

PROPOSED USE OF PODCAST AS A MEDIUM FOR AURAL REHABILITATION WITH
POST-LINGUALLY DEAFENED ADULTS WHO USE COCHLEAR IMPLANTS

by

Jessica Fuggiti

Copyright © Jessica Fuggiti 2021

An Audiology Doctoral Project Submitted to the Faculty of the
DEPARTMENT OF SPEECH, LANGUAGE, AND HEARING SCIENCES

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF AUDIOLOGY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2021

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Audiology Doctoral Project Committee, we certify that we have read the Audiology Doctoral Project prepared by: Jessica Fuggiti
titled: PROPOSED USE OF PODCAST AS A MEDIUM FOR AURAL REHABILITATION WITH POST-LINGUALLY DEAFENED ADULTS WHO USE COCHLEAR IMPLANTS

and recommend that it be accepted as fulfilling the Audiology Doctoral Project requirement for the Degree of Doctor of Audiology.

Mark DeRuiter

Mark DeRuiter

Date: May 6, 2021

Linda Norrix

Linda Norrix

Date: May 6, 2021

Linda R Shaw

Linda R Shaw

Date: May 6, 2021

Erica M. Hansen

Erica M. Hansen

Date: May 10, 2021

Final approval and acceptance of this Audiology Doctoral Project is contingent upon the candidate's submission of the final copies of the Audiology Doctoral Project to the Graduate College.

I hereby certify that I have read this Audiology Doctoral Project prepared under my direction and recommend that it be accepted as fulfilling the Audiology Doctoral Project requirement.

Mark DeRuiter

Mark DeRuiter

Date: May 6, 2021

Speech, Language and Hearing Sciences

Table of Contents

Abstract.....	4
Introduction and Scope	5
Background	7
Aural Rehabilitation and Cochlear Implants.....	7
The Importance of Communication Partners	13
The Importance of Counseling	15
Podcasts.....	17
Methods.....	19
Script Development.....	19
Future Directions and Research Needs.....	23
Appendix A – List of Podcasts	28
Appendix B – Proposed Podcast Scripts.....	30
Introduction Episode	30
Episode 2	31
Episode 3	33
Episode 4	35
Episode 5	37
Appendix C – Satisfaction Survey	39
References.....	41

Abstract

For post-lingually deafened adults who have undergone cochlear implantation, listening to acoustically rich environments, and undergoing aural rehabilitation can be critical in adapting to listening through the altered acoustic signal of their processor. Despite the availability of at-home aural rehabilitation tools, there are still barriers to receiving effective aural rehabilitation. Podcasting is one form of aural rehabilitation that has yet to be developed or researched in audiology. This project considers the potential efficacy of podcast as an aural rehabilitation tool and provides scripts for a future podcast series to be recorded and distributed at the University of Arizona Hearing Clinic. The episodes are designed to be listened to by post-lingually deafened adults after their audiology follow-up appointments for the first six months post-implantation. Perceptual training experiences and counseling are incorporated into the podcast to increase engagement with the listener. Communication partners are encouraged to partake in this aural rehabilitation tool as they can provide valuable feedback and encouragement. In conjunction with appropriate follow-up appointments with a professional, the use of podcasts can provide additional aural rehabilitation to help cochlear implant patients reach their communication goals.

Introduction and Scope

In audiologic best-practice, aural rehabilitation has been recommended to ensure maximum benefit from use of hearing devices, including hearing aids and cochlear implants. Adult aural rehabilitation is the “reduction of hearing-loss-induced deficits of function, activity, participation, and quality of life through a combination of sensory management, instruction, perceptual training, and counseling” (Boothroyd, 2007). The goal of aural rehabilitation techniques is to improve quality of life through increased speech perception.

For adult patients who have post-lingually undergone cochlear implantation, it can be especially critical that they receive aural rehabilitation as their brains have likely been deprived of robust auditory stimulation and they require training on how to listen through this new listening modality (Moberly, Lowenstein, & Nittrouer, 2016). One medium for providing aural rehabilitation to this population that has not been used is podcasts, which are digital audio files that can be listened to at consumers’ convenience. Podcasts provide the option to be a unique tool as the act of listening to a podcast can be considered a form of aural rehabilitation through auditory stimulation. Moreover, the content of the podcast can also serve to aid patients in their rehabilitation journey.

The purpose of this project is to: 1) evaluate literature on aural rehabilitation, 2) evaluate literature on podcasts, 3) examine activities which can be used as perceptual training that can be distributed via podcast and 4) develop transcripts for a podcast series that is tied to evidence-based aural rehabilitation and counseling techniques which can be listened to by the cochlear implant user and communication partner(s). The target audience for this proposed podcast is post-lingually deafened adults in their first-year post-cochlear implantation and their designated

communication partners. Children and pre-lingually deafened adults were not targeted in this program as their aural rehabilitation/habilitation journey looks very different. In many cases, a more extensive and interdisciplinary habilitative approach is required for this population as they have not had the same spoken language inputs compared to normal listeners or post-lingually deafened adults. However, there may be utility in listening to podcasts for anyone undergoing aural rehabilitation if tailored to the unique needs of that population. This project provides proposed scripts with recommendations on podcast development for post-lingually-deafened adults who have recently undergone cochlear implantation and are receiving services at the University of Arizona Speech & Hearing Clinic.

Upon review of resources at the inception of this project, there did not appear to be a podcast or series of podcasts targeted towards this patient population with the purpose of being aural rehabilitation, as reviewed subsequently in this work. Currently, cochlear implant patients at the University of Arizona Speech & Hearing Clinic are provided with resources for home-based aural rehabilitation to do in their free time which can include listening to audiobooks, interactive software such as AngelSounds™, and activities like reading out loud. The proposed podcast, unique from the other tools currently provided by the University of Arizona Speech and Hearing Clinic, combines conversation information, counseling, and short perceptual training exercises in a manner that can be easily distributed. This work begins by providing a background on aural rehabilitation, communication partners, counseling, and podcasts, then discusses methods used to develop scripts for an aural rehabilitation podcast series to later be distributed through the University of Arizona Hearing Clinic. Lastly, future directions and limitations for the podcasts' use will be discussed.

Background

Aural Rehabilitation and Cochlear Implants

Based on Boothroyd's 2007 definition, Montano (2014) described aural rehabilitation as:

A person-centered approach to assessment and management of hearing loss that encourages the creation of a therapeutic environment conducive to a shared decision process which is necessary to explore and reduce the impact of hearing loss on communication, activities, and participations (p. 27).

The American Speech-Language-Hearing Association (ASHA, n.d.-a) has outlined the roles and responsibilities of audiologists when providing adult aural rehabilitation as summarized in Table 1 below.

Roles and Responsibilities of Audiologists in Adult Aural Rehabilitation
Educating the public and other professionals on: <ol style="list-style-type: none"> 1. the needs of persons with hearing loss 2. the role of audiologists in the prevention, identification, and management of hearing loss
Advocating for the needs, including advocating for the rights of those with hearing loss and related disorders.
Conducting a comprehensive auditory assessment.
Developing and implementing an aural rehabilitation plan of care in collaboration with the person receiving services as well as with family and other professionals (e.g., physicians, speech-language pathologists).
Providing evaluation and fitting services for hearing aids, cochlear implants, other sensory aids, and hearing assistive technology.
Providing device and technology support, including programming services.
Instructing the person receiving services and the family on hearing loss and device use and care.
Providing information and training on: <ul style="list-style-type: none"> • communication strategies with friends, family, and significant others • managing the listening environment • strategies for addressing quality of life • hearing protection and noise exposure • self-advocacy

Counseling persons with hearing loss and their family on factors related to hearing loss, device use, and tinnitus/hyperacusis (e.g., impact on quality of life).
Providing referrals to other appropriate professionals to ensure access to services.
Providing information about resources.

Table 1. The roles and responsibilities of audiologists in adult aural rehabilitation as stated by ASHA

Additionally, in accordance with the World Health Organization International Classification of Functioning (WHO-ICF), a holistic aural rehabilitation approach ideally combines sensory management, instruction, perceptual training, and counseling to result in outcomes of increased activity, participation, and quality of life (Boothroyd, 2007; WHO, 2001). The key components of adult aural rehabilitation (Table 1) can apply for all patients who have been diagnosed with hearing loss or other related disorders (e.g. tinnitus). Even without the provision of hearing aids, cochlear implants, or assistive listening devices patients and their families can benefit from aural rehabilitation through education, advocacy, and counseling. Most patients who receive hearing aids experience an aural rehabilitation journey which focuses on adapting to amplification, receiving device support, and counseling regarding effective communication strategies.

In comparison to adults who use hearing aids, those that have undergone cochlear implant surgery, are expected to require a more comprehensive approach to aural rehabilitation as they are receiving auditory input through a new modality. A cochlear implant is comprised of an internal device which is implanted into the cochlea and an external sound processor. The external sound processor receives sound from a microphone, processes the sound signal into a digital format, and transmits it to the internal electrodes within the cochlea. After initial activation, post-lingually deafened cochlear implant patients will often describe the sounds they hear, especially speech, as being unnatural (Caldwell, Jiam, & Limb, 2017). This occurs because cochlear implants provide speech through a modified modality so that patients must correlate this new

auditory input to their existing memory of speech (Robinson & Summerfield, 1996). Rather than listening to sounds through acoustic signals, like for individuals with normal hearing or those with hearing aids, cochlear implants provide this information through electric stimulation of spiral ganglion and auditory nerve fibers, bypassing cochlear mechanics (Arlinger, 1996). Despite advancements in cochlear implants, patients may still have difficulty with sound quality due to limitations with pitch, the perceptual correlate of frequency. Cochlear implant electrodes stimulate varying portions of the tonotopically arranged cochlea at different firing rates to imitate natural place-coding and rate-coding (Arnoldner, Riss, Brunner, Durisin, Baumgartner, & Hamzavi, 2007). However, cochlear implants cannot mimic the same fine-tuned frequency discrimination cues as an unimpaired cochlea (Caldwell, Jiam, & Limb, 2017). Additionally, speech perception outcomes may be limited in patients who qualify for cochlear implantation if they have had a lengthy period of profound hearing loss and have not had the ability to hear most sounds in their environments, let alone conversational-level speech. Over several months after activation, implantees experience acclimatization with the new auditory stimulation. Acclimatization as defined by Arlinger et al. (1996), is “A systematic change in auditory performance with time, linked to a change in the acoustic information available to the listener. It involves an improvement in performance that cannot be attributed purely to task, procedural or training effects” (p. 87S). Patients often report that speech begins sounding more natural as they acclimate to auditory input through a cochlear implant (Tyler & Summerfield, 1996). In addition to subjective benefit, improvements in speech perception can be measured up to 12 months after initial activation (Vila et al., 2016). This can be attributed to more exposure to listening with a cochlear implant and full-time processor use (Holder et al., 2020).

There is great outcome variability in speech recognition ability within adult cochlear implantees. Some research has attributed this variability to the audiologic profile prior to implantation, electrode position within the cochlea, cognitive abilities, motivation, and family support (Moberly, 2016; Tyler & Summerfield, 1996). The greatest predictor of variance in post-lingually deafened adults is duration of deafness (thresholds greater than or equal to 90 dB HL) prior to cochlear implantation (Blamey et al., 1996). Plasticity changes and degradation of central auditory neural substrate are the physiologic factors most attributed to variance in this population (Moore & Shannon, 2009). Aural rehabilitation has been suggested as a method to help those patients who may have greater difficulty adapting to cochlear implantation. Although aural rehabilitation programs may not be able to entirely overcome the speech perception variance due to physiologic degeneration of the auditory system, it can be valuable in helping patients meet maximum speech perception abilities through auditory training (Ferguson & Henshaw, 2015). It can also aid in mitigating negative emotional reactions to speech processing through cochlear implants by providing counseling and realistic expectations. Exhaustive aural rehabilitation programs are not necessary for most adult cochlear implant patients, but many patients can benefit from some form of aural rehabilitation post-activation. For example, aural rehabilitation can be critical for adults in residence facilities or for those who live alone as they may not regularly participate in effective conversation with others and may not be in acoustically rich listening environments (Erber, 1994). Without regular exposure to speech and communicative interactions, a person must rely on other means to adequately provide auditory stimulation, especially when listening through a cochlear implant. .

As previously described, a holistic aural rehabilitation approach combines sensory management, instruction, perceptual training, and counseling (Boothroyd, 2007; WHO, 2001).

For cochlear implant patients, the sensory management is the cochlear implant device itself and the auditory stimulation it provides. Instruction is performed in the office to train patients and their family members how to use the devices. Perceptual training can be done in-office and by participating in take-home exercises. Counseling is typically performed by an audiologist to help patients transition to listening via the cochlear implant. Examples of how these components of aural rehabilitation can apply to patients is provided in Table 2. Through the combination of these components, patients with hearing loss can ideally experience increased speech perception, social participation, and even greater quality of life (Boothroyd, 2007).

<u>Sensory Management</u> Cochlear implantation and subsequent mapping appointments	<u>Instruction</u> Teaching patient basic cochlear implant maintenance such as changing batteries and cleaning the microphones
<u>Perceptual Training</u> Recommending activities such as reading out loud, listening to audiobooks, or podcasts	<u>Counseling</u> Managing realistic expectations of cochlear implant listening and providing communication strategies

Table 2. How components of aural rehabilitation (Boothroyd, 2007) can be applied to post-lingually deafened adults after cochlear implantation.

Many mediums for aural rehabilitation exist and can vary in how they are administered from clinicians to patients. In some instances, the aural rehabilitation can be conducted at the clinic on an individual-basis or in group settings such as in the University of Arizona's *Living Well with Hearing Loss* program (Marrone & Harris, 2012). Aural rehabilitation may also be administered in the form of assignments and activities sent home with the patient to do on their own time. Some examples can include listening to audiobooks or reading newspaper articles out loud. Limitations to in-person aural rehabilitation can include lack of reimbursement or funding

for performing aural rehabilitation by the audiologist (Center for Medicare and Medicaid Services, 2010), time constraints, or insufficient motivation by the patient and their family.

At-home auditory (or perceptual) training and aural rehabilitation can provide a supplement to aural rehabilitation in a clinical setting. Sweetow and Palmer (2005) recommend that for individual auditory training to be widespread and effective for adults it should: 1) be cost effective, 2) be easy, fun, and rewarding for the patient, 3) be practical and easily accessible, 4) be verifiable, 5) incorporate top-down (synthetic) and bottom-up (analytic) approaches and 6) provide the patient with feedback regarding progress. Bottom-up (analytic) training focuses on identifying speech sounds rather than work at the word, sentence, or meaning level, while top-down (synthetic) training attempts to help the individual gain meaning of a message through communication strategies such as improved attention, use of context, and repair strategies.

An example of an existing, evidence-based at-home aural rehabilitation program that utilizes the recommendations of Sweetow and Palmer (2005) is the Listening and Communication Enhancement (LACE) program developed by Sweetow and Sabes (2006). This tool was designed as an adaptive computer-based auditory training program to provide listening strategies, build confidence in patients, and address cognitive changes during aging. Although outcomes of LACE are mixed (Saunders et al., 2016), presumably due to procedural learning, some research has shown likely perceptual learning and generalization to off-task listening while using the program (Sweetow & Sabes, 2007).

Another example of a similar, home-based auditory training program is Computerized Learning Exercises for Aural Rehabilitation (cLEAR) which is a series of computer games that target specific auditory skills. Users can select lesson plans which target the skills they would

like to improve on (e.g., listening in noise). Improvements in speech recognition in noise were found as well as a reduction in perceptual effort when listening to spoken language while using this program (Sommers, Tye-Murray, Barcroft, & Spehar, 2015). For a fee, users can download cLEAR, have access to support by on-staff audiologists, and receive feedback regarding progress.

Home-based auditory training programs such as LACE and cLEAR offer patients who are not able to receive clinic-based aural rehabilitation a chance to experience the perceptual training they would otherwise miss. This could have great implications for elderly patients who have limited access to constant and varied auditory stimulation. Although effective aural rehabilitation tools can be home-based, they should not be intended to replace appointments with the patient's audiologist, as valuable components of aural rehabilitation (Table 1) can be provided during an appointment (e.g., programming services).

The Importance of Communication Partners

There are several reasons to include communication partners in hearing loss treatment; they can aid in a person's adjustment to life with a hearing loss, they may help in adherence to treatment, and they can provide more information and perspectives regarding the patient's hearing loss (Trychin, 2012). Communication partners can include spouses, romantic partners, close family members, or caregivers (Kamil & Lin, 2015) - people who are in frequent communicative contact with the person with hearing loss. They should be encouraged to take part in the aural rehabilitation process, as communication deficits associated with hearing loss can have negative psychosocial effects on not just the person with hearing loss but also their communication partners (Barker, Leighton, and Ferguson, 2017).

Since both the person with hearing loss and communication partner may be involved in communication breakdowns it is important to address talker and listener strategies for both parties (e.g. providing context in a conversation or reducing background noise). Communication breakdowns are when the message of a conversation is not properly conveyed due to one or more parties having difficulty with hearing or understanding an utterance. These breakdowns can result in negative effects for both the person with hearing loss and their communication partners; some examples include activity limitations, participation restrictions, feelings of frustration and high emotional arousal (Barker, Leighton, and Ferguson, 2017; Vas, Akeroyd, and Hall, 2017). For those with severe to profound hearing loss, as are candidates for cochlear implantation, these negative emotions can be elevated by the extreme communication difficulties these patients face. Aural rehabilitation can help reduce the negative emotions associated with communication breakdowns by helping patients and their families identify and manage the sources of these disruptions in communication .

Once identified, patients and communication partners can anticipate situations in which breakdowns occur and preemptively use conversation repair strategies to avoid frustration. Another step that can be taken is to help communication partners and those with hearing loss to manage their level of emotional arousal in response to communication breakdowns. Sensory management through cochlear implantation can often result in a reduction of negative psychosocial effects for the person with hearing loss (i.e., depression, loneliness, social anxiety, social isolation, and suspiciousness) (Knutson, 1991). However, effective counseling can help both the patient and their communication partners address communication breakdowns so that they can enact effective behavioral changes and regulate emotional responses to reduce negative psychosocial effects of hearing loss for both parties. Analyses in other healthcare fields have

shown that the inclusion of family members in treatment of chronic conditions can improve health outcomes for not only the patients but also their family (Wolf, Lehman, Quinlin, Zullo, & Hoffman, 2008)

The Importance of Counseling

Audiologists engage in counseling to teach their patients about hearing loss and treatment, refine communication behaviors, and address emotional responses to hearing loss and communication breakdowns. Counseling plays a critical role in all aural rehabilitation as part of a humanistic, patient/family-centered approach to managing hearing loss (Boothroyd, 2007). The medical model of disability, which preceded the current WHO-ICF guidelines (WHO, 2001), focused primarily on informational counseling by educating the patient on hearing loss and treatment. Current approaches to counseling place more value on patient and family input to not only provide information but also address the psychosocial effects of hearing loss and communication breakdowns (Luterman, 2008).

Ideally, audiology appointments should be patient-centered and provide information regarding hearing loss and management tailored to each individual patient (Boisvert et al., 2017). For those with cochlear implants, this information will be different than for patients with hearing aids or other audiologic profiles. Counseling those with cochlear implants may focus on adapting to new sound input, realistic expectations of perception with a cochlear implant, and attempt to increase participation in social gatherings. Typically, device orientation and management are discussed (e.g. how to change batteries and clean processor). Realistic expectations are often explained to make the patient aware of how listening through a cochlear implant does not restore a person's natural hearing abilities. Additional topics of counseling may include discussions of community resources, impact of environment on listening conditions, self-advocacy skills, and

enrollment in support groups (ASHA, n.d.-b). Patients may require more or less time on each topic during counseling based on their needs.

Unfortunately, patient recall of medical information provided during appointments is remarkably low and in instances where information is retained, it can often be incorrectly recalled (Hons, 2000; Anderson et al., 1979). Presumably, this lack of information retention results in poor adherence to treatment recommendations. Several suggestions for why this occurs have been made such as age-related cognitive decline, patients' previous knowledge of the subject, patient stress levels during the appointment, perceived importance of the information, and the mode in which the information is presented (Kessels, 2003). These factors will vary greatly depending on the patient and knowledge of these factors can help guide a clinician in how to counsel each person and family. In audiology, not only is it important for cochlear implant patients to retain information regarding how to operate their processors (Vasil et al., 2021) but to also manage communication breakdowns and practice repair strategies. This information will impact everyday life for the patients and can promote or inhibit participation in conversations and social gatherings.

Presenting information in different formats, such as a podcast, presents a unique opportunity to aid in treatment adherence for those who have cochlear implants by restating information that is presented during an appointment as well as providing the information in a spoken and written format. On-demand accessibility of information can be used at the patient's immediate convenience so that the clinician will not have to be contacted, therefore delaying answering the patient's question(s). Additionally, the use of take-home multimedia information can free up valuable clinic appointments so that more time can be spent addressing patient concerns through mapping and providing worthwhile, individualized counseling.

Podcasts

On-demand health programs have increased in popularity with the most favored applications targeting Health, Productivity, and Sport (Stewart, 2020). As of 2018, these programs comprised of over twenty-five thousand apps. One example of a health-related app is a weight loss program called Noom which generates custom reports regarding weight trends, calorie intake, and provides feedback about exercises that help achieve target body weight. It has been the top grossing health and fitness app since 2012 with more than 10 million installs worldwide (Patel, 2015). These readily available resources offer patients the opportunity to actively engage in health programs without having to see a medical professional.

Podcasting is one multimedia format for providing aural rehabilitation that has not been explored in audiology. Podcasts are series of audio clips of individuals speaking, which are uploaded to the internet for mass distribution and can be listened through portable music players, computers, laptops, and smartphones (Kidd, 2012). They can be found through websites or Podcast Players where individuals can search a range of topics to find their ideal podcast. Unlike audio broadcast mediums of the past, podcasts offer unique opportunities for education through their availability to target specific populations, relatively simple production, and ability to be self-paced (Drew, 2017). Given the nature of this audio tool, simply listening to a podcast can serve as auditory training and aural rehabilitation; much like how listening to audiobooks is recommended to cochlear implantees.

Previous research into podcasting has attempted to outline best practices for educational purposes. These best practices related to type of content, length, author, style, and purpose have been outlined by Fernandez et al., (2015). There are three content categories of podcasts for

educational purposes; *substitutional* which are simply recordings of lectures from classes, *supplemental* which provide non-essential class content to aid in student review of material, and *integrated* which are unique to lecture and engage students to enhance understanding of material (Drew, 2017). Aural rehabilitation podcasts should serve under the supplemental or integrated categories to promote engagement and interest in material, ideally maximizing information retention. Podcast length is divided into three categories: short (1–5 min), medium (5–15 min), and long (15 + min) (Carvalho, 2009). Walsh (2004) has argued that each podcast episode should be approximately the length of a song to maintain student engagement. The author of educational podcasts can be teacher, other students, guests, or a combination of these speakers. Podcast styles can be either formal, with information being directly stated, or informal, which utilize humor and seek to entertain the listener. Fernandez et al., (2015) describes the purposes of podcasts as being like course objectives while using cognitive verbs from Bloom’s taxonomy (1956). Purpose can therefore be categorized from lower-order cognitive skills such as “knowledge,” with information recall of episode content, to higher order cognitive skills like “evaluation,” where the student can make judgments about the value of materials. Despite these efforts to identify best practices in podcast development, Drew (2017) states, “The diversity of variables in podcast design evident across the corpus of highly downloaded podcasts reveals how “good practice” should be considered a contextual term when it comes to podcast design” (p. 60).

Further considerations should be made about podcast uptake as it is likely that the older adult cochlear implant population may not be technologically adept. Optimistically, Manchiaiah et al., (2020) found that in a survey of media use by older adults, 70% of respondents (mean age of 67 years) used the internet more than 10 hours a week. In the same study it was found that most respondents turned to the internet and health professionals for symptom-related information

and that health care providers were rated to be more favored than the internet. These findings are encouraging for patient podcast uptake when it is recommended by either the internet or an audiologist.

Methods

A search of peer-reviewed literature for podcasts related to aural rehabilitation was carried out which yielded no pertinent results. Searches were conducted on Academic Search Ultimate using the term “podcast,” in combination with: Audiology, hearing loss, and cochlear implant. Additionally, a review of current podcasts relevant to audiology and hearing loss was conducted to determine if podcasts had previously been used as an aural rehabilitation medium. A list of relevant podcasts can be found in Appendix A. Searches were conducted on the Apple Podcast app and Spotify. Terms used to search for related podcasts were: Cochlear implant, audiology, Med-El, cochlear, hearing loss, aural rehabilitation, and Advanced Bionics. These podcast players and search terms were selected as they are likely to be used by patients to find aural rehabilitation material on their own. None of the podcasts found were intended as aural rehabilitation tools for individuals with cochlear implants for the first six-months post-implantation.

Script Development

Considering podcasts focusing on aural rehabilitation in adult cochlear implant users were not present, scripts were created so that a podcast series, targeted to this population, could be recorded, and distributed at the University of Arizona’s Hearing Clinic. Each episode was developed with the intention of being listened to after audiology follow-up appointments during the first six-months post-implantation. Episode scheduling was based on the University of

Arizona standard follow-up appointment recommendations for cochlear implant patients. An introduction episode would be recorded which states the intention of the podcast series and general format of following episodes. Subsequent episodes followed a similar format with an introduction, expectations of possible listening experiences, listening activities, and finishes with recommendations to reduce communication breakdowns. The strategies discussed at the end of each episode are not only intended for the implantee but for their designated partners as well, as communication breakdowns are not only the responsibility of the person with hearing loss, but also the person they are conversing with. Transcripts of each episode can be found in Appendix B.

Following each episode's introduction, a statement was made on possible listening experiences a cochlear implant user would have at that stage (i.e. how speech should be perceived at the 2-week, 1-month, 3-month, and 6-month post-activation period). Recommendations for these listening experiences were taken from Cochlear Americas *Clinician's Guide to Adult Expectations* (2013) sections on adults with post-lingual hearing loss. Given the variability in perceptual abilities between cochlear implantees, the listener is reassured that these experiences may not be the same for everyone and aural rehabilitation should be continued to achieve listening goals. As part of a comprehensive aural rehabilitation tool, brief auditory training tasks were incorporated into the podcast scripts through listening activities. It is intended that the listener interact with the activities by writing down their answer or saying the answer out loud to their communication partner who could score the response. The communication partner may also serve as a guide to aid the person in listening to the podcast by filling in gaps that the patient may miss, provide feedback on performance, or even encourage the patient.

Activities were developed based on discrimination tasks using the Ling Six Sounds (Ling, 1976), *Living Well with Hearing Loss* activities (Marrone & Harris, 2012), and review of TIMIT Sentences (Lamel et al, 1986). The listening activities get increasingly more difficult as the episodes progress by becoming longer and using more difficult speech discrimination tasks (activities within each episode's script can be found in Appendix B). Ideally, the increased difficulty of the activities should coincide with the patient's improved ability to listen through their processor. The conclusion of each podcasts' script includes recommendations for effective communication strategies that the patient and their partner may use. Communication strategies were based on recommendations discussed during the University of Arizona's ongoing *Living Well with Hearing Loss* classes.

Several of the principles for aural rehabilitation set by Sweetow and Palmer (2005) are incorporated into this proposed podcast by being a free and entertaining program that University of Arizona Hearing Clinic patients will have access to at their convenience. Given the nature of podcasts, information tends to be distributed in a single-sided fashion therefore dialogue between the podcast speaker and the listener is not possible. In addition, podcasts are limited in their ability to provide the listener and developer information regarding the implantee's progress. To partially offset this and have the recordings be more engaging, consistent positive feedback is incorporated into each episode to avoid having the listener give up. Top-down (synthetic) training is integrated into the podcast through the expectation that the listener can comprehend and gain meaning from the spoken content in each episode. Further synthetic processes are included with the more advanced listening exercises and discussion of communication repair strategies at the end of each episode. Bottom-up (analytic) training is integrated into early episodes of the podcast by utilizing discrimination activities which rely on the identification of

the sounds of speech rather than comprehending meaning from spoken words. Examples of how synthetic and analytic training are incorporated into the proposed podcasts are shown in Table 3 below. The proposed podcast primarily relies on synthetic training rather than analytic training because analytic training relies more on feedback and engagement with the listener than synthetic training. Methods on how this tool can be validated and further developed are suggested in the Future Directions portion of this paper.

Type of training	Example from the proposed podcast
Top-down (synthetic)	I would like you to repeat these sentences or write them down <ul style="list-style-type: none"> • Call an ambulance for medical assistance.
Bottom-up (analytic)	I am going to say a list of words. I want you to write down or tell your partner how many have the sound “ee” in them. <ul style="list-style-type: none"> • Clean, Pen, See, Green, Brush

Table 3. Examples of synthetic and analytic training from the podcast proposed transcripts.

Once developed, readability statistics of transcripts were evaluated using a Flesch Kincaid readability test through Microsoft Word which revealed a Flesch Reading Ease score of 65.4 and Flesch-Kincaid Grade Level of 8.0 representing that an eighth grader can understand the document. It is typically recommended that the Flesch Reading Ease score be between 60 and 70 for average readability (Flesch, 1979). Flesch readability statistics are both determined by evaluating word length and sentence length in a document. The words “cochlear,” “implant,” “aural,” and “rehabilitation” were excluded from the readability statistics as it is assumed that these words are in the patients’ lexicon or were defined in the introductory episode. With the target population of the podcast being post-lingually deafened adults, it is anticipated that these patients have average literacy skills and would be able to read along with the scripts, given the Flesch readability statistics.

Future Directions and Research Needs

It is recommended that the podcast be recorded in a double-walled sound booth using a Blue Yeti microphone. Microphone settings should be set to a cardioid polar plot and set approximately 3 feet from the speaker, per manufacturer recommendations. The free, open-source Audacity software could be used for podcast editing. Once recorded and edited, the podcasts and transcripts could be made available on the University of Arizona Hearing Clinic's website so that patients and communication partners can readily access the materials. Cochlear implant patients at the University of Arizona can find out about the podcast through their audiologist when learning about aural rehabilitation and effective tools to help in the process.

Several modifications can be implemented in the proposed podcast to provide further aural rehabilitation to cochlear implant patients. For example, supplemental episodes with interviews of cochlear implantees, audiologists, surgeons, etc., could be recorded to further engage the listener and provide varied voices and acoustic signals. The podcast could even extend beyond the first 6-months post-activation and continue to be an aural rehabilitation tool for patients throughout their implantation journey. More auditory training tasks can be added and made more difficult for the listener by including background noise, different speakers, or more challenging exercises. Another modification to the podcast is by providing videos of each episode being recorded to include visual input in addition to the auditory input. Video podcasting can aid in the listeners ability to utilize visual cues like speech reading, changing this program from auditory-only to an auditory-visual tool.

At present, the bulk of research in podcasting has explored its efficacy in the context of higher education. Results on the efficacy of podcasts as educational tools in academic settings

has been variable, likely due to the inconsistency of podcast design and distribution in research (Fernandez et al., 2014). Audiology research is lacking on the use of podcasts as a clinic tool and, at present, there are no validated methods to evaluate podcast efficacy in medical settings. Given this absence in the literature, the proposed podcast can serve as a basis to evaluate the utility of podcasting for patients with cochlear implants.

The proposed podcast and suggested modifications could provide more bases for research and eventually lead to development of best practices in podcasting for aural rehabilitation. It is recommended that, once recorded, this podcast be distributed in conjunction with a satisfaction survey. Commercially available surveys that rate podcasts can be used as there are no similar evaluation tools in the literature (QuestionPro, 2021). These questionnaires typically address how a person learned about the podcast and how often they listen to. It is anticipated that individuals will learn about the proposed podcast through their audiologist and listen to each episode for the entire duration based on the suggested schedule. An example of a satisfaction survey for the proposed aural rehabilitation program can be found in Appendix C. This questionnaire asks demographic information, satisfaction of components of the podcast, and whether they would recommend the podcast to others.

Given that satisfaction is not an evidence-based evaluation method (Cohen, Myckatyn, & Brandt, 2017) obtaining valid outcome data of patients listening to a podcast would be difficult to acquire. Although there is great value in the provision of aural rehabilitation for cochlear implantees, there is still outcome variability within this patient population (Moberly, Lowenstein, & Nittrouer, 2016). Attributing changes in speech perception or quality of life to podcast listening alone would be difficult as the entire listening experience of the participants cannot be controlled for. Podcasts lack the ability to give feedback regarding user experience and

performance given the single-sided presentation style. However, other tools based on the proposed podcast could be developed that do provide feedback on patient performance. For example, an aural rehabilitation app could serve as a future direction to serve the targeted patient population. An app can further provide comprehensive auditory training in a manner that is limited through podcasting. Apps can collect data for both the user and developer regarding progress and components of auditory training that need to be further addressed.

At the time of this project's development, an aural rehabilitation app exists based on the previously mentioned auditory training program cLEAR called Amptify (<https://amptify.com/>). This app administers auditory training and counseling through video games, interactive lessons, and quizzes while connecting users to an online support group. Additionally, users are connected to a "hearing coach" who can track progress and provide guidance on how to reach individual listening goals, ideally taking up a significant portion of auditory training and counseling from the clinician to focus on other components of aural rehabilitation. Components of auditory training for Amptify and the proposed podcast are outlined in Figure 1 below. For a fee, users and hearing healthcare professionals can access this app and use the resources depending on which service package they purchase. The Amptify program advertises that this brain training approach enhances speech discrimination, reduces perceptual effort, increases listening confidence, and enhances the hearing healthcare experience from evidence-based research. It has been found that meaningful gains are made in off-task speech comprehension when using the similar cLEAR program (Barcroft, Spehar, Tye-Murray, & Sommers, 2016; Barcroft, Sommers, Tye-Murray, Mauzé, Schroy, & Spehar, 2011; Barcroft, Mauzé, Schroy, Tye-Murray, Sommers, & Spehar, 2011). Additionally, it was found that cLEAR reduced perceptual effort in

understanding spoken language and that participants retained these gains 3-months after using the program (Sommers, Tye-Murray, Barcroft, & Spehar, 2015).

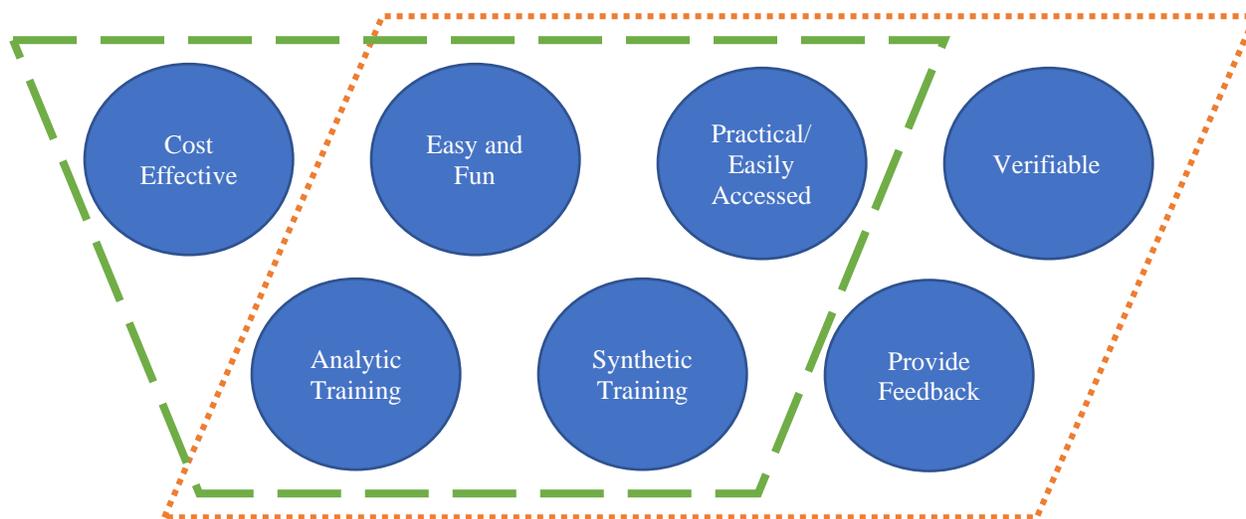


Figure 1. Components of auditory training outlined by Sweetow & Palmer (2005) addressed by Amptify (orange dots) and the proposed podcast (green dashes).

An app developed based on the proposed podcast, might serve as a free tool for patients at the University of Arizona Hearing Clinic who use cochlear implants. It could supplement the components of aural rehabilitation and auditory training that are constrained by podcasting (i.e., feedback and bottom-up training) while utilizing the same evidence-based approaches used for cLEAR and Amptify. A proposed app could differ from Amptify by having communication partners record speech samples that could be used with various signal-to-noise ratios therefore increasing generalization to real-world listening experiences. Unlike Amptify, the app could have different types of background noise for the user to select from rather than just multi-talker babble. Instead of a paid hearing coach, like Amptify, a University of Arizona Hearing Clinic app could allow the patient direct access to their audiologist instead of the hearing coach who they are unfamiliar with. An app also has utility for evaluating patient performance through usage data on the app in a way that is limited in podcasts. However, the use of an interactive app

requires that the patient be more technologically adept than by simply listening to a podcast. Not only must the user be able to navigate the complexity of an app they must also have the appropriate resources (e.g. a smartphone and broadband internet access). These limitations pose a barrier to aural rehabilitation app usage as approximately 10 percent of all Americans (34 million people) lack access to benchmark broadband speeds (25 Mbps/3 Mbps) (Federal Communications Commission, 2016). These barriers for at-home aural rehabilitation should be taken into consideration when making patient-centered recommendations but do not limit the potential validity of an aural rehabilitation podcast or app for patients. Both proposed programs can likely serve as valid aural rehabilitation tools but further research into best practices and patient retention must be conducted. The proposed podcast of this project will hopefully serve as a first step and a basis for further research and development of similar aural rehabilitation tools that help patients through their cochlear implant journey.

Appendix A – List of Podcasts

Title	Podcast Player	Date of Pilot	Summary
BAAPodcast	Apple	7/2/2012	Interviews with researchers in the field of audiology and hearing sciences.
The Hear Me Out! [CC] Podcast	Apple	8/26/2018	Interviews with people in the d/Deaf community by a person with hearing loss.
The Audigy Podcast	Spotify and Apple	12/26/2018	Interviews with professionals within the Audigy company
All about Audiology	Spotify and Apple	1/31/2019	A pediatric audiologist discusses hearing evaluation and treatment for parents of children with hearing loss.
Ascending Audiologists	Spotify	3/7/2019	Marketing advice for hearing professionals.
The Hearing Journal	Spotify and Apple	4/17/2019	Discussions on issues affecting practices, advancements in technology, and strategies to improve hearing care.
The Audiologist - A Phonak Podcast	Spotify	6/12/2019	Discussions on topics related to audiology for professionals.
Hearing Matters	Spotify and Apple	7/2/2019	Educating the public on how hearing works, hearing technology, and best practices.
The Listening Brain	Spotify	7/19/2019	For families and people with hearing loss to learn about technological advancements and hear interviews with professionals in the field.
The Hear Me Out Audiology Podcast	Spotify and Apple	7/25/2019	Interviews with professionals in the field.
MED-EL Podcast	Apple	8/12/2019	Designed as a learning tool for professionals to receive updates on MED-EL technology.
Hear and Now Podcast	Spotify	8/16/2019	A person with progressive hearing loss discusses her experience with hearing loss and amplification and cochlear implantation.
Future Ear Radio	Spotify	11/20/2019	Updates on hearing aids and relevant technology.

The Hearing Now Podcast	Apple	4/11/2020	Discussions on how hearing works.
The Speech & Hearing Show	Spotify	5/7/2020	Case reports with speech and hearing professionals.
Telepractice Today	Spotify	5/14/2020	Interviews with professionals to teach audiologists on how to practice telehealth.
The Thick Ear	Spotify	5/15/2020	Discussions to educate the public on the anatomy and physiology of hearing.
Listen Up Rockland	Spotify	6/4/2020	Community outreach to inform patients about hearing, balance, and tinnitus.
Hearing Health Today	Spotify	6/26/2020	Educational tool for hearing health professionals to learn more about Cochlear's products and services.
On the Ear: An Audiology Podcast	Spotify and Apple	7/23/2020	Interviews with professionals in audiology and communication sciences. Each episode is worth .1 ASHA CEU after completing the accompanying audio course.
Empower EAR Audiology	Spotify and Apple	8/12/2020	An audiologist discusses her professional and personal journey with hearing loss and interviews guests.
A Dose of Dizzy	Spotify	9/2/2020	Overview of research related to balance assessment and treatment.
Specsavers Audiology P.A.C Podcast	Spotify and Apple	9/9/2020	Recordings of conference speakers for Specsavers online conference.
Hear Today Featuring A.u.D. Joanie Davis	Spotify	9/13/2020	A private practice discusses topics related to hearing to educate her patients and other listeners.
The Business of Hearing	Apple	10/20/2020	Information sharing for private practice owners in audiology.
Turning Heads	Spotify	11/19/2020	Overview of bedside assessment, running a dizzy practice, and interdisciplinary collaboration.
The Unbundled Audiologist	Spotify and Apple	12/1/2020	Discussions of business models for hearing healthcare.
Pure Tinnitus & Hearing Podcast	Spotify	2/17/2021	Discussions about tinnitus therapy, tinnitus treatment, and research for a cure to tinnitus.

Appendix B – Proposed Podcast Scripts

Note: These podcast scripts were developed based on the work of Sweetow and Palmer (2005). It is recommended that an aural rehabilitation tool should be:

- 1) be cost effective, 2) be easy, fun, and rewarding for the patient, 3) be practical and easily accessible, 4) be verifiable, 5) incorporate top-down (synthetic) and bottom-up (analytic) approaches and 6) provide the patient with feedback regarding progress.

Introduction Episode

Hi, I'm *Jessica* and I am a doctoral student in audiology at the University of Arizona. If you are listening to this podcast, you or someone you love will have or has had surgery for a cochlear implant. Before we begin, I would like to point out that written transcripts have been provided for each episode by your audiologist. You can obtain the transcripts from the University of Arizona Hearing Clinic's website. From there you can also find information about this podcast and other cochlear implant resources. I encourage you to listen and read along to each episode, or parts of them as many times as you wish. You should be listening to these episodes in a quiet room with no distractions. Each episode of this series is meant to be listened to after follow-up appointments with your audiologist. You are welcome to listen to each episode as often as you wish and at your own pace.

Now, as your audiologist may have told you, it is incredibly important for you to listen to the world around you during this time after surgery. This podcast is meant to be a tool to help you adapt to hearing with a cochlear implant, along with other apps, websites, or tools your audiologist recommended. This podcast is not meant to replace real-world listening experiences or your audiologist's recommendations; it is to help give you a little more practice.

Aural rehabilitation has been shown to positively impact speech perception, music appreciation, and quality of life. As you go through these episodes, you may find that you are having difficulty. That's okay, cochlear implants and aural rehabilitation are not a one-size-fits-all process. Don't get discouraged. The important take away is to continue practicing.

There is a range of abilities for each milestone during the first year after surgery. I like to think of this process like a yoga class; there are a range of abilities and experiences in the classroom so what one person can do is not that same as anyone else. By the end of the yoga class everyone can feel better no matter how much modification and practice they had to do.

Another way to help you maximize your success with cochlear implants is to have someone listen to this podcast with you. This person can be a significant other, a family member, or a friend; anyone who should understand what you are going through. Having someone else there can help improve your success and decrease negative emotions during aural rehabilitation.

Now that you know what aural rehabilitation is, we can move on to the next episodes. The following episode will be for two weeks after your activation appointment with your audiologist. We hope to hear from you soon!

Episode 2

Welcome! I'm so glad you can make it to listening today. This will be great practice in your aural rehabilitation. Just a reminder from last time, aural rehabilitation is the process of change and practice to learn how to listen with a cochlear implant; it's your ear therapy. Remember, written transcripts to this episode have been provided for you on the University of Arizona Hearing Clinic's website.

In today's episode I will talk about some possible listening experiences you are having, then we will have some fun with practice activities, and finally, I will share some listening strategies with you to use at home with your communication partner. I really encourage you to listen to this podcast with someone whom you often communicate with to help them understand what you are going through and to aid in the activities.

At this point, you should have had your cochlear implant activated for about two weeks. This means that your new ear is two weeks old! Many people describe their hearing at first as sounding like "TV static" or "Donald Duck." At this stage, we hope that things are beginning to sound more natural since when your implant was first activated. In these two weeks, you may recognize some familiar voices and common phrases like "how are you?" You may even recognize some speech sounds "m, oo, ar, ee, sh, s." Let me repeat that in case you missed it: some sounds you may recognize are "m, oo, ar, ee, sh, s." Maybe you can't recognize those sounds, that's okay, we will work towards getting there.

Whatever stage you are at is okay. Don't worry if your ability to understand speech isn't perfect right away or things aren't sounding natural yet. This is a process and requires practice. There is a wide range of listening abilities for people at this stage. The fact that you are listening today and making proactive steps in your aural rehabilitation is a great start.

With practice and working with your audiologist, you can achieve realistic listening goals! Some exercises have been prepared for you in this podcast to help you with practice. Every episode the exercises will get a little more difficult. The goal is to have exercises that are challenging at first but will get easier over time – like when practicing yoga. Are you ready? Let's spend some time doing some practice activities:

Be sure to have a pen and paper out or have your communication partner with you.

- I am going to say a list of words. I want you to write down or tell your partner how many have the sound "ee" in them.
 - Clean, Pen, See, Green, Brush
- I am going to say a list of words. I want you to write down or tell your partner if the word has the sound "sh" in it.
 - Wish, Bat, Mow, Lamb, Car

- I am going to say a series of two sounds. I want you to write or say whether they are the same or different.
 - So Mo, Goo Goo, Bar Bat, Mee Mee
- I would like you to repeat these sentences or write them down
 - The car has a flat tire
 - I am going to the store
 - What do you want for dinner?

If these activities were difficult for you or you could not do them on your first try, that's okay! You can always come back to this point in the episode to continue practicing until the activities become easier. They are meant to start difficult and get easier over time.

Let's discuss a communication strategy to help you or anyone else you are talking with to communicate better. It is important as the speaker to talk slowly and clearly. Not ridiculously slowly but it is important to pace yourself when talking to someone with a hearing loss. Many people think that talking loudly will help but, most of the time, it is the speed and clarity that helps others understand. So remember, if you are talking to someone with a cochlear implant, speak clearly and don't shout! And if you are talking to someone and don't understand what they said, ask them to speak clearly. It's important to advocate for yourself.

That is all for today, please feel free to listen to this episode as many times as you want. It is so important to wear your cochlear implant every day and in many different real-world environments as well as practicing with this podcast. The following episode will be for one month after your activation appointment with your audiologist. We hope to hear from you soon!"

Episode 3

Welcome back! Thanks for listening today and taking action in your aural rehabilitation. Remember, you can find the transcripts for this episode at the University of Arizona Hearing Clinic's website. Here you can also find information about this podcast and more about aural rehabilitation.

In today's episode I will talk about some listening goals that you may have achieved, then I will have some fun with practice activities, and finally, I will share some listening strategies with you to use at home with your communication partner. I really encourage you to listen to this podcast with someone who you often communicate with to help them aid you in your rehabilitation.

At this point, you should have had your cochlear implant activated for about one month. This means that your new ear is one month old! At this stage, you may recognize people's voices who you talk to often. Maybe you can identify "m, oo, ar, ee, sh, s" from a short distance. I'll repeat those sounds like I did last episode: some sounds you may recognize from a short distance are "m, oo, ar, ee, sh, s." It's possible that at this point you may feel more independent and able to rejoin the hearing world. I hope that soon you can participate in conversations on a familiar topic with a small group of people in a quiet room. In these situations, maybe the best you can do is tell when a phrase begins and ends but not understand the content. Don't worry if your progress isn't as fast as you would like or if it isn't as fast as other people with cochlear implants. Everyone will be at different stages. Remember the yoga example from the first episode! The important thing is that you practice hearing with your cochlear implant.

Now, let's give you some listening practice with your cochlear implant. This activity will be like last episode's but will be a little more difficult. The goal is to challenge you so that listening becomes easier over time. Before we begin, make sure you have someone with you, or you have a pen and paper. Ready? Let's begin.

- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "oo" in them.
 - Food, Beet, Man, Crew
- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "sh" in them.
 - Cash, Ditch, Shop, Bash, Dish, Catch
- I am going to say a series of two sounds. I want you to write or say whether they are the same or different.
 - Car Tar, Bee See, Oot Oot, New Mew, Ash Ash, Lull Dull
- I would like you to repeat these sentences or write them down

- Call an ambulance for medical assistance.
- Don't ask me to carry an oily rag like that.

If these activities were difficult for you or you could not do them on your first try, that's okay! You can always come back to this point in the episode to continue practicing until the activities become easier.

Before we end today, I wanted to talk about a listening strategy for you and your communication partners to work on. This will help you learn to listen with your cochlear implant. One that we love to say here at University of Arizona is to “walk before you talk.” This means that when you or someone you are with wants to talk, make sure that you both are in the same room and facing each other before talking. As the talker you can provide the listener with visual cues from facial expressions and lip movement, that would not be available if you were in different rooms. So remember to “walk before you talk.”

That is all for today, please feel free to listen to this episode as many times as you want. It is so important to wear your cochlear implant every day and in many different real-world environments as well as practicing with this podcast. The following episode will be for three months after your activation appointment with your audiologist. We hope to hear from you soon!”

Episode 4

Welcome back! Thanks for coming back and listening, I hope you are finding this podcast helpful in your aural rehabilitation. Be sure to check out the written transcripts at the University of Arizona Hearing Clinic's website. Here you can also find information about this podcast and more about aural rehabilitation.

In today's episode I will talk about some listening goals that you may have achieved, then I will have some fun with practice activities, and I will share some listening strategies with you to use at home. I really encourage you to listen to this podcast with someone who you often communicate with.

At this point, you should have had your cochlear implant activated for about three months. This means that your new ear is three months old!

At this point, you may be able to understand some of what is being said on the TV or on the radio without needing captions. Or maybe speech is becoming easier to hear when people are further away. Wherever you are in your aural rehabilitation, I hope that you are feeling more confident about your listening abilities. Maybe some of these things are still challenging for you. Remember, aural rehabilitation is not one-size-fits-all and is an individualized process. People have different levels of ability at the same stages. Staying proactive about your aural rehabilitation and practicing listening activities will help you reach your goals.

Now, let's give you some listening practice with your cochlear implant. This activity will be like last episode's but will be a little more difficult. The goal is to challenge you so that listening becomes easier over time. Before we begin, make sure you have someone with you, or you have a pen and paper. Ready? Let's begin.

- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "oo" or "ee" in them.
 - Clue, Moon, Far, Stew, Eat, Brown, Free
- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "sh" in them.
 - Catches, So, Mash, Matches, Shape, Crashes
- I am going to say a series of two sounds. I want you to write or say whether they are the same or different.
 - East East, Gold Mold, Five Dive, Guh Guh
- I would like you to repeat these sentences or write them down
 - Kindergarten children decorate their classrooms for all holidays.

- Cory and Trish played tag with beach balls for hours.
- Laugh, dance, and sing if fortune smiles upon you.

If these activities were difficult for you or you could not do them on your first try, that's okay! You can always come back to this point in the episode to continue practicing until the activities become easier.

Now I want to discuss a few listening strategies that can help you or anyone else you are talking with communicate better. The first one is to get a person's attention before talking to them. This one is similar to the one we discussed last episode, "walk before you talk." It is important that you get a person's attention before talking to them so that he or she can face you, and that they can focus on the conversation. Listening is more difficult for people with hearing loss, even if they have a cochlear implant, so it is important that they can look at the speaker to receive visual cues from their facial expressions and body language. Another strategy that can be helpful is to warn a person with a cochlear implant what the topic of conversation is going to be. For example, before talking about dinner plans you can say "about dinner, I was thinking we go out to eat." This way, the person can have an idea of the topic beforehand so that he or she does not have to spend time and energy trying to guess what is being discussed. I want to mention that all the communication strategies we have talked about so far aren't just helpful for those with hearing loss but can apply to anyone you are talking to. These small changes in the way you talk and behave can go a long way not just for people with cochlear implants but for everyone!

Episode 5

Welcome back! Thanks for coming back and listening, I hope you have found the past episodes helpful in your aural rehabilitation. This will be the last episode in our series, but I urge you to continue your aural rehabilitation. Remember, you can come back to any point in this episode and find written transcripts for our podcast at the University of Arizona Hearing Clinic's website. Here you can also find information about this podcast and more about aural rehabilitation.

In today's final episode I will talk about some listening goals that you may have achieved, then I will have some fun with practice activities, and, for the last time, I will share some listening strategies with you to use at home with your communication partner. Like always, I really really encourage you to listen to this podcast with someone who you love to help them aid you in your rehabilitation.

At this point, you should have had your cochlear implant activated for about six months. This means that your new ear is six months old!

At this point, you may be able to hear at an even greater distance, or even someone speaking from a different room. Maybe you have an easier time following conversations and participating in noisy situations. I hope that you are beginning to understand unfamiliar speakers in person and on the phone most of the time. Although you have made great progress in the past six months, there are probably some noisy situations you will not be able to hear well in, like loud restaurants or parties. These places are hard to hear even for people with normal hearing, so they are especially hard for someone with a cochlear implant. If you are experiencing frustrations in everyday situations, please talk to your audiologist and continue with your aural rehab.

Speaking of aural rehabilitation, let's give you some listening practice with your cochlear implant. This activity will be a little more difficult than what you have done in the past. It just shows how much progress you have made in the past six months! The goal is to challenge you so that listening becomes easier over time. Before we begin, make sure you have someone with you, or you have a pen and paper. Ready? Let's begin.

- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "oo" or "ee" in them.
 - Daydream, Raspberry, Spittoon, Daylight, Between, Toolbox, Necklace
- I am going to say a list of words. I want you to write down or tell your partner which ones have the sound "s" in them.
 - So, Crash, Show, Shrub, Bash, Stub, Bats
- I would like you to repeat these sentences or write them down
 - Alice's ability to work without supervision is noteworthy.

- The easygoing zoologist relaxed throughout the voyage.
- Brush fires are common in the dry underbrush of Nevada.
- Now I will be saying a sentence and asking you a question about it. Please answer the question:
 - The directions on Veronica's medicine say to take one pill every 12 hours. How many pills does Veronica take every day?

If these activities were difficult for you or you could not do them on your first try, that's okay! You can always come back to this point in the episode to continue practicing until the activities become easier.

For today's final episode I want to discuss some strategies that you and your communication partner can use when there is a communication breakdown. Even when you do everything right such as speaking clearly, walking before you talk, and facing each other, communication breakdowns can still happen. They happen to everyone, whether they have a hearing loss or use a cochlear implant, or even for those with normal hearing in noisy rooms. When a communication breakdown happens, people may experience negative emotions such as frustration. Can you remember a time when you got frustrated because you could not hear what someone was saying to you? Maybe they got frustrated at you? So if we think back to those situations we talked about, many of them were challenging. With challenging situations, you have the choice of whether to actively cope with the situation or avoid the challenge altogether. For example, instead of bluffing and nodding your head when you didn't hear someone, you could instead say "could you speak a little slower?" With avoiding behaviors, the problem will not have a chance to be solved and it increases the likelihood that the problem will be repeated many more times. It's not always easy to use coping strategies and it takes some practice to use them but over time you will start to notice fewer and fewer communication breakdowns.

I hope you have found these communication tips helpful and that you and your communication partner have enjoyed listening to the podcast! Your aural rehabilitation does not stop here but should continue. If you would like more helpful aural rehabilitation tools like this podcast you should talk to your audiologist or check some of our favorites out at the University of Arizona Hearing Clinic's website.

Appendix C – Satisfaction Survey

How would you describe yourself?

- I am the person who is/will be using a cochlear implant
- I am a communication partner of someone who uses a cochlear implant
- Other

What is your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75 +

What are your preferred pronouns?

- She/her
- He/him
- They/them
- Other

Do you currently listen to podcasts other than this one?

- Yes
- No

If yes, how many times in a week do you listen to podcasts?

- Never
- Once a week
- Twice a week
- 3-5 times a week
- 6 times a week
- Everyday
- I don't listen to other podcasts

How likely are you to recommend this podcast to someone you know?

Not at all likely

Very Likely

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Content is informative

Agree

Disagree

1	2	3	4	5
---	---	---	---	---

Content is interesting to listen to

Agree					Disagree
1	2	3	4	5	

I learned something in this podcast that I will use in my life

Agree					Disagree
1	2	3	4	5	

	Very dissatisfied	Not satisfied	Neutral	Satisfied	Very satisfied
Frequency of podcasts	<input type="radio"/>				
Length of podcasts	<input type="radio"/>				
Quality of information provided by the host	<input type="radio"/>				
Presentation of information	<input type="radio"/>				

References

- AIB Externs. (Host). (2020-Present). *Turning heads* [Audio podcast].
- Allen, K. D., & Houston, T. (Host). (2020-2021). *Telepractice today* [Audio podcast].
- American Speech-Language-Hearing Association (n.d.). *Aural Rehabilitation for Adults* (Practice Portal). www.asha.org/Practice-Portal/Professional-Issues/Aural-Rehabilitation-for-Adults/.
- American Speech-Language-Hearing Association (n.d.). *Cochlear Implants* (Practice Portal). www.asha.org/Practice-Portal/Professional-Issues/Cochlear-Implants/.
- Anderson, J. L., Dodman, S., Kopelman, M., & Fleming, A. (1979). Patient information recall in a rheumatology clinic. *Rheumatology*, *18*(1), 18-22.
- Arlinger, S., Gatehouse, S., Bentler, R. A., Byrne, D., Cox, R. M., Dirks, D. D., Humes, L., Neuman, A., Ponton, C., Robinson, K., Silman, S., Summerfield, A. Q., Turner, C. W., Tyler, R. S., & Willott, J. F. (1996). Report of the eriksholm workshop on auditory deprivation and acclimatization. *Ear and Hearing*, *17*(3 Sup 1), 87S-98S.
- Arnoldner, C., Riss, D., Brunner, M., Durisin, M., Baumgartner, W., & Hamzavi, J. (2007). Speech and music perception with the new fine structure speech coding strategy: Preliminary results. *Acta Otolaryngol*, *127*, 1298–1303.
- Armatoski, K. (Host). (2019-2020). *Ascending audiologists* [Audio podcast]. <https://ascendingaudiologists.com/the-podcast/>

Audigy. (Host). (2018-Present). *The audigy podcast* [Audio podcast].

<https://www.audigy.com/podcast/>

Barcroft, J., Sommers, M. S., Tye-Murray, N., Mauzé, E., Schroy, C., & Spehar, B. (2011).

Tailoring auditory brain training to patient needs with single and multiple talkers: Transfer-appropriate gains on a four-choice discrimination test. *International Journal of Audiology*, 50(11), 802-808.

Barcroft, J., Spehar, B., Tye-Murray, N., & Sommers, M. (2016). Task-and talker-specific gains in auditory brain training. *Journal of Speech, Language, and Hearing Research*, 59(4), 862-870.

Barker, A. B., Leighton, P., & Ferguson, M. A. (2017). Coping together with hearing loss: A qualitative meta-synthesis of the psychosocial experiences of people with hearing loss and their communication partners. *International Journal of Audiology*, 56(5), 297-305.

Blamey, P., Artieres, F., Başkent, D., Bergeron, F., Beynon, A., Burke, E., Dillier, N., Dowell, R., Fraysse, B., Gallégo, S., Govaerts, P, J., Green, K., Huber, A, M., Kleine-Punte, A., Maat, B., Marx, M., Mawman, D., Mosnier, I., O'Connor, A. F.,...Lazard, D. S. (2012). Factors affecting auditory performance of postlinguistically deaf adults using cochlear implants: An update with 2251 patients. *Audiology & Neurotology*, 18(1), 36-47.

Bloom, B. S. (1956). *Taxonomy of educational objectives, handbook I: The cognitive domain*. New York: David McKay Co. Inc.

Boisvert, I., Clemesha, J., Lundmark, E., Crome, E., Barr, C., & McMahon, C. M. (2017).

Decision-making in audiology: Balancing evidence-based practice and patient-centered care. *Trends in Hearing, 21*, 1-14.

Boothroyd, A. (2007). Adult aural rehabilitation: What is it and does it work? *Trends in Amplification, 11*(2), 63-71.

British Academy of Audiology. (Host). (2012-2013). *BAAPodcast* [Audio podcast].

Caldwell, M. T., Jiam, N. T., & Limb, C. J. (2017). Assessment and improvement of sound quality in cochlear implant users. *Laryngoscope investigative otolaryngology, 2*(3), 119–124. <https://doi.org/10.1002/lio2.71>

Carvalho, A., Aguiar, C., Carvalho, C., & Cabecinhas, R. (2009). Influence of podcasts characteristics on higher students' acceptance. In C. Bonk (Ed.), *Proceedings of world conference on e-learning in corporate, government, healthcare, and higher education 2008* (pp. 3625–3633).

Center for Medicare and Medicaid Services. (2010). Medicare benefit policy manual (CMS Publication No. 100-02, Chapter 15, section 80.3).

Cochlear Limited. (Host). (2020-2021). *Hearing health today* [Audio podcast].

<https://pronews.cochlearamericas.com/hearing-health-today-podcast/>

Cochlear Limited. (2013). *A clinician's guide: Adult expectations*. Cochlear Limited.

- Cohen, J. B., Myckatyn, T. M., & Brandt, K. (2017) The importance of patient satisfaction: A blessing, a curse, or simply irrelevant? *Plastic and Reconstructive Surgery*, 139(1), 257-261 doi: 10.1097/PRS.0000000000002848
- Davis, J. (Host). (2020). *Hear today featuring A.u.D. Joanie Davis* [Audio podcast].
- De Silva, D. (Host). (2020). *The speech & hearing show* [Audio podcast].
- Delfino, G., & Delfino, B. (Host). (2019-Present). Hearing matters [Audio podcast].
- Dillon, H., James, A., & Ginis, J. (1997). Client oriented scale of improvement (COSI) and its relationship to several other measures of benefit and satisfaction provided by hearing aids. *Journal of the American Academy of Audiology*, 8, 27-43.
- Drew, C. (2017). Edutaining audio: An exploration of education podcast design possibilities. *Educational Media International*, 54(1), 48-62.
- Erber, N. P. (1994). Conversation as therapy for older adults in residential care: The case for intervention. *International Journal of Language & Communication Disorders*, 29(3), 269-278.
- Federal Communications Commission. (2016). 2016 broadband progress report. Section IV.B.2.
- Ferguson, M. A., & Henshaw, H. (2015). Auditory training can improve working memory, attention, and communication in adverse conditions for adults with hearing loss. *Frontiers in Psychology*, 6, 556.
- Fernandez V., Sallan J.M., Simo P. (2014) Past, Present, and Future of Podcasting in Higher Education. *Exploring Learning & Teaching in Higher Education. New Frontiers of*

Educational Research, 305-330. https://doi-org.ezproxy1.library.arizona.edu/10.1007/978-3-642-55352-3_14

Flesch, R. (1979). *How to write plain English: A book for lawyers and consumers* (1st ed.). Harper & Row.

Holder, J. T., Dwyer, N. C., & Gifford, R. H. (2020). Duration of processor use per day is significantly correlated with speech recognition abilities in adults with cochlear implants. *Otology & Neurotology*, 41(2), E227-E231.

Hons, Y. G. (2000). Do they listen? A review of information retained by patients following consent for reduction mammoplasty. *British Journal of Plastic Surgery*, 53(2), 121-125.

Houston, K. T. (Host). (2019-2020). *The listening brain* [Audio podcast].

Jones, P. M. & Luke, O. (Host). (2020-Present). *The business of hearing* [Audio podcast].

Kemp, D. (Host). (2019-Present). *Future ear radio* [Audio podcast].

<https://futureear.co/category/future-ear-radio/>

Kessels, R. P. C. (2003). Patients' memory for medical information. *Journal of the Royal Society of Medicine*, 96(5), 219-222.

Khalifa, A. (Host). (2018-2020). *The hear me out! [CC] podcast* [Audio podcast].

<https://hearmeoutcc.com/podcast/>

Kidd, W. (2012). Utilising podcasts for learning and teaching: A review and ways forward for e-Learning cultures. *Management in Education*, 26(2), 52-57.

King, S.E., Firszt, J. B., Reeder, R. M., Holden, L. K., & Strube, M. (2012). Evaluation of TIMIT sentence list equivalency with adult cochlear implant recipients. *Journal of the American Academy of Audiology*, 23(5), 313-331. doi: 10.3766/jaaa.23.5.3.

Knutson, J. F., Tyler, R. S., Schartz, H. A., Hinrichs, J. V., Gantz, B. J., & Woodworth, G. (1991). Psychological change following 18 months of cochlear implant use. *Annals of Otology, Rhinology & Laryngology*, 100(11), 877-882.

Lamel, F. L., Kassel, R. H., & Seneff, S. (1986). Speech database development: design and analysis of the acoustic phonetic corpus. Proceedings of DARPA Speech Recognition Workshop, Report No SAIC-86\1546.

Lebano, S. (Host). (2020-Present). *Hear and now podcast* [Audio podcast].

Luterman, D. M. (2008). *Counseling persons with communication disorders and their families*. PRO-ED, Inc.

Marrone, N., Harris, F. P., (2012) A multifaceted living well approach to the management of hearing loss with adults and their frequent communication partners. *Perspectives on Aural Rehabilitation and its Instrumentation*, 19(1), 5–14.

Manchaiah, V., Bellon-Harn, M. L., Kelly-Campbell, R. J., Beukes, E. W., Bailey, A., & Pyykkö, I. (2020). Media use by older adults with hearing loss: An exploratory survey. *American Journal of Audiology*, 29(2), 1-225.

MED-EL. (Host). (2019-2020). *MED-EL Podcast* [Audio podcast]. <https://medel.libsyn.com/>

- Moberly, A. C., Lowenstein, J. H., & Nittrouer, S. (2016). Word recognition variability with cochlear implants: “Perceptual attention” versus “auditory sensitivity”. *Ear and Hearing*, 37(1), 14-26.
- Moberly, A. C., Vasil, K., Baxter, J., & Ray, C. (2018). What to do when cochlear implant users plateau in performance: A pilot study of clinician-guided aural rehabilitation. *Otology & Neurotology*, 39(9), E794-E802.
- Montano, J. J. (2014). Defining audiologic rehabilitation. In J.J. Montano & J.B. Spitzer (Eds.), *Adult audiologic rehabilitation* (2nd ed.; pp. 23–35). San Diego, CA: Plural.
- Moore, D. R., & Shannon, R. V. (2009). Beyond cochlear implants: Awakening the deafened brain. *Nature Neuroscience*, 12(6), 686-691.
- Patel, R. et al. Smartphone apps for weight loss and smoking cessation: Quality ranking of 120 apps. *N Z Med J* **128**, 73–76 (2015).
- Person, E. (Host). (2020-Present). *The unbundled audiologist* [Audio podcast].
- Phonak. (Host). (2019). *The audiologist - A Phonak podcast* [Audio podcast].
- QuestionPro. (2021). *Podcast survey questions + Sample questionnaire template*. QuestionPro. <https://www.questionpro.com/survey-templates/podcast-survey-template/>
- Robinson, K., & Summerfield, A. Q. (1996). Adult auditory learning and training. *Ear and Hearing*, 17(3 Suppl), 51S-65S.
- Romero, D. J., & Fuemmeler, L. (Host). (2020-Present). *A dose of dizzy* [Audio podcast].

Rudden, D. (Host). (2019-Present). *The hearing journal* [Audio podcast].

<https://journals.lww.com/thehearingjournal/pages/podcasts.aspx>

Saperstein, L. (Host). (2019-Present). *All about audiology* [Audio podcast].

<https://allaboutaudiology.com/>

Saunders, G. H., Smith, S. L., Chisolm, T. H., Frederick, M. T., McArdle, R. A., & Wilson, R.

H. (2016). A randomized control trial: Supplementing hearing aid use with listening and communication enhancement (LACE) auditory training. *Ear Hear*, 37(4), 381-96. doi: 10.1097/AUD.0000000000000283. PMID: 26901263.

Sehemby, S. (Host). (2020). *Specsavers audiology p.a.c podcast* [Audio podcast].

Shannon, J. (Host). (2020-Present). *Listen up Rockland* [Audio podcast].

<https://www.hudsonaudiology.com/about-us/listen-up-rockland-podcast/>

Sommers, Mitchell S, Tye-Murray, Nancy, Barcroft, Joe, & Spehar, Brent P. (2015). The effects of meaning-based auditory training on behavioral measures of perceptual effort in individuals with impaired hearing. *Seminars in Hearing*, 36(4), 263-272.

Sharp, D. (Host). (2020-Present). *On the ear: An audiology podcast* [Audio podcast].

Spangler, C. (Host). (2020-Present). *Empower ear audiology* [Audio podcast].

Stamp, A. (Host). (2020). *The thick ear* [Audio podcast].

Stewart, C. (2020) *Growth in the number of medical apps downloaded during the COVID-19 pandemic by country in 2020*. Statista.

<https://www.statista.com/statistics/1181413/medical-app-downloads-growth-during-covid-pandemic-by-country/>

Sweetow, R. W., & Palmer, C. V. (2005). Efficacy of individual auditory training in adults: A systematic review of the evidence. *Journal of the American Academy of Audiology*, *16*(7), 494-504. doi: 10.3766/jaaa.16.7.9. PMID: 16295236.

Sweetow, R. W., & Sabes, J. H. (2006). Technologic advances in aural rehabilitation: Applications and innovative methods of service delivery. *Trends in Amplification*, *11*(2), 101-111.

Sweetow, R. W., & Sabes, J. H. (2007). Listening and communication enhancement (LACE). *Seminars in Hearing*, *28*(2), 133-141.

Taddei, S. R. (Host). (2020). *The hearing now podcast* [Audio podcast].

Thompson, B. (Host). (2021-Present). *Pure tinnitus & hearing podcast* [Audio podcast].
<https://puretinnitus.com/>

Truong, M. (Host). (2019-Present). *The hear me out audiology podcast* [Audio podcast].

Trychin, S. (2012). Factors to consider when providing audiological services to people who have hearing loss and their communication partners. *Seminars in Hearing*, *33*(1), 087-096.

Tyler, R. S., & Summerfield, A. Q. (1996). Cochlear implantation: Relationships with research on auditory deprivation and acclimatization. *Ear Hear*, *(3 Suppl)*, 38S-50S. doi: 10.1097/00003446-199617031-00005. PMID: 8807275.

- Vas, V., Akeroyd, M. A., & Hall, D. A. (2017). A data-driven synthesis of research evidence for domains of hearing loss, as reported by adults with hearing loss and their Communication partners. *Trends in Hearing, 21*.
- Vasil, K., Lewis, J., Ray, C., Baxter, J., Bernstein, C., Brew, D., Presley, R., Sydlowski, S., Bosworth, C., Bakke, M., Hume-Johnson, K., Hehl, E., & Moberly, A. (2021). Assessment of reliability and validity of the cochlear implant skills review: A new measure to evaluate cochlear implant users' device skills and knowledge. *American Journal of Audiology, 30*(1), 1-23.
- Vila, P. M., Hulla, T. E., Buchman, C. A., Lieu, J. E. C. (2016). Analysis of outcome domains in adult cochlear implantation: A systematic review. *Otolaryngology–Head and Neck Surgery, 155*(2), 238-245.
- Walsh, S. (2004). Appendix: iPod, therefore I learn. In D. Clark & S. Walsh (Eds.), *iPod-learning* (pp. 23–29). Brighton: Epic Group.
- Wolf, D. M., Lehman, L., Quinlin, R., Zullo, T., & Hoffman, L. (2008). Effect of patient-centered care on patient satisfaction and quality of care. *Journal of Nursing Care Quality, 23*(4):316–321
- World Health Organization. (2001). *International classification of functioning, disability and health:ICF*. Geneva: World Health Organization.