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Increasing Pediatric Hearing Aid Use: Considerations for Clinical Practice

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**Conflict of Interest Statement**

The authors report no relevant conflicts of interest.

## Abstract

**Purpose:** Hearing aid use can be variable for young children and inconsistent wear time can undermine spoken language development. This study explored the effectiveness of hearing aid datalogging awareness and coaching sessions on increasing hours of hearing aid use. We also collected qualitative data on challenges participants' experienced managing hearing aid use.

**Method:** We used a single-subject design that included three conditions, during a six week period, in the same order for each participant. Condition A was baseline, Condition B was DL monitoring alone, and Condition C was remote coaching calls plus DL monitoring.

**Results:** Hours of hearing aid use increased for each child from baseline to the end of the study, ranging from 1.19 to 4.4 hours. Mothers reported the coaching calls were beneficial, and helped them identify and problem-solve issues.

**Conclusion:** Parents were able to increase hours of hearing aid use with data logging awareness and coaching support. Tele-audiology offers an opportunity to provide parents with more frequent support that can be individualized based on their situation, challenges, and family needs.

Early hearing loss diagnosis makes it possible for infants to receive early intervention within the first months of life, services critical for supporting child development and school readiness (Joint Committee on Infant Hearing, 2019). Children who are hard of hearing need to use hearing aids to access speech sounds, and better language outcomes have been found for young children who use hearing aids ten or more hours per day (Tomblin et al., 2015). Importantly, auditory experience for young children who use hearing aids correlates with speech sound production and contributes to later literacy success in school (Farquharson et al., 2022). Low hours of hearing aid use puts children at risk for language delay, and hearing aid data logging (DL) has revealed a problem with consistent hearing aid use for young children (Walker et al., 2013 [M = 8 hours]; Jones & Launer [M = 5 hours], 2010; Muñoz et al., 2014 [M = 4 hours]). Caregivers are central to the intervention process and need support in learning how to effectively manage hearing aids for consistent audibility.

In a scoping review, Nailand and colleagues (2021) identified sixteen factors that negatively influenced hearing aid use for young children. Importantly, twelve of those factors related to the child, parent, and professional, were malleable. Studies have reported parent challenges for decades, describing anxiety related to hearing aid management (Sjogblad et al., 2001) and handling difficulties associated with hearing aid use (Muñoz et al., 2013). Parents have said they want comprehensive information, lack confidence, have feelings of uncertainty and frustration related to managing their child's hearing aids (Muñoz et al., 2015). Moreover, parents would like the audiologist to check-in with them more often (Muñoz et al., 2016). Findings from a systematic review (Salamatmanesh et al., 2022) recommended DL to monitor hearing aid use during the intervention process. Furthermore, authors raised the need for research

to determine effective clinician counseling and coaching strategies that support improvement in parent hearing aid management.

In another scoping review, Muñoz and colleagues (2022) found four intervention studies aimed at improving hours of pediatric hearing aid use. Three of the studies provided an intervention for parents of young children, and had mixed success in increasing hours of use. Muñoz et al. (2017) provided virtual visits for six months for four families. Visits included remote DL measurement. For one parent virtual visits were initiated at the time of hearing aid fitting and 10 hours of hearing aid use was achieved and maintained. During the study, hours of use increased to exceed 10 hours for two families, and increased to 8 for one family. Ambrose and colleagues (2020) incorporated an educational program and individualized support within intervention for three parents. Hearing aid use was monitored with DL and hours increased to the goal of 8 hours per day for two children, and to 3.4 for the third child, meeting the parent's goal. Muñoz and colleagues (2021) conducted a randomized controlled trial with a general sample of parents (N=82) to explore benefits of a six-week eHealth hearing aid management program. Significant differences were not found for parent reported hours of hearing aid use between groups at 12 weeks (intervention M = 9.5; control M = 8.4) ; however parents in the intervention group had significantly greater gains for knowledge, confidence, and device monitoring.

It is becoming increasingly common for hearing aids to offer mobile apps to provide information such as DL, and to provide tele-audiology. The Pew Research Center (2021) reports that 95-96% of people aged 18 to 49 years own a smartphone, although for low-income families, approximately one-quarter report not having a smartphone. Some parents may change their behaviors to increase hours of use when they receive DL feedback, as was found in Muñoz et al

(2014). Until recently, DL feedback required a visit to the clinic to obtain the measurement. It is reasonable to consider that frequent access to DL on the app may help some parents recognize problems with consistent use and change their behavior to increase hours of use more quickly for their children. Factors that can be effective in changing parent behavior to increase hours of hearing aid use are not clearly understood. To further the discussion in audiology regarding parent support to increase hours of use, the current study explored changes in hours of hearing aid use from baseline for two conditions: (1) when parents monitored DL daily, and (2) when parents received coaching to address barriers to hearing aid use in addition to DL.

## **METHODS**

We used a single subject A, B, C design, where A = baseline, B = daily DL feedback, and C = remote coaching plus DL monitoring. This design allows demonstration of replication across participants when changes are only seen after the intervention has been administered, not before (Barlow et al., 2009). The study was conducted between January 2021 and March 2022. Study procedures were approved by the university institutional review board.

### **Participants**

Three mothers, recruited from one audiology clinic, met the eligibility criteria, consented to participate, and completed the study conditions. Eligibility criteria included having a child aged birth to seven years who used their behind-the-ear hearing aids less than 9 hours per day determined by DL, had a smartphone, and were proficient in English or Spanish. The children were enrolled in a specialized spoken language focused early education program for deaf and hard of hearing children. All three children received audiology services in the onsite pediatric audiology clinic. The audiology services did not change, the study activities were in addition to the services they received. For the duration of the study, children used study hearing aids for

access to DL on the hearing aid app. All three children were male, and their hearing loss was identified by one-month of age (see Table 1). The children had been using their hearing aids from 9 to 34 months prior to participating in this study, and they were home full time with their families during participation in the study.

## **Procedure**

Data were extracted from the clinic chart to document demographic information (i.e., child age, child gender, age of hearing loss diagnosis, age of hearing aid fitting) and test results needed to program the study hearing aids (i.e., hearing thresholds, real-ear-to-coupler-difference [RECD] values) and DL. Study hearing aids were programmed to match their personal hearing aids using simulated real ear and measured RECDs to match pediatric DSL 5.0 targets (see speech intelligibility index [SII] values in Table 1). One pediatric audiologist, trained in counseling and person and family-centered care, worked with the families. During Condition C, the audiologist collaborated with the parents to provide support using strategies from Motivational Interviewing (Rollnick et al., 2008) for device management and problem-solving challenges that emerged, such as those related to the environment, child state, and parents' emotional state. The target for hours of use was 10 or more daily average was recommended as part of routine services families received, and discussed during the first study visit. Participants completed the study conditions sequentially.

**Condition A.** The audiologist programmed the study hearing aids. The App provided parents with access to data logging for hours of use. The parent came to the clinic and collected the study hearing aids and scheduled a Zoom call with the audiologist for the same day to receive instruction on use of the hearing aids. Baseline DL was recorded the first week. Prior to the study, DL was variable for participants 1 (4.5 to 8 hours) and 3 (typically 5 to 6 hours, one time

at 9 hours), and for participant 2 DL was consistently low (1 to 3 hours). There was minimal in-person contact because the clinic was following COVID protocols approved by the university risk management and safety committee.

**Condition B.** The audiologist met remotely with the parent one week after they received the hearing aids to provide instruction on downloading the app (MyPhonak) and accessing DL on the app. The study hearing aids were paired to the parent's phone via Bluetooth. At the time of the study, the app was created for adult patients to use and the pediatric version (MyPhonak Junior) had not yet been released. In this version of the app, parents were able to track DL daily and use My Hearing Diary for notes (i.e., child sick, child with grandparents for the weekend, etc), although they did not receive any instructions about using the diary for the study. Parents were instructed to look at DL after they put their child to bed and report the number of hours each evening for two weeks. DL results were collected and stored through REDCap (a secure electronic data management system).

**Condition C.** The audiologist scheduled weekly video calls, conducted using the Phonak Target programming software and the MyPhonak app, with the parent on an agreed upon day and time for four consecutive weeks. During the coaching calls, DL results were obtained from the programming software and were discussed along with barriers/facilitators parents experienced with hearing aid use. The audiologist coached the parent in changing and/or maintaining behaviors that were consistent with achieving recommended hours of hearing aid use. The audiologist guided parents in identifying challenges, potential solutions, using strategies such as asking open-ended questions, validating parent emotions, and SMART (specific, measurable, achievable, relevant, time-bound) goals to break down problem-solving. Parents did not report DL daily; however, continued to have access to DL on the app.

## **Analyses**

Consistent with analysis of single-subject designs, descriptive statistics were used to report change over time within subject, for DL hours of hearing aid, and were graphed for each condition. The highest number of hours was reported for DL if there was a difference between hearing aids. For the coaching phone calls, the audiologist documented parent experiences and coaching support in REDCap; insights are described for each participant.

## **RESULTS**

During condition B, two parents submitted DL hours daily (14/14 [parents 2, 3]) and one parent submitted hours most days (11/14 [parent 1]). Hours of use for Condition C (average for the four weeks) increased compared to baseline by 4 hours for two participants (1 and 3), and by less than one hour (0.49) for participant 2. See Figure 1 for DL results for each child. The four coaching calls were on average 13 minutes in duration (ID1 [M=14; SD=2.35]; ID2 [M=13.25; SD=1.3]; ID3 [M=12; SD=4.5]). Insights from the talking with parents during the coaching sessions contributed to understanding issues that interfered with hearing aid use.

### **Parent 1**

This mother had nine months of experience with her child's hearing aids at the onset of the study. During the first coaching call the audiologist learned the rechargeable hearing aids were on even when the child was not using them and they were not in the charger (e.g., nap time), inflating DL. The DL hours decreased once this was addressed; however, identifying this issue provided a more accurate understanding of actual hours of use. The mother shared that getting DL from the app motivated her to "get the number up" and that the daily text reminder helped her remember to check DL. She also shared strategies she planned to try, such as using toupee tape to help with hearing aid retention, and to put the charger in the living room as a



visible reminder for her to put the hearing aids on her son in the morning. She also planned to turn off the hearing aids during breaks to get a more accurate number of hours worn. During the final call, she reported that her son was sick and this affected wear time. She reiterated that being aware of DL with the app was helpful, and she planned to work on having her child wear his hearing aids throughout the day.

### **Parent 2**

This mother had ten months of experience with her child's hearing aids at the onset of the study. Her son was identified with a mild hearing loss early; however, the parents chose not to obtain hearing aids, preferring to wait and see if hearing aids would be necessary. During the first coaching call, the mother described her biggest concern was losing the hearing aids; she noticed that he randomly takes them out and leaves them around the house. She discovered that he thinks it's fun to look at DL with the app, and she began using incentives to motivate her son to keep them in. The mother reported that setting an alarm was a helpful reminder to put the hearing aids in. She shared that she was not consistent in offering him a reward for using the hearing aids, and he spent time in the splash pad and other water activities that interfered with hearing aid use. She felt that summer is a tricky time for consistent hearing aid use, but it helped to have it in the front of their minds.

### **Parent 3**

This mother had thirty-four months of experience with her child's hearing aids at the onset of the study. During the first coaching phone call the mother indicated that she felt the app was helpful because she realized she was overestimating how often he wore the hearing aids. She shared that her biggest success was putting the hearing aids on first thing in the morning and keeping them in all day. She indicated her son was more involved with practicing insertion and

removal, and she noted that giving him responsibility helped. During the final call, the mother shared that she felt like the remote support was really helpful and the app helped her with accountability.

## Discussion

Parents may need targeted education and support to increase the effectiveness of their daily role in supporting consistent audibility for their children. We suggest the following considerations when providing pediatric hearing aid services for young children:

***Teach parents about DL.*** DL is a tool that can be used to support behavior change by providing objective information to increase parent awareness. Access to DL alone may be sufficient for some parents to modify their behaviors and increase hours of use (Muñoz et al., 2014).

***Offer frequent remote check-ins over time following the hearing aid fitting.*** Parents are given much information during the hearing aid fitting process, and learning how to manage hearing aids for their children can be overwhelming. Frequent remote check-ins, in addition to typical appointments, can help parents gain confidence in this new role—from the beginning, rather than waiting for problems to become evident and hoping they will resolve with time. When parents feel confident they are more likely to navigate challenges effectively.

***Collaborate to provide coordinated support.*** Working together audiologists, parents, and intervention providers can help children have the best audibility possible for a trajectory that supports spoken language development. The ability to access DL on an app broadens opportunities for partnering that supports coordinated care and effective problem-solving.

***Guide parents in identifying and resolving barriers.*** The aim of supporting parents is to help them develop effective routines and confidence in navigating difficult situations that optimize

audibility. Motivational Interviewing (Rollnick et al., 2008) can help providers guide parents with intentional evidence-based counseling techniques that supports positive change.

Limitations of our study include the small sample size, and other factors, such as participating in the study itself, may have contributed to changes in hearing aid use. The audiologist had a good rapport with the parents prior to participation in the study and parents were receptive to the intervention. At a minimum, the parents perceived value in spending time participating in the intervention. Because the intervention phase of the study was relatively short, four weekly coaching sessions, it may have been insufficient to resolve issues impacting wear time and we were not able to determine if the changes in wear time were sustained. The audiologist was skilled at guiding parents in problem-solving to support their engagement, and avoided providing parents with a solution. Variations in implementation of counseling skills and techniques during coaching calls could influence effectiveness of parent partnerships.

### **Future Directions**

There is a need for additional research to determine parent education and support intervention components that are effective in increasing hours of hearing aid use over time for parents from diverse backgrounds. Given the variable outcomes from the intervention studies completed to date (Muñoz et al., 2022), research to determine assessments that provide insights into what information and support parents require could help audiologists and other intervention providers effectively tailor parent interventions. Also, future studies that screen for internal barriers (thoughts, emotions) could help explain factors influencing wear time and illuminate directions for individualized support to overcome barriers. For example, parents with high psychological inflexibility had better outcomes when they received the remote hearing aid education and support intervention than parents in the control group (San Miguel et al., 2022).

## **Conclusion**

Parents of young children who use hearing aids received feedback about hearing aid use from DL and coaching sessions to address wear time. We found that hearing aid use increased, in varying amounts, from the intervention. Parents reported receiving benefit from being aware of DL from the app and in having accountability from the audiologist in the coaching calls.

## **Data Availability Statement**

The datasets generated during the current study are available from the corresponding author on reasonable request.

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Figure Legend

Figure 1. DL collected during the course of the study. Days 1 through 7 are Condition A.

Table 1. Child hearing-related demographic information

Child					Data Logging Hours		
	Current Age (months)	Age Fit (months)	4 Frequency PTA (dB HL)	SII Average speech (65)	Baseline	Monitoring M (SD)	Coaching M (SD)
1	11	2	41 R / 36 L	91 R / 91 L	4.5	10.45 (0.32)	8.9 (2.46)
2	48	38	38 R / 38 L	81 R / 78 L	2.9	1.18 (0.24)	3.39 (1.33)
3	36	2	58 R / 57 L	91 R / 91 L	6	8.29 (0.51)	10.1 (0.86)

Note: SII (speech intelligibility index); R (right); L (left)

Figure 1. DL collected during the course of the study. Days 1 through 7 are Condition A. Parent 1 is represented in purple, Parent 2 red, and Parent 3 green.

