



Transcript of meeting: Saturday, July 20 , 2019

This is an edited version of the transcription projected on the screen during the meeting. The transcriber used the "TypeWell" method synthesizing the essence of the discussion Using advanced abbreviated software. Thus, the following is not necessarily verbatim.

Pam Spencer, Programs Chair: I have the great pleasure of introducing Dr. Douglas Sladen. He is an Assistant Professor in the Department of Communication Sciences and Disorders at Western Washington University. He earned an M.A. in Audiology at Western Washington University in 1994 and completed his Ph.D. in Hearing and Speech Sciences at Vanderbilt University in 2006.

After completing doctoral studies, he was a Research Assistant Professor at Vanderbilt University from 2006 until 2008, and then on faculty at the University of Texas at Austin from 2008 until 2011. Prior to joining Western Washington University, he was the Director of the Mayo Clinic Cochlear Implant Program between 2011 and 2017.

Professor Sladen's research examines the speech perception abilities of children and adults who use cochlear implants. Specifically, his work is focused on the factors that drive performance outcomes among this population. He has a special interest on using cochlear implants to treat hearing loss among children and adults with unilateral hearing loss.

The cochlear implant program at Western offers services to the local community. People who have implants can receive help from Dr. Sladen and his graduate students in the Doctoral Program. That is a great service to Bellingham and the area. He is building a research program in the area of cochlear implants. Dr. Sladen's focus is speech with adults and children with cochlear implants. He has been studying cochlear implants with single sided hearing loss and presented his research findings nationally and internationally.

Welcome!

[Applause]

Dr. Sladen: Thank you so much for having me. I have been here a couple of times and I am impressed by the enthusiasm of this group. The people who come to this group are fantastic and their passion for understanding hearing and hearing loss always impresses me.

I want to talk to you about aural rehabilitation and give my thoughts about how it is changing and emerging treatment options and alternatives for people with hearing loss. We will focus on adults instead of pediatrics today.

These are my disclosures. I have no proprietary interest in any product I am talking about today. I will not benefit financially. I like talking about this because it is my passion. I like talking about aural rehabilitation because it is my passion.

A bit about me. I am Canadian, I am from a small town in BC that is halfway between Vancouver and Calgary. The town was historically known for its production of apples but in recent years the orchards are turning in to vineyards. The Okanagan valley is a premier place for wine production. The interior of BC is very hot in the summer and very dry. The landscape is gently sloping. It produces some very nice wines. There are 72 wineries in the Okanagan valley now. Also, I am not getting a kickback from them either!

The Okanagan is also known for this Ogopogo which is like the Loch Ness monster. I haven't seen it, but a friend of a friend has so it is probably true.

I am married to this fellow here, he is a Professor in Community health at Western Washington University. We have children together. If I look foggy in the face it is because I have these little children and they keep me up!

Today I am going to do a brief review of spoken communication and then talk about aural rehabilitation and give you a bit of history of how aural rehabilitation grew up in the U.S. and where it is heading now in 2019.

You folks are all familiar with the auditory system but for clarity I want to review that sound waves travel down our ear canal, hit our ear drum and it vibrates. This vibration is carried through bones to the inner ear where there are thousands of tiny hair cells that move in response to vibrations. That movement carries information to the auditory nerve which receives it as sound.

If we were to take that inner ear structure and turn it upside right and cut it down the middle, we see the image on the left. That is a cross section of your inner ear. I want to draw your attention to these cells right here. These are called spiral ganglia cells which is the target for electrical hearing for people with cochlear implants. So that becomes important as we talk later.

I am bringing this up because many of you have cochlear implants. With hearing aids, you are targeting the hair cells. Hearing can be damaged by exposure to noise or even medications you have taken or Just aging.

With that I want to make the case that hearing is a passive activity. It is something I do without my own control. As I stand here, I hear Rustling next door, the hum of the projector. I am not doing it on purpose. Processing though is with intention. To process a sound, I must devote cognitive resources to what is happening, decode it and process it as linguistic information.

As you can imagine spoken language communication is a complex activity that requires my attention, my working memory, proficient language skills and a functional auditory system. Off the bat your hearing and hearing loss is not a simple fix. It is not like glasses where we put them on and restore vision. When you put hearing aids on that information needs to be processed by the brain and you need to devote cognitive resources. That all takes effort and energy. I can imagine with hearing loss; at the end of the day you feel pretty fatigued by the effort you spent processing sound.

I really like this model of spoken language communication. For me it captures every element of what is happening in a communication exchange. On the left side you have the speaker. The speaker is the person who is creating the utterance, the message. They must think of the message they want to say, send it to the articulators, then produce that message. That message then must travel through the air to the listener on the right side.

The medium becomes important. The distance between the speaker and listener, how much ambient noise, how much echo in the room. On the listener side we think about who this person is. Are they a native English speaker? Do they have hearing loss? Are they distracted by what is going on? On the listener side there

are arrows going up and going down.

The arrows going up show information going up. If you have hearing loss you might get less information going up. The arrow goes down shows how many cognitive resources are being used to understand that message. The less information you are getting the more cognitive resources you need to understand the message.

I like to think of it this way in this bottom up processing model. The sensory information processing. Then also the top down model. All this together shows how complex understanding spoken language is. Between the listener, the environment and the speaker we have several areas and levels where things can start to fall apart. That can be problematic for people with hearing loss.

On the left side you see a picture of a healthy inner ear. You are seeing the thousands of hair cells that line the inner ear and are responsible to transform sound to the hearing cells. On the right we have a model that was damaged by strong medications. The hair cells are completely missing in some cases. These are completely gone. These are bent over, sometimes fused together. This model would have significant hearing loss.

The same thing happens to us when we are in excessive noise, take certain medications, as we age. This is a good way to show you what can happen on the inside. For this person making sounds louder won't help. The hair cells are so depleted there is nothing up there to stimulate. For this person a cochlear implant is the best response. It will bypass the hair cells and go to the ganglia cells.

Hearing aids can improve hearing speech in ambient noise levels. Ambient noise levels impair our ability to find localized sounds. It can also cause psychosocial deficits. In fact, the impact of hearing loss is profound and severe. It can cause depression, isolation, anger, exhaustion, anxiety, insecurity, despair, negative self-image, inability to relax, loss of group affiliation, paranoia.

For us in the hearing industry it is important to help remediate these things. We do that through treatment and through our aural rehabilitation programs. I think you will find it interesting that aural rehabilitation grew out of the second World War. When the veterans came back, they were facing a lot of hearing loss. As part

of the rehabilitation program all veterans with hearing loss were expected to participate in an eight-week aural rehabilitation program. It was part of the process of being rehabilitated. They all took part.

At the time the hearing aid options were really limited so the program focused on behavioral changes. The participations saw acoustic technicians who would have helped manage the hearing loss with amplification. They saw an auditory instructor who taught them to interpret sounds, a speech correctionist and a staff psychologist along with vocational counselors.

They did this because the options for amplification were limited. You might have ear trumpets and ways to collect sound and send them to your ear. We had early hearing aids. But not the technology we have access to today. What is so surprising about these programs is that they were wildly successful. People who completed this program came out feeling confident with the ability to manage their hearing loss. They were given training on how to alter their environment to hear better. They were given information about communication strategies. They were much more prepared to manage their hearing loss from a behavioral perspective. They were given information on how to understand the limitations of hearing loss and the impact it has on their lives.

Despite the wild success of these programs they started to deplete. We saw a decline of aural rehabilitation in the decades that followed. Hearing technology started to improve. Aural rehabilitation programs started to go down. We started to see these programs relegated to universities or speech and deafness centers.

There was a misconception that hearing aid technology could replace behavioral modifications. There is some truth to that. Hearing aids improve audibility, but you can imagine that it would be difficult for a hearing aid to overcome all the things we have talked about like depression and anxiety and despair and social isolation.

A hearing aid can't do that on its own. We need aural rehabilitation to help people manage their hearing loss.

In the last 15-20 years we started seeing a reemergence of aural rehabilitation. We have a greater need now. We have an aging population. We have a growing

body of literature that shows the benefits of aural rehabilitation. We know that aural rehabilitation is better for patients and families. It is better for the audiologist. It is better for third party payers which is important as we move to an outcome-based model in insurance.

We also have a shift back to a holistic approach for hearing care. Instead of treating the hearing loss through hearing aid or cochlear implants we look at a patient trying to address all the things happening in their lives.

In addition, we see a broadening of aural rehabilitation to help manage the communicative and psychosocial deficits. Aural rehabilitation is looking to address the areas where you are having the biggest problems.

Mark Ross is a famous audiologist with hearing loss. He says that aural rehabilitation is any device, procedure, information, interaction or therapy which lessens the communicative, psychosocial and economic consequences of a hearing loss. That is a broad definition of aural rehabilitation. You can imagine that this process begins when you are diagnosed with hearing loss. The diagnosis, the fitting of hearing aids, the process of learning how to use them, how to use assistive technology, how to use technology in specific environments, communication strategies, how to ask people to rephrase things, teaching you how to know the acoustics of a room. Aural rehabilitation is all of this.

Arthur Boothroyd, Distinguished Professor Emeritus, City University of New York, defined four levels of aural rehabilitation. I go back to these on a regular basis. When constructing an aural rehabilitation, I think of these.

First is sensory management to optimize auditory function. This is fitting hearing aids to your hearing loss and optimizing those for you. Make sure they are doing the job they are supposed to do. How to use assistive technology like remote microphones.

Instruction in the use of technology and control of the listening environment. Modifying the environment to suit your needs. Going to a quieter room or adjusting the acoustics in your home.

Professional counseling to teach you about your hearing loss and managing it.

Perceptual training like auditory training where we do drill work to improve your ear's ability to process new sounds. We do this with people who have cochlear implants on a regular basis or people who are fitted with a new hearing aid. Within these levels of an aural rehabilitation system we find several components. Fitting of hearing aids, fitting of assistive devices, auditory training, communication training, informational counseling.

Rational acceptance counseling which helps management. Psychosocial counseling to address the psychological and social impact, communication training. Working with your spouse to produce clear communication. Speech reading is like lip reading but focuses on facial cues or posture.

Speech language therapy and in-service training where you go to specialized staff to manage hearing loss.

Aural rehabilitation is changing for us. We are seeing an advancement in technology that we couldn't have imagined. Hearing aids are very sophisticated today. You can pair hearing aids to cell phones. You can stream Music from an iPhone to a cochlear implant and/or hearing aid. All sorts of wireless technology can improve hearing over noise.

Technology is changing how we approach aural rehabilitation. We spend more time thinking about how the technology can be harnessed to improve your overall listening function. These tools are powerful. If you aren't using an assistive technology, I encourage you to talk to your audiologist. These are excellent for helping overcome the problems of noise, distance and echos.

We also see a rise of direct to consumer and over the counter hearing aids. These are not new. We have seen ads in hunting magazines for these like the *Whistler 2000* to hear deer from a great distance. But these are rising in popularity. Over the counter hearing aids will come in 2020 likely. These are things you can buy at Costco or Walmart.

This impacts aural rehabilitation. These devices are sold in isolation. There is not a chance for an audiologist to advise you to use them correctly or help them fit your ears. I bring this up to have discussions about what these devices can and can't

do. They might be an effective entry level device for someone who can't afford other hearing aids, but they come with very limited abilities to restore audibility.

There is one good study that informs our use of direct to consumer hearing aids. This was done by Larry Humes, Distinguished Professor in the Department of Speech and Hearing Sciences, Indiana University. I like this study because it was so well designed. It was a double blind placebo controlled study.

(Ed. Note: A double-blind study design means that neither the experimenters nor the subjects know which subjects are in the "test group" and which are in the "control group".)

One group got over the counter hearing aid and the other got hearing aids custom fit by an audiologist. Both groups got better but the group that got theirs from the audiologist improved more than the group that did not. So, there is a benefit to over the counter hearing aids but they are not as good as ones fitted by an audiologist. Audiologists are trained to help improve the results of the hearing aid.

Cochlear implants: a lot of you have them. I am thrilled at that. That is my overreaching goal in my career, to inform people about the benefits. They were misunderstood for a long time. They were also misused. We didn't understand how to use the technology to its full potential. Now people are doing amazingly well. The devices have improved as well. The first processors were large and looked like an old cell phone that you held on your belt. Now they are small devices that look like small hearing aids.

The reasons cochlear implants are successful are technology has improved and we are implanting better candidates. People who have had hearing and lost it are fantastic candidates. People who are not good candidates are those who were born deaf and grew up using sign language.

One reason that implants are successful is because of neural plasticity which is how our brain makes sense of new information and how the brain responds to the absence and appearance of new information. We are thinking about synapses here. A synapse is a transmission of energy from one neuron to another. As that synapse occurs in a specific pattern time and time again that becomes strong and effective. Having input to the ear from a young age makes these strong and robust.

A good example of how our brain responds to synopsis can be seen from work by Michael Merzenich, Professor Emeritus Neuroscientist, University of California, San Francisco. Dr. Merzenich looked at the brain of a monkey and looked at the Use of digits. Certain areas of the brain respond to the Use of certain digits. On animals where a digit was removed you see there was representation of digits and the one that was removed was no longer there. The territory of that digit has been taken over by the other digits. The same is true in hearing loss.

In complete deafness we see that area of the brain taken over by vision. With a cochlear implant we can reclaim some territory but not completely. That is why it is important to implant people who have had hearing and lost it or children who are very young.

We think of two levels here. One is the primary plasticity. That occurs with the onset of hearing loss. My brain starts changing in its response to sound. It is no longer getting that sound.

The secondary plasticity occurs with the restoration of sound. I am fitted with hearing aids or cochlear implants so my brain can reclaim that landscape and Use it for processing sound. It is important to get implantation at the right time. If you go without stimulation for a long time you lose key spiral ganglia cells. If you look at the density of those cells, we see that over time the density goes down. The ear is not being stimulated.

Once we receive a cochlear implant then the number of ganglia cells is maintained. Over here we have an increase of cell density. So, what we know about cochlear implants is they preserve the cell structure and keep our auditory plasticity high because they preserve those spiral ganglia cells.

I mentioned the changing face of aural rehabilitation. The necessity for us is to shift our gears and adapt new technology in a way that is benefiting the end User. We provide these technologies because they work so well. The best device on the market is this Roger Pen. It is so good because the microphone technology is spectacular. It can be Used in most hearing devices. You can couple it to cochlear implants and hearing aids using some coupling fashion.

No matter which device you use you have options for a remote microphone, a device to stream from phone to ear, a device from television to ear and remote controls.

What are we looking at now with adult aural rehabilitation? With the fitting of hearing aid and cochlear implants we see a direct link between the number of hours you use the device and your outcomes in speech perception. This is important because many times hearing aids get put in the drawer or cochlear implants don't sound perfect and processors get taken off. I want to encourage you to wear your devices as many waking hours as you can. Put them on in the morning and take them off when you go to bed.

There are aural rehabilitation programs for anyone no matter who you are and where you live. The key to building a good program is figuring out a good capacity for the person doing the program. If you have limited mobility, we can help you get self-directed in the home environment. You can do this with many tools. The one I like the best is called speech tracking which is an exercise where you use a finger to track what is read.

The reason this is so powerful is that our literacy is based on our knowledge of sound. The adage we hear as kids is "sounding it out." Knowing what sounds are and the meaning of sounds is called phonology, your phonological ability. This is necessary for reading. As you speak a sound out loud and read at the same time, you give the brain a reference to understand it. By using this technique, you can drive up the ability to process the sound on a target ear.

There are several computer-based programs. If you are a computer person you can download programs to do auditory training. There is one called *Clear Ear* that is a program out of University of Washington, and another called *Angel Sound* that tracks your performance.

There are several apps for smart phones and tablets. The one I like well is called *Ear Coach* because it keeps track of your performance and the words change regularly so it won't be monotonous.

There are center based aural rehabilitation programs. If you don't want to do it at home, you can come to the center. I also want to talk about telehealth.

This is one of the most exciting parts of aural rehabilitation. Telehealth is not a new form of service. We have had visions and elements for several decades. This can be simple like me emailing your physician some records and exchange information electronically. This could also be a CAT scan and sending it.

Recently we have been Using Video Chat. This is a perfect fit for aural rehabilitation programs. We don't have to see your ear to do aural rehabilitation. We can do this over a video screen. What is so lovely about this is that people who are home bound or live in rural areas have access to care that they didn't have access to before. You can access high end providers you wouldn't have been able to see in the past.

If you have limited connectivity at home or not a strong internet program it might be difficult to maintain a synchronous telehealth program. But if you want to do aural rehabilitation and can't get to a center but you want it clinician directed this could be a good fit for you. The outcomes here have been spectacular. People are reporting improved quality of life, improved hearing, improved satisfaction. I like this from a sustainability and cost efficiency side. If you can stay home to do health care, we decrease the resources we use. You aren't driving. You aren't spending money on travel or parking. It's a good use of your time and a good use of clinicians' time.

There are several telehealth aural rehabilitation programs across the US. We don't have it at Western Washington University yet but keep your ears open because it is coming.

I want to give a bit of time towards Western Washington University's services. We started a Doctor of Audiology Program a couple years ago which is feeding our clinical services. People who have cochlear implants can come for testing, for outcome testing, for aural rehabilitation. This can be done individually or in a group. We have been doing an eight-week program but are switching to a four-week program. We will do that for people who are newly fitted with hearing aids or cochlear implants to serve both populations.

Most of what we do is geared towards providing a service to the community and providing students an ability to learn the skills to be fully functional clinicians when they leave our program.

My program is aimed at people with hearing loss. If you have hearing aids or a cochlear implant and want to do research, please visit us or contact me directly to learn more.

I want to say acknowledge that the negatives of hearing loss go beyond sensitivity and acuity and can be very profound. I want to empower everyone to look at their lives and see how hearing loss has affected them.

Aural rehabilitation is gaining momentum again because of advances in technology and because we have a necessity to treat the whole patient. Aural rehabilitation improves satisfaction with devices and overall health and quality of life. If you haven't done an aural rehabilitation yet you should do this because the outcomes are fantastic.

Also, aural rehabilitation programs are available to anyone. Don't rule this out if you have specific needs. We can always find a way to provide these programs. With that I will end and take any questions you have.

Vicki: You talked about hair cells dying and spiral ganglia. Two issues. How do you determine which for someone with hearing loss?

Dr. Sladen: There is no test to do to tell us how many hair cells are gone or how many cells are surviving. We can glimpse that by testing speech processing. Otherwise there is no way to predict how many you have left. We can also get a glimpse with hearing history. People with meningitis have a low number of ganglia cells.

This is opposed to people who have noise induced loss which causes a loss of hair cells. Good question!

Charlene: In contrast, I decry the lack of awareness of hearing loss in our world. People seem to believe that a word spoken is a word heard which it is not. Do you have any information or encouragement to think that hearing loss might be addressed as a health concern in the U.S.? We are so isolated culturally.

Dr. Sladen: I am not sure if you are familiar with the U.S. based initiative of

Healthy People 2050. It is listed as a top health concern by Americans. It is growing at a grass roots level, on a national level, on a governmental level.

Larry: I want to make a comment and question. I have gone through this Aural Rehabilitation Program and it is incredibly useful. I am more than happy to talk about it with anyone. Charlene and George and Jerry are involved. Several of us have been through this.

My question is if there is any movement relative to reimbursement for aural rehabilitation? That seems to be a roadblock. It is hard for audiologists to get paid for this service.

Dr. Sladen: That is a great question. I don't know of anything promising or encouraging regarding reimbursement. At this point insurance companies see this as done by a speech pathologist who can be reimbursed but audiologists can't. We try to work this into other services we can bill for.

Robert: In terms of individual aural rehabilitation programs at Western Washington University, would you be able to build a program that doesn't involve technology and lip reading?

Dr. Sladen: Yes absolutely. We can build a program outside of technology. I love the question because it drives home that aural rehabilitation is not a cookbook approach. It is not one size fits all. It is hard to build a program that serves all people. In the group here we find people with vision loss or mobility issues or cognitive issues. Lots of variance in what this looks like. We can build a program using nonverbal cues and communication strategy. Absolutely.

Joyce: Do you have advocacy in your program? Advocating for the self in certain situations and in the workplace?

Dr. Sladen: Yes absolutely. One of our common programs is confidence. How much do you have as you go into different environments. Also, what kind of communicator are you? Are you passive? Are you assertive? Do you step in to ask about hearing more and asking for rephrasing? Are you aggressive? Do you get angry when you don't understand? Those communication profiles change how to be effective in self advocacy.

The ADA requires institutions to accommodate people. If people want to pursue workplace advocacy, we refer them to people who are specialists in ADA.

Larry: Thank you very much! We have a shopping bag for you! We appreciate your time and all you do for the community. It is so wonderful and such a great resource