = 30).

The mean deviation from the baseline programs was 5 dB SPL or below, with ranges from 1 to 7 dB. There were two outlier settings. One participant created a program in which the goal was to reduce surrounding sounds in order to focus on school work (represented by the red outlier marker). A second participant had created a program in which the goal was to hear as much as possible during an outdoor band practice (represented by the green outlier marker).

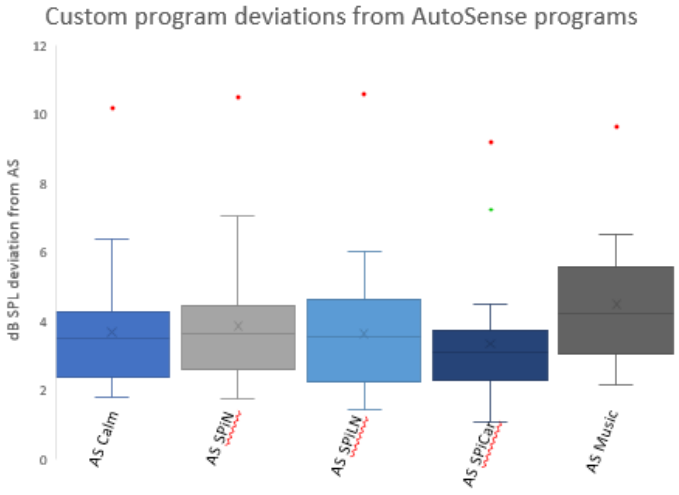

Figure 5. The average differences in dB SPL between the custom programs (n = 30) and the AutoSense OS baseline programs for 13 participants.

Figure 6 shows the individual deviations across frequency range. All of the individual's custom programs were compared to each of their baseline AutoSense OS programs, and an average deviation per frequency was calculated for each participant. The deviations could be either an increase or decrease of the SPL. For most participants, the average deviation away from AutoSense OS baseline programs was less than 10 dB, which could be explained by volume adjustments.

The blue line in the graph below represents the same participant who had created the special setting for outdoor band practice in figure 5 (green outlier). This participant had created two programs, both of which were used for band practice- one in the band room at school, and one outdoors on the field. This is a wonderful example of a unique situation in which a teenager may want to adjust their settings in order to hear something differently than what AutoSense OS is providing at a particular moment. Certainly, a band room can be noisy, loud, and reverberant, and AutoSense OS would likely switch to a program in which noise reduction was applied, however, for a band student, it is important to hear the other instruments, as well as the teacher, and in some cases, the student may not want noise reduction applied.

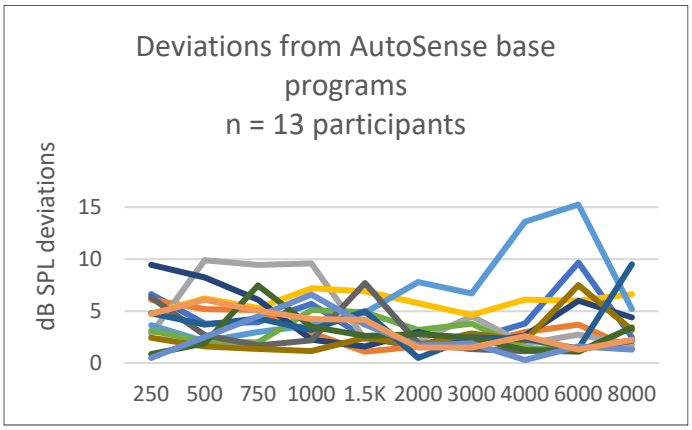

Figure 6. Individual average deviations from baseline AutoSense programs.

Methodology: myPhonak Junior 1.0 lab measures

Due to the Covid-19 pandemic, clinical evaluations of the new myPhonak Junior 1.0 app with human participants were delayed. Therefore, the following describes technical measures that took place at PARC using KEMAR. The purpose of these measures was to evaluate the impact various adjustments of the NR and SF modifiers, via the myPhonak Junior 1.0 app, would have on the SII values in a noisy condition. These modifiers were chosen as they were the ones that were rated as the most useful by the Hearts for Hearing study participants. They are also considered to have lesser impact on SII compared to the bass, middle and treble sliders.

The SII values are helpful measures that are automatically calculated during speech mapping on the Verifit2 system. It does not predict speech intelligibility scores on objective tests, but can provide information on how much speech information is audible to the listener, typically expressed as a percentage. Additionally, when using the DSL v.5 pediatric targets, the Verifit2 displays an acceptable SII fitting range, as per Bagatto (2011). If the obtained SII value falls within

the displayed range, the hearing aid fitting is considered "electroacoustically acceptable".

Four standard hearing losses were tested: N2 (mild), N3 (moderate), N4 (moderate-severe), and N5 (severe) (Bisgaard et al, 2010). The Sky M 90 PR was used for the N2 and N3 hearing losses, the Sky M 90 SP was used for the N4 hearing loss, and the Naida P 90 UP was used for the N5 hearing loss. All hearing aids were programmed for a 10 year old child using the DSL v.5 pediatric fitting formula, and fit to KEMAR ears using custom earmolds.

The Audioscan Verifit2 real ear analyzer was used and the international speech test signal (ISTS) was played at 65 dB SPL for all testing. In addition, 60 dB of calibrated speech babble was played from three speakers placed at 60°, 180°, and 300°. All efforts were made to match fitting targets in the quiet condition first. For each hearing loss, a baseline REM was obtained in the AutoSense OS Speech in Noise program, and the corresponding SII value was used as the reference. The hearing aids were paired to the myPhonak Junior 1.0 app which was then used to manually adjust both the Noise reduction and Speech Focus settings for a total of eight different test conditions. Volume was kept at the programmed default. The test conditions are shown in the following table 1.

Test	HA Program	NR setting	SF setting
Reference	SPiN	Default	Default
1	SPiN	Min	Default
2	SPiN	Max	Default
3	SPiN	Default	Min
4	SPiN	Default	Max
5	SPiN	Min	Min
6	SPiN	Max	Max
7	SPiN	Min	Max
8	SPiN	Max	Min

Table 1. Test conditions for technical lab measures on KEMAR.

Results: myPhonak Junior 1.0 lab measures

Using a graph adapted from the University of Western Ontario Pediatric Audiological Monitoring Protocol, the SII values in both the quiet and reference conditions met the "acceptable fitting" criteria for the N2, N3, and N4 hearing losses. The SII values for the N5 loss were largely within the acceptable fitting range as well, with the exception for those adjustments in which either the NR or the SF was set to maximum, as seen in Figure 7. It is important to remember that the Speech Focus slider on the app also adjusts the Dynamic Noise Canceller in the Naida P90 UP devices. That is, when the aids are in a Speech in Noise program, the directionality is indicated on the SF slider as between 0 (Omnidirectional) and 5 (Full UltraZoom), at which point the DNC is off. Once the SF slider moves beyond 5, the DNC is activated up until the point where it would be set to its maximum strength at 10. Slight attenuation of gain can occur with increased noise reduction, which in turn can affect the SII values.

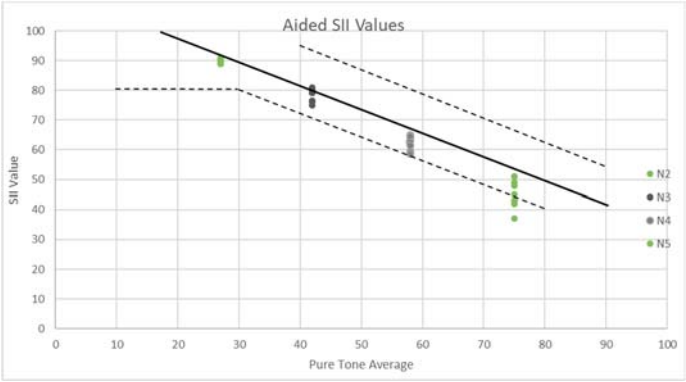

Figure 7. SII values for each hearing loss and each tested condition are plotted on a graph adapted from the "Aided Speech Intelligibility Index Normative Values v1.0, Revision 2", accessed via https://www.dslio.com/?page_id=283

The obtained SII values for the N2, N3, and N4 hearing losses were all within the acceptable fitting range per Bagatto (2011), thereby confirming that adjustments of the advanced features do not negatively impact the SII of these fittings. As mentioned previously, several of the N5 loss values were within the acceptable fitting range. Those values that were just outside of the range represented more extreme adjustments, and would typically be made only in circumstances in which comfort was the priority. These results using the myPhonak Junior app and compatible devices align with the results obtained from the clinical study, in that the SII values remain quite similar to the AutoSense OS baseline value.

Remote Support study (Study 2)

The second study conducted at Hearts for Hearting focused solely on the Remote Support feature of the myPhonak app. Nineteen pediatric patients, age 5 to 11, and their parents, participated in this study. Since the study was primarily focused on the attitudes of the parents, the fitting criteria of the child with hearing loss was relatively broad. All of the children were experienced hearing aid users, with at least six months of wearing time.

The children were all fit with Bolero M90 devices, as Sky hearing aids are not compatible with the myPhonak 3.0 app. The app was installed on the parent's phone, and three Remote Support sessions were scheduled. Three different clinicians participated in this study.

Questionnaires following each remote fitting were completed by the parent and clinician to assess satisfaction, confidence with level of care, usability and preference for type of appointment for future follow up visits (remote or in-person visits).

Overall, parents and clinicians had a positive experience with the Remote Support sessions. They expressed

confidence that the child's needs were met and stated the remote sessions were very convenient.

Discussion

The myPhonak Junior 1.0 app offers parents and older children or teens the convenience and flexibility of connecting with their hearing care provider via Remote Support. This option may be especially attractive for parents of young children or busy families in which schedules, activities, and child care make keeping an appointment with the audiologist challenging. The Remote Support study, briefly mentioned in this article, will be discussed in more detail in a forthcoming publication. However, based on the results from the parent focus group that took place in 2016, the Remote Support study at Hearts for Hearing, and the teen remote support study done in the UK, this option is wanted and appreciated by parents and teens alike.

By including only the most preferred and appropriate features from the myPhonak app, myPhonak Junior 1.0 gives older children and teenagers the opportunity to adjust their hearing aids to their listening preferences and comfort without negatively impacting their hearing aid fitting. Adults are not the only age group with busy lives; pre-teens and teenagers are in a variety of listening environments throughout their day. AutoSense OS adjusts automatically, according to the environment, and in most listening situations this is favorable. Subjective evidence verifies that children and teens understand this and agree, but there are unique circumstances in which they may wish to adjust for either comfort or preference in that specific situation. Allowing access to the most preferred modifiers of Noise reduction and Speech Focus empowers the younger user to take an active role in their hearing journey while still providing boundaries. By giving them limited controls, the child can still have a choice in how they are hearing, without drastically or negatively affecting their fitting. Parents agree that giving their child access to the Remote Control app may help their child to become more self-sufficient and self-aware.

The projects discussed in this article confirm that a pediatric specific app benefits parents and children by offering convenience, flexibility, and the opportunity for older children and teenagers to take ownership in their hearing care.

References

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