Chapter 14
Helping Families Accept Technology

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NOTE: Technology refers to hearing aids, cochlear implants, BAHAs, and FM systems. Infants who are identified at birth are usually fit with hearing aids first then move to cochlear implants if hearing aids do not provide sufficient benefit or to BAHAs if anatomy requires it. As a result, the term "hearing aids" is being used, since it is the most common first technology. Please understand that the same considerations apply to all technologies.

Why Is It Important for Families to Accept Technology?

No matter which communication mode a family chooses, developing auditory skills can significantly improve chances for success. For families who choose listening and spoken language, the ability of a child to use audition is critical. Language is best learned by hearing it spoken around us, so consistent exposure to a clear, audible, speech signal is vitally important. Full-time use of appropriate technology allows the auditory brain to develop and is critical to auditory language development—and language development is critical for literacy and development of social skills.

The best predictors of verbal language skill development are:

- Age at which full-time hearing aid use is begun.
- Degree of hearing loss.
- Amount of exposure to meaningful listening experiences.

Neuroscience has defined critical periods for auditory learning with the first critical period ending at around 3 years of age and the second at around 7 years. Children who learn early to use technology successfully have a better chance of developing good language skills.

What Is Involved in Parents Accepting Technology?

Having a child diagnosed with hearing loss or any other disability can be overwhelming for new parents. Because 95% of children with hearing loss have parents with normal hearing, most of those parents:

- Have had no experience with hearing loss.
- Do not know what to expect.
- Do not understand what is involved with helping their child succeed.

Their primary language is spoken language, so even thinking about learning another language can be overwhelming. Parents frequently do not understand the

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value of hearing a loud, clear signal and the importance of full-time hearing aid use. In addition, while dealing with their grief about having a child with a disability and the work involved in learning about hearing loss, they are troubled by problems with managing technology and keeping hearing aids on the child's head. They need to be sure that technology is working. If they do not observe responses to sound when the child is wearing hearing aids, it is difficult to believe that using hearing aids is necessary and valuable—making the work of keeping them on even more taxing.

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Hart and Risley (1995) have demonstrated that the number of words heard directly affects both the number of words in a child's vocabulary and the child's IQ at age 3 years. Children who heard 30,142 words in a 14-hour day had a vocabulary of 1,116 words and an IQ of 117 at age 3 years, while children who heard 8,624 words in a day had a vocabulary of 525 words and an IQ of 79 (see *Table 1*).

Parents must understand that hearing aids need to be worn during all waking hours to provide maximum benefit. They need to know that if children wear hearing aids 4 hours/day, it will take their child 6 years to hear what a typical child hears in 1 year (Stovall, 1982). If a baby is awake 8 hours a day and wears hearing aids for 2 hours of the day, she will hear only 25% of what other babies hear, and we can expect only 25% achievement. The effect this will have on learning is clear. For a family who chooses listening and spoken language for their baby with hearing loss, their child needs to hear as many hours a day as possible.

Just putting hearing aids on a baby does not immediately result in development of spoken language. Parents must have realistic expectations about when a baby will begin to speak. Hearing babies listen for about a year before beginning to speak. We cannot expect this to be different for

Table 1
Number of Words Heard vs. Vocabulary

	Parents			Children		
	Professional	Working Class	Welfare	Professional	Working Class	Welfare
IQ age 3				117	107	79
Vocabulary size	2,179	1,498	974	1,116	749	525
Average utterances/hour	487	301	176	310	223	168
Average different words/hour	382	251	167	297	216	149
Average words/ hour	2,153	1,251	616			
Average words/ 14-hour day	30,142	17,514	8,624			

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children with hearing loss. About 90% of what children learn is learned incidentally by overhearing conversation. Dehaene (2009) reports that it takes 20,000 hours of listening as a basis for learning to read. Pittman (2008) has reported that children with hearing loss require three times the exposure to learn through listening. What does all this mean for the child with hearing loss? It means that it is essential that the child with hearing loss has the technology available to listen as many hours a day as possible. Only though the consistent effort of families and professionals working with them can children with hearing loss succeed in learning listening and spoken language.

Hearing Aid Use

Data logging studies have demonstrated that only 10% of children wear hearing aids full time (12-14 hours/day), while 40% of children wear hearing aids only 4-6 hours/day (Jones & Launer, 2010). Parental report indicates that parents overestimate the number of hours a child wears hearing aids. In addition, not all listening takes place in quiet where listening is relatively easy. Even young children may spend between 2 and 6 hours/day in noisy listening situations. Families need to understand the difficulties noise can cause for children with hearing loss, and the advantage an FM system can provide for hearing speech in noise. Audiologists, speech-language pathologists, listening and spoken language practitioners, and teachers of deaf and hard-of-hearing children must understand the importance of technology use and the need to help parents understand and use technology successfully.

Helping Technology Succeed

For parents to accept and use technology appropriately, they have to:

- Accept that the baby has a hearing loss.
- Understand the benefits that technology can provide.
- Believe (and observe) the benefits technology is providing for their child.
- Be able to keep the technology working and on the baby's head.

Accepting the Hearing Loss

It is difficult to understand that an auditory brainstem response (ABR) or otoacoustic emissions (OAE) test is really evaluating hearing. Parents cannot see if the child is responding and have to accept test results on faith. Behavioral observation audiometry (Madell, 2014) utilizing changes in sucking in response to sound can help parents see and understand what a baby does and does not hear with and without technology.

Parents sometimes report that they cannot manage the technology and use that excuse to explain why the baby is not wearing the hearing aids. Accepting technology should not be a problem for today's parents. They use smartphones and computers and are comfortable with them. If parents are not accepting the necessity for their child to depend on technology, it is probably not the technology they are not accepting . . . it is the hearing loss. Clinicians working with families need to help them accept the hearing loss and the need for appropriate technology. Parents must be given ample opportunity to grieve and deal with it. This is a complicated but important part of the process that all families must experience prior to full acceptance of the hearing loss.

Many parents benefit from meeting other parents and older children with hearing loss and successful hearing-impaired adults. Communicating with others who have been in a similar situation can help parents be optimistic about their child's future and help them do what needs to be done. Organizations, such as AGBell Association and Hands and Voices, can be vital links to other families in similar circumstances.

Understand the Benefit of Technology

When a child is diagnosed with hearing loss, most parents receive a crash course about listening, learning, and language. They learn the importance of access to sound in order to develop the auditory brain. They must learn there are critical periods for learning to listen, that time is of the essence, and that the sooner a child hears the better the chances for learning to listen. Parents need to understand the advantages of listening and talking and the effect of listening on academic skills and literacy. This is a lot to learn when parents have an infant just identified with hearing loss and are still bonding and adjusting to having a new member of the family. While it does not all have to be accomplished in the first week, it does have to happen as soon as the family is ready to proceed—ideally within the first couple of months. All professionals who work with the family need to provide ongoing information to parents as they become ready to accept it. Meeting with other families can be a big help.

Parents are most likely to accept the benefits of technology and work to keep technology on a baby's head if they can see results when the hearing aids are on the baby.

Believing That Technology Is Providing Benefit for Your Child

Parents are most likely to accept the benefits of technology and work to keep technology on a baby's head if they can see results when the hearing aids are on the baby. Parents need to know they are a vital part of the process. It is not just the responsibility of the audiologist to determine if the technology is working. Parents play a critical role in confirming benefit. Parents should observe testing in the test booth when the audiologist is obtaining aided thresholds, so they can see how the baby responds. Parents should be taught to test babies at home every morning to see what their baby hears. Parents should learn to present one of the Ling sounds (Ling, 2002) and observe if the baby responds by alerting, changes in sucking, etc. Parents should be encouraged to report to the audiologist which sounds the baby can and cannot hear—at close (2-3 feet) or at far (10 feet) distances—with each hearing aid alone. As children get older, they can be asked to repeat words or point to pictures to be sure they are hearing all the phonemes. By sharing the information about responses to sound at home, parents can provide the audiologist with valuable information to modify technology settings to improve access to all phonemes.

Keeping Technology on the Head

Madell and Anderson (2014) conducted a survey of parents and audiologists to determine the problems families had keeping technology on babies and which devices were most successful. The survey identified that parents are overwhelmed at the time of diagnosis and do not understand the impact of hearing loss on language. It also revealed that audiologists do not understand the problems parents have keeping technology on tiny ears. While audiologists may recommend devices like clips to help keep from losing devices, clips do not actually keep the devices on the child's ear.

Photo courtesy of NCHAM

All professionals who work with children with hearing loss must recognize the value of helping families understand and use technology successfully with the goal of having every child with hearing loss successfully communicate.

Audiologists and parents were asked to rate different hearing aid retention devices (see *Table 2; Madell & Anderson, 2014*). The results between the two groups were significantly different, indicating that they were not communicating well with each other. This would lead us to conclude that audiologists are not providing parents with the most useful information about how to keep technology working well. A free brochure that was developed for parents (*Children's Hearing Aid Retention Strategies*) containing suggestions on how to keep children hearing is available at http://www.janemadell.com/publications/HearingAidRetention.pdf and at http://successforkidswithhearingloss.com/hearing-aids-on

Conclusion

Learning to accept and effectively use technology can be difficult, but if parents see their babies responding to sound, it makes the process much easier. If they can immediately communicate with their baby by speaking in a language they are comfortable using, they can immediately start teaching baby to listen and talk. All professionals who work with children with hearing loss must recognize the value of helping families understand and use technology successfully with the goal of having every child with hearing loss successfully communicate.

Table 2
Ratings of Hearing Aid Accessories and Strategies: Survey of 286 Parents and 101 Audiologists

Retention Accessory			Child Safety		Durability		Ease of Use		Keeps Aids on and Working	
Ear Gear	1	3	2	1	1	1	2	3	1	2
Cap	3	1	1	2	2	2	1	2	3	5
Safe-n-Sound	2	3	1	1	3	2	2	3	2	3
Wig/Toupee Tape	2	4	3	3	9	7	5	4	5	4
Oto/Critter Clips	7	2	8	1	5	3	5	1	5	1
Headband	9	6	5	4	5	4	9	5	6	7

White column = Parent Responses
Blue column = Audiologist Responses

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