

**20th Annual CAA 2017 Conference and Exhibition Program
Delta Hotels Ottawa City Centre**

Wednesday, October 11, 2017	
5:30 pm – 7:00 pm Panorama & Pinnacle	Opening Reception
Thursday, October 12, 2017	
8:00 am – 6:00 pm Grand Salon Foyer	Conference Registration
9:00 am – 10:30 am Opening Keynote Grand Salon	Edward Deci <i>Promoting Optimal Motivation for Healthy Living</i>
10:30 am – 10:45 am Grand Salon Foyer	Break, and Networking Opportunities
10:45 am – 11:45 am	Concurrent Sessions
TA1 Chaudiere	John Greer Clark <i>Hearing Unspoken Words: A Gateway to Trust</i>
TA2 Capitale	Erin Picou <i>CSI Audiology: Investigating Television Listening for Patients with Hearing Loss</i>
TA3 Panorama	Douglas Brungart <i>Acoustic and Non-Acoustic Factors Influencing Speech Intelligibility in Real-World Environments</i>
11:45 am – 12:45 pm	Concurrent Sessions
TA4 Capitale	Kathy Pichora-Fuller <i>The Framework for Understanding Effortful Listening (FUEL): Connecting Hearing, Cognition, Motivation and Social Factors</i>
TA5 Panorama	Steve Aiken <i>In Search of Hidden Hearing Loss — Evidence and Diagnosis</i>
TA6 Chaudiere	Amy Amlani <i>Are Direct-to-Consumer Devices a Threat to Traditional Hearing Aids?</i>
12:45 pm – 1:00 pm Grand Salon Foyer	Members AGM Registration
1:00 pm – 2:30 pm Grand Salon	Presidents Lunch and AGM
2:30 pm – 3:30 pm	Concurrent Sessions
TP1 Panorama	Joseph Montano <i>Narratives in Patient-Centered Audiologic Care</i>
TP2 Capitale	Harvey Abrams <i>The Relationship Between Hearing Loss and Chronic Health Conditions: What's the Evidence?</i>
TP3 Chaudiere	Jill Firszt <i>Update on Asymmetric and Unilateral Hearing Loss Studies: Current Results and Future Considerations</i>
3:30 pm – 4:30 pm	Concurrent Sessions
TP4 Panorama	Nicole Marrone <i>The Community-Engaged Audiologist: Expanding Our Reach</i>
TP5 Capitale	Devin McCaslin <i>The Association Between Hearing Loss and Vestibular Disorders and the Role of the Audiologist</i>
TP6 Chaudiere	Harvey Abrams <i>Computer-Based Auditory Training: It's Convenient and Affordable - But Does It Work?</i>
4:30 pm – 5:30 pm International Ballroom Foyer	Poster Presentations and Student Poster Evaluations
5:00 pm – 7:00 pm International Ballroom and Foyer	Exhibitor Reception & Silent Auction
Friday, October 13, 2017	
8:00 am – 6:00 pm Grand Ballroom Foyer	Conference Registration
9:00 am – 10:00 am Grand Ballroom	Chris Plack <i>Hidden Hearing Loss in Humans</i>
10:00 am – 2:00 pm International Ballroom and Foyer	Exhibit Hall and Silent Auction
10:00 am – 2:00 pm International Ballroom Foyer	Posters

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Friday, October 13, 2017	Continued
10:00 am – 11:00 am International Ballroom Foyer	Poster Presentations and Student Poster Evaluations
10:00 am – 10:15 am International Ballroom and Foyer	Refreshment Break
12:00 pm – 1:00 pm International Ballroom and Foyer	Lunch in the Exhibit Hall
1:40 pm – 2:00 pm International Ballroom and Foyer	Exhibitor Draws
2:00 pm – 3:00 pm	Concurrent Sessions
FP1 Richelieu	<i>Erin Picou</i> <i>The Potential Benefits and Limitations of Hearing Aid Microphone Technologies for Adults and Children</i>
FP2 Capitale	<i>Susan Small</i> <i>Infant Assessment Using the Auditory Brainstem Response and Auditory Steady State-Response: Updates for Clinical Practice</i>
FP3 Chaudiere	<i>Samantha Lewis</i> <i>Auditory Considerations for Individuals with Multiple Sclerosis</i>
3:00 pm – 3:15 pm Grand Salon Foyer	Refreshment Break
3:15 pm – 4:15 pm	Concurrent Sessions
FP4 Capitale	<i>Podium Sessions</i>
FP5 Chaudiere	<i>Nicole Marrone</i> <i>Group Audiologic Rehabilitation for Adults with Hearing Loss and Communication Partners</i>
FP6 Richelieu	<i>Josh Alexander</i> <i>Nonlinear Frequency Compression - What's In and Out</i>
4:15 pm – 5:15 pm	Concurrent Sessions
FP7 Chaudiere	<i>Podium Session</i>
FP8 Capitale	<i>Amyl Amlani</i> <i>Factors Disrupting Uptake of Audiological Services and Technology</i>
FP9 Richelieu	<i>Michael Chrostowski</i> <i>Treating Tinnitus: Where Do We Stand?</i>
6:00 pm Panorama Reception & Grand Salon Dinner	CAA 20 th Anniversary Gala
Saturday, October 14, 2017	
8:00 am – 12:00 pm Grand Salon Foyer	Conference Registration
8:50 am – 9:00 am Grand Salon	Poster Award Presentation
9:00 am – 10:00 am Grand Salon	<i>Francois Julita</i> <i>The Role of the Internet in Audiology Care Management</i>
10:00 am – 10:15 am Grand Salon Foyer	Morning Break and Networking Opportunity
10:15 am – 11:15 am	Concurrent Sessions
SA1 Chaudiere	<i>Sheila Moodie</i> <i>Family-Centred Early Intervention: Supporting a Call to Action</i>
SA2 Capitale	<i>Larry Roberts</i> <i>The Neuroscience of Tinnitus From Cochlea to Brain</i>
11:15 am – 12:15 pm	Concurrent Sessions
SA3 Capitale	<i>Nicholas Reed</i> <i>Direct to Consumer Amplification Products and Hearing Aids: A Comparative Analysis</i>
SA4 Chaudiere	<i>Ryan McCreery</i> <i>Raising the Bar for Children Who Wear Hearing Aids: Improving Clinical Outcomes</i>

Podium Session I – Innovation in Patient Delivery & Amplification

Presenter	Presentation Title
Andreas Seelisch	Clinicians' perspectives on patients' resistance to amplification
Bill Hodgetts	Don't fade into the background: A randomized trial exploring the effects of message framing in audiology
Pam Millett	Using the CIRCLE model to address hearing loss in Nunavut school children
Jacynthe Bigras	The relationship between auditory processing capacities and functional listening challenges in Franco-Ontarian children with learning difficulties
Marilyn Reed	Toronto HEARS: A new service delivery model for older adults with untreated hearing loss
Sarah Downing	Bimodal ear to ear audio streaming: Speech understanding advantages in complex listening situations

Clinicians' perspectives on patients' resistance to amplification

Andreas Seelisch¹ and Jeff Crukley^{2,3}

1. Hearing Solutions, Toronto, ON
2. Starkey Hearing Technologies, Eden Prairie, MN
3. Department of Speech Language Pathology, University of Toronto, Toronto, ON

Objectives: This study explored reasons for patients' delay or decline of recommended amplification through the perspective of clinicians.

Background: Despite documented risk factors associated with untreated hearing loss, delays in hearing instrument acceptance are lengthy and hearing instrument penetration rates remain low, especially when compared to incidence rates. More research is required to support clinicians in working with patients to address their hesitations and support their decision-making experiences. A better understanding of factors involved may support patient centered care, clinician training or even promote earlier acceptance of hearing instruments.

Methods: This retrospective study included a sample of 3464 patients seen by 19 clinicians for hearing assessment where some degree of hearing impairment was detected but hearing instrument uptake did not take place immediately following assessment. Clinicians were asked to document the reason they thought a patient did not pursue hearing instruments at the time of the appointment.

Results: Results indicate that "consulting with significant others" and "cost" were two of the most common reasons for delaying or preventing recommended treatment. Patients being "Happy with current devices", requiring additional time to "think about it" and being in "denial" were the next most common. These 5 factors accounted for 70% of the responses.

Conclusions: Our results reinforce the importance of including significant others in the decision-making process and having family members present at assessment appointments. Consistent with previous research, our results also demonstrate that cost remains a significant barrier to hearing instrument uptake.

Don't Fade Into the Background: A randomized trial exploring the effects of message framing in audiology

Hodgetts, W.E.^{1,2}, Ostevik, A.V.¹, Aalto, D.¹ and Cummine, J.¹

¹ University of Province, Faculty of Rehabilitation, Edmonton, AB

² University of Institution, National Centre for Hearing, Toronto, ON

Objective(s): To determine whether the attitudes and beliefs about seeking or recommending hearing services differs as a function of the type of message presented.

Background: Eighty percent of people who might benefit from hearing aids do not use them. There are many potential reasons for this, including how we frame messages (advertisements) about hearing help and services.

Methods: We surveyed 769 adults (>18 years old) about their attitudes and beliefs around hearing loss and hearing aids. Individuals were randomly assigned to 1 of 4 messaging conditions: inclusionary, fact-based, exclusionary, and dissonant.

Results: Overall, there was a clear preference for the fact-based (average effect size = 0.52) and exclusionary messages (average effect size = 0.48) over the inclusionary message and the dissonant message. The dissonant message was considered to be neutral (subjects neither liked nor disliked it). In general, when considering hearing health, individuals would be more likely to seek or recommend services when presented with either a fact-based or exclusionary message compared to an inclusionary message.

Conclusions: How we frame messages in audiology may have a substantial impact on the attitudes and beliefs around seeking or recommending hearing services. The results of this research help inform audiologists and other healthcare professionals about methods of framing messages regarding hearing services for those individuals who need, but have not yet sought, hearing help.

Using the CIRCLE model to address hearing loss in Nunavut school children

Pam Millett, PhD¹, Lynne McCurdy, AuD²

¹ York University, Toronto, ON

² Wellington Hearing Care, Guelph, ON

The high prevalence of hearing loss in Indigenous communities has been well documented for many years, particularly in the pediatric population, where acute and chronic otitis media, and noise exposure results in alarmingly high prevalence rates of conductive, sensorineural and mixed hearing loss. There have been several initiatives to address hearing loss in Canada's Inuit peoples over the past 40 years, which have been generally unsustainable. The Better Hearing in Education for Northern Youth project (www.bheny.ca) is a collaborative initiative by audiologists, educators and community groups to address hearing loss in Inuit school children by implementing sound field amplification technology in classrooms with support for sustainability, providing professional development, training and support for educators, improving audiology services and engaging parents and the community by providing information to support the needs of children with hearing loss. In order to be effective and sustainable, however, these initiatives need to fit into (rather than being superimposed onto) Inuit culture, values and educational principles. Chino & DeBruyn (2006) describe the CIRCLE Model (Community Involvement to Renew Commitment, Leadership, and Effectiveness) as an approach to community capacity building and community empowerment to address health care disparities and challenges in Indigenous communities. The CIRCLE is "...a 4-step, cyclical, iterative process and philosophy for program design and community development for indigenous people. The CIRCLE incorporates Western concepts of community capacity building and parallels the values of community-based participatory research." This presentation will describe how the Bheny project has used the principles of the CIRCLE Model to address acceptance and sustainability, including challenges and successes.

The relationship between auditory processing capacities and functional listening challenges in Franco-Ontarian children with learning difficulties

For CAA 2017 Conference Abstract

Jacynthe Bigras¹, Josée Lagacé¹

¹ University of Ottawa, Faculty of Health Sciences, Ottawa ON

Objective:

The aim of this study is to examine the relationship between auditory processing capacities and specific listening challenges in Franco-Ontarian children with listening and learning difficulties.

Background:

Children who have auditory processing difficulties form a heterogeneous population. Many have a history of learning disabilities such as dyslexia or a language development delay. In fact, children are often seen for an auditory processing evaluation for reasons other than hearing difficulties. Audiologists complete an auditory processing test battery with these children in order to evaluate which auditory mechanisms show a deficit and recommend accommodations to manage the listening difficulties. Often, the recommendations are based solely on the results of the auditory processing test battery and the case history. However, for the same audiometric results, different listening challenges can arise and at different degrees of difficulty. It is therefore essential to evaluate children's own perception of their difficulties and which situations are the most challenging for them.

Methods:

Data will be collected from the records of Franco-Ontarian children from 7 to 12 years old who were identified with auditory processing difficulties at the Interprofessional Rehabilitation Clinic. Results obtained from the auditory processing test battery will be compared to the answers provided by the children on the Listening Inventory for Education (Revised) questionnaire.

Results and Conclusions:

Results and conclusions will be presented.

Toronto HEARS: A new service delivery model for older adults with untreated hearing loss

Marilyn Reed¹, Kate Dupuis², Sara Mamo³, Jagger Smith¹, Frank Lin⁴ and Carrie Nieman⁴

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2 Sheridan Centre for Elder Research, Sheridan College, Oakville, ON

3 University of Massachusetts Amherst, Amherst, MA USA

4 Johns Hopkins University, Baltimore, Maryland USA

Objective(s): To study the feasibility of Toronto HEARS, a new community-based model of hearing healthcare to reach underserved older adults, developed at Johns Hopkins University.

Background: Hearing loss is highly prevalent amongst older adults and is often associated with declines in cognitive, physical and mental health. Despite this, hearing loss goes largely untreated. The Toronto HEARS project was designed to overcome many of the barriers to obtaining hearing help by delivering an accessible and affordable community-based education and counselling program tailored to older adults, combined with an optional low cost amplification device.

Methods: The Toronto HEARS program was offered to clients of three community center senior day programs in low income areas of Toronto. All participants had at least mild hearing loss, were not currently using hearing aids, and scored above 21/30 on the Montreal Cognitive Assessment. A Communicative Disorders Assistant worked with each participant to identify communication goals, provide education (ideally along with a communication partner) regarding better hearing and communication skills, and (optional) assist them in choosing between two low cost over-the-counter hearing devices. Participants were oriented to the device using materials tailored to their communication needs. Specific outcomes of the intervention related to communication ability, social participation, and quality of life.

Results: Of 42 older adults screened to date, 13 were eligible to participate in the program. At the one-month follow-up, the majority of participants who had completed the program reported that it was considerably worthwhile, and showed 'quite a lot' of improvement in their prioritized difficult communication situation (as measured by the IOI-AI).

Conclusions: Participants found the program beneficial, reporting improved communication and self-efficacy in using the HEARS strategies, even if they did not purchase a device. We continue to recruit participants to examine the benefits of this program for older adults with untreated hearing loss.

Bimodal ear to ear audio streaming: speech understanding advantages in complex listening situations for CAA 2017 Conference Abstract

Sarah Downing, M.S., CCC-A¹, Emily Cardenas, Au.D., CCC-A¹, and Smita Agrawal, PhD¹

¹Advanced Bionics, LLC, Valencia, CA.

Objectives: To assess the benefit of two applications of ear-to-ear audio streaming (StereoZoom and ZoomControl) in adult bimodal listeners.

Background: Unilateral cochlear implant (CI) benefit can be enhanced by adding a hearing aid (HA) to the contralateral ear, termed bimodal hearing. With the Phonak Naída™ Link hearing aid, unilateral users of an Advanced Bionics (AB) Naída CI Q70 or Q90 have the opportunity to benefit from Binaural VoiceStream Technology™. ZoomControl streams audio input from the device on the side of a target talker to the contralateral device and attenuates the audio input from the contralateral device by 12 dB. StereoZoom creates a third-order directional beamforming system by wirelessly connecting the four microphones across the Naída CI Q90 processor and the Naída Link hearing aid. These features of Binaural VoiceStream Technology™ could improve speech understanding in noisy environments, and in situations where the target speaker may not be ideally located.

Methods: 19 adult bimodal participants with a Naída CI Q90 processor in one ear and a Naída Link hearing aid in the contralateral ear participated in the study. Speech understanding was evaluated using AzBio sentences (60 dB C) in cafeteria noise. An $S_0N_{\pm 60, \pm 90, 180}$ speaker configuration was used for assessing the effectiveness of StereoZoom. ZoomControl was assessed with speech on the HA side and noise from the CI side ($S_{HA}N_{CI}$). Bimodal benefit was also measured in both study set-ups by switching off the HA.

Results: Activation of StereoZoom led to a mean 21% improvement in speech scores in noise ($p < 0.0001$). ZoomControl use improved speech scores by 28% ($p < 0.0001$). Additionally, significant bimodal benefit was measured in both test set-ups (21% and 33% respectively, $p < 0.0001$).

Conclusions: Ear-to-ear audio streaming can allow bimodal listeners to take advantage of enhanced directional capability and focused listening, thereby improving speech understanding and ease of listening in challenging listening situations.

Podium Session II – Central Auditory Processing & Cognition

Presenter	Presentation Title
Flora Nassrallah	Understanding the effects of mild bilateral and unilateral hearing loss on children in the early school years
François Bergeron	Auditory perception assessment in real world environments
Robert Harrison	Central auditory changes in SNHL
Jeff Crukley	Cognitive screening: Does age, hearing loss, or amplification matter?
Jeff Crukley	Does cognitive capacity predict listening effort? A study using consumer-grade equipment
Simone Dunbar-Nesbeth & Don Luong Nguyen	A study about speech auditory brainstem responses and digits-In-noise recognition measures

Understanding the effects of mild bilateral and unilateral hearing loss on children in the early school years

Flora Nassrallah^{1,2}, Elizabeth M. Fitzpatrick^{1,2}, JoAnne Whittingham², Huidan Sun², and Eunjung Na^{1,2}

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² Children's Hospital of Eastern Ontario Research Institute, Ottawa, ON

Objective: The objective of this work was to quantify the impact of mild/moderate bilateral, or unilateral hearing loss on auditory, communication, early literacy and academic skills in early school-aged children and to compare their results to those expected from hearing children.

Background: Recent epidemiologic data shows that less severe degrees of hearing loss account for a substantial amount of childhood hearing disorders. According to population-based prevalence data more than 40% of children are diagnosed with mild/unilateral hearing loss. Prior to newborn hearing screening, this degree of loss was not identified until early school age. While studies highlight the burden of children with late-identified mild/unilateral hearing loss, little is known about the effects of early identification of milder forms of hearing loss.

Methods: A total of 32 children, age 5 to 9, from three Ontario regions took part in this study. Children underwent assessments from a battery of speech (GFTA) and language (PPVT, WIAT, CTOPP, CELF) measures. Parents also completed questionnaires related to functional auditory (PEACH) and social (SSIS) skills.

Results: Assessment of speech and language skills showed that most outcomes are within normal range (± 1 SD) when compared to expected scores for hearing children. However, a larger number of participants obtained scores below average on phonological processing skills. In particular, 13 (40.6%) children were below one standard deviation on the phonological memory subtest. Parent reported auditory skills were lower than average in most cases and social skills were generally within the range of hearing peers. A subgroup comparison between unilateral and bilateral cases showed no difference in tests scores between these groups on all outcomes.

Conclusions: Preliminary analyses indicated that overall children with mild/moderate bilateral or unilateral loss are slightly delayed in reading-related phonological processing skills. Findings reinforce the need for additional research on this population of children.

Auditory perception assessment in real world environments.

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²Université de Montpellier, France

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Objective(s): Improvement in auditory perception is a major objective of therapeutic interventions for the hearing impaired. Numerous tests are proposed to guide these interventions and assess their benefits. Optimally, these tests should explore complex abilities such as those encountered by hearing impaired persons in their daily life. Thus, many contemporary tests are designed on sentence recognition against a speech spectrum noise. While sentences appear as a realistic daily stimulus, one can argue that a speech spectrum noise issued from fixed sources with variable or arbitrarily predetermined signal to noise ratios can be far from what people experience in real life. Yet, it is possible to create more realistic test environments. The Immersion 360 system proposes a virtual environment that can reproduce in clinic any everyday sound experience and thus, support a more realistic testing condition to assess auditory perception. This project aimed to specify the psychometrics of this system and define norms for speech perception for French speaking normal-hearing people.

Methods: Thirty young adults with normal hearing were assessed in Canada and in France with the French adaptation of AzBio in 9 virtual environments (car, garage, cafeteria, restaurant, ball game in a gymnasium, race training in a gymnasium, kindergarten, road traffic, street traffic). Presentation and signal to noise levels were set at the levels measured on the recording sites.

Results: Descriptive analysis specify the average, variance and confidence intervals at 95% for each test condition of the Immersion 360 system. Normative data are derived from these metrics.

Conclusions: A new test based on auditory virtual environments is now available to assess speech perception in realistic testing conditions. Future work will incorporate visual information to support a full audio-visual assessment of daily handicapping situations for hearing impaired patients.

Central auditory changes in SNHL

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Summary

It is almost impossible to clearly distinguish cochlear versus more central hearing disorders. It is important to appreciate the very intimate links between cochlear function and central auditory mechanisms. What do we mean when we talk about an auditory processing disorder? How can we distinguish what component deficits are central versus peripheral? It is common to make a designation of a 'central auditory processing disorder' or to consider ANSD to be a mainly 'central' problem. However, it is likely that many cases have, dominantly, a peripheral cause. Perhaps it is time to rethink how we define different types of sensorineural hearing loss, or at least move away from any classification based on site of lesion.

Take home Messages

- Cochlear hearing loss causes changes to central auditory pathways.
- Peripheral lesions can alter the wiring patterns in the central auditory system.
- Cochlear hearing loss of any aetiology will be accompanied by some degree of central neural degeneration.
- It is difficult to clearly distinguish sound processing deficits at the cochlear level from central auditory processing disorders.

Cognitive screening: does age, hearing loss, or amplification matter?

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Objectives: We evaluated the relationships between Montreal Cognitive Assessment (MoCA; Nasreddine et al., 2005) scores and age, hearing loss, and hearing aid use. Our hypotheses were that higher age and hearing thresholds would be associated with lower MoCA scores; and that aided MoCA scores would be higher than unaided MoCA scores.

Background: Data from epidemiological studies suggest cognitive decline and hearing loss often co-exist (Lin et al., 2013; Dawes et al., 2015). Of particular importance to audiology is the potential confound of hearing loss on cognitive assessment. Individuals with hearing loss may fail cognitive screening due to difficulty hearing verbal instructions rather than due to the presence of an actual cognitive impairment (Dupuis et al., 2015; Jorgensen, Palmer, Pratt, Erickson, & Moncrieff, 2016). The MoCA is a common screening tool; however, it relies on verbal instructions. We sought to evaluate the impact of improved audibility, through hearing aid use, on MoCA scores.

Methods: 32 experienced hearing aid users (mean age: 68.4 years) completed the MoCA with and without hearing aids at two separate sessions. Hierarchical models of MoCA scores were constructed with age, hearing thresholds, and aided vs unaided test administration as predictors.

Results: MoCA scores were significantly correlated with both age and hearing thresholds. However, there was no significant effect of age, hearing thresholds, or hearing aid use on MoCA scores. There was no significant difference between aided and unaided MoCA scores.

Conclusions: Our data suggest use of amplification may not confound MoCA scores, under optimal test conditions. Future research could investigate how to utilize screening results in clinical practice.

Does cognitive capacity predict listening effort? A study using consumer-grade equipment

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²Department of Speech Language Pathology, University of Toronto, Toronto, ON

³Psychology, Neuroscience and Behaviour, McMaster University, Canada

Objectives: We investigated the relationships between individuals' working memory capacity (WMC) and listening effort (LE). Our specific research aims were to:

1. Determine if we could collect physiological data to measure LE with consumer-grade equipment.
2. Investigate the effect of individual WMC on measures of LE.
3. Investigate the relationships between measures of LE.

Background: LE refers to the attentional and cognitive resources required to understand speech and has been measured using self-report, secondary task performance, autonomic nervous system responses, and electroencephalographic (EEG) recordings (for review, see McGarrigle et al., 2014). The Ease of Language Understanding model (ELU; Rönnerberg et al., 2013) predicts that individuals with larger WMC will expend less LE in challenging situations. In this study, we evaluated the ELU model's LE hypothesis across several measures of LE.

Methods: 28 undergraduate students with normal hearing participated. Participants' WMC was assessed with the Reading Span Test (RST; Daneman & Carpenter, 1980). We then assessed participants' LE during a speech recognition in noise task, using both high- and low-predictability sentences and two masking signals (babble and speech-shaped noise). LE was assessed with a combination of self-report, secondary task performance, and physiological data, specifically pupillometry and EEG measured with consumer-grade equipment.

Results: We were able to collect physiological LE data using consumer-grade equipment. There were significant correlations between WMC, speech recognition scores, secondary task performance, and pupil dilation. EEG recordings indicated a significant interaction between WMC and sentence predictability. There were significant correlations between speech recognition scores, secondary task performance, and pupil dilation.

Conclusions: Our data provide support for the ELU hypothesis that WMC may mediate LE. However, the nature of the relationship was dependent on the specific measure of LE. The results of the correlational analyses may indicate that different measures of LE tap into different aspects of effort.

A Study About Speech Auditory Brainstem Responses And Digits-In-Noise Recognition Measures

Simone Dunbar-Nesbeth, Don Luong Nguyen, Amineh Koravand and Josée Lagacé
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Objective: The aim of the study is to investigate a possible correlation between speech auditory brainstem responses and the performance on a digits-in-noise recognition task in normal hearing adults.

Background: Difficulty understanding speech in noisy conditions is the most common reason for consultations in audiology. It is possible to measure speech recognition abilities in noise with behavioral measures, but the underlying cause of speech in noise difficulties cannot always be unequivocally identified by these methods.

Studies combining electrophysiological and behavioral measures have been conducted to understand the neural underlying mechanisms involved during speech perception. It is assumed that accurate speech perception is dependent on efficient neural encoding of the auditory stimuli. As such, if a deficit is present in the neural encoding of the stimuli, this should be observable in both electrophysiological and behavioral measures. Although there is some evidence that behavioral speech recognition in noise performance can be predicted by electrophysiological measures, the experimental paradigms that have been used to obtain these evidence are still not clinically viable.

Methods: Sixty bilingual French-English speaking adults participated in this study and were divided into three groups according to their self-rated degree of proficiency in French. Behavioral measures included a digit-triplets-in-noise task, followed by speech-evoked ABR measures, with and without a competitive noise.

Results: Interpretations about the relationship between brainstem function and speech recognition in noise performance will be presented.

Conclusions: This study contributes to a better understanding of the brainstem responses as a quantifiable measure of the neural encoding of speech sounds while taking into account language proficiency. It is hoped that by knowing the underlying cause of the speech in noise deficits, audiologists should be able to provide efficient treatments.

Poster Session – Student Competition - includes abstracts

Presenter	Presentation Title
David Sindrey	Hear On: Parent video intervention to Increase hearing aid use in infants with hearing loss
Ekanayake Wemml	Development of a sinhala dichotic digits test to assess binaural integration and separation abilities in normal hearing young adults
Eunjung Na	Parents' preferences for services for children with mild bilateral and unilateral hearing loss: A conjoint analysis
Eunjung Na	Cochlear implantation in children with residual hearing
Jonathan Vaisberg	Electroacoustic correlates of subjective sound quality for hearing aid processed music
Kendra Di Bacco	Exploring the self-regulatory behaviors of elementary students with hearing loss in inclusive classrooms
Leticia Vicente	Cortical auditory responses in children with sequential bilateral cochlear implants
Maxime Maheu	Test-retest characteristics of cVEMP and oVEMP measures
Maxime Maheu	Vestibular and postural evaluations to reduce risk of falls following cochlear implant surgery
P.G.S. Madushani	Auditory effects among 18-45 year old workers of a textile plant in Sri Lanka
Sangamanatha Ankmnal Veeranna	Analysis of auditory brainstem responses in children with auditory processing disorder
Stephanie Monette	Acoustics of French-English Bilingual Infant-Directed Speech (IDS)
R.A.I.A. Subasinghe	Hearing status and noise exposure levels of workers at a washing plant in Dankotuwa, Sri Lanka
Matthew Urichuk	Effect of electrode montage on speech-evoked envelope following responses
Viviane Grandpierre	Barriers and facilitators to cultural competence in early hearing loss services: A qualitative analysis

Effect of stimulus level and carrier on speech-evoked envelope following responses (EFRs)

Adrienne L. Harrison¹, Vijayalakshmi Easwar^{1,2}, Susan Scollie^{1,2}, David W. Purcell^{1,2}

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Objectives: Outcome measures are an essential part of the hearing aid fitting process. Infants with hearing loss are identified and fit with hearing aids at younger ages due to newborn screening programs. Behavioural outcome measures that are typically used to verify audibility in hearing aid users cannot be applied to young infants; therefore, objective outcome measures are utilized.

Background: Previous studies propose objective test paradigms based on speech-evoked envelope-following responses (EFRs) elicited by the naturally spoken stimulus /susafi/. The stimulus contains low, mid and high frequency information that is essential for speech processing. /Susafi/ elicits EFRs across eight carriers: modified /u/, /a/, and /i/ vowels record two simultaneous EFRs from the spectral F1 and F2+ formant regions; and amplitude-modulated fricatives /f/ and /s/. Results indicate EFR is sensitive to stimulus level changes.

Methods: The current study aims to determine the lowest sound pressure level that can elicit EFRs, and to determine which carriers provide the most significant and distinct responses. Single-channel electroencephalograms were recorded in normal hearing adults during the repeated presentation of /susafi/. EFRs were recorded at 20, 35, 50, and 65dB SPL, across the carriers. Behavioural thresholds of the eight carrier stimuli were also recorded.

Results: A significant effect of stimulus level on number of EFR detections exists, as well as a positive relationship with response amplitude. /f/ and /s/ carriers elicited the most significant responses, followed by /a/ F2 and /u/ F1.

Conclusion: The purpose of the experiment was to determine the validity of the EFR paradigm as an objective outcome measure of audibility. The EFR paradigm is sensitive to changes in audibility, in terms of the number of EFR detections and response amplitude, and is in general agreement with behavioural thresholds. The EFR paradigm needs to be tested further on hearing impaired and infant target populations.

Intuition and algorithms: Cognitive errors in clinical reasoning

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In this short scoping review, we investigated factors that commonly underlie poor clinical reasoning within the context of a dual-process model of cognition. The vast majority of misdiagnoses do not spring from ineptitude or a dearth of knowledge, but rather are a result of one or more cognitive errors, over 100 of which have been identified and associated with clinical decision making. We highlight and describe a few of the more common cognitive errors providing examples, as well as strategies and interventions which have been demonstrated as being effective in mitigating such errors and thus improving clinical reasoning. Much of the literature we reviewed examined clinical reasoning as pertaining to physicians and nurses, and we have made several suggestions for ways to apply this knowledge to the field of audiology.

Hear On: Parent Video Intervention to Increase Hearing Aid Use in Infants with Hearing Loss

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Objective(s): To develop an evidence based intervention designed to persuade, educate, and train both carers to increase hearing aid wear time for infants with hearing loss.

Background: To maximize benefit, hearing aids need to be worn “all waking hours”, which remains a goal for most parents of children with permanent hearing loss under the age of 2. A need was identified for an intervention which would increase malleable factors in parents contributing to hearing aid use.

Methods: 1. Scoping review of the literature regarding parent use of hearing aids for their young children with hearing loss (birth to age 2). 2. Scoping review of literature regarding behaviour change theories. 3. Choice of most appropriate behaviour change model and use of this model with stakeholder input and feedback to generate an evidence based intervention.

Results: Facilitators and Barriers to hearing aid use were identified and an intervention plan was developed, guided by the Behaviour Change Wheel, the Theoretical Domains Framework and the Behaviour Change Techniques Taxonomy. Twelve videos are planned to be used, one per week, from initial ABR diagnosis throughout hearing aid fitting and two months beyond.

Conclusions: Theory based behaviour change approaches help comprehensive planning in intervention design.

References: Michie, S., Atkins, L., & West, R. (2014). The behaviour change wheel: A guide to designing interventions. London: Silverback Publishing.

Development of a Sinhala Dichotic Digits Test to assess Binaural Integration and Separation Abilities in Normal Hearing Young Adults.

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Objectives

1. To develop a Dichotic Digit Test (DDT) in Sinhala language.
2. To establish cut-off scores for Sinhala speaking young adults.
3. To determine inter-aural dichotic performance difference within the normative data.
4. To compare scores between males and females.

Background: DDT is a test of dichotic listening and it is made up of several digits presented to both ears simultaneously. The DDT assess binaural integration and binaural separation abilities when performed in free recall and directed recall test conditions.

Methods: Three sets of 25 single pair digits were recorded using 6 bisyllabic Sinhala digits. The DDT was performed under free recall, directed right and directed left listening conditions. A sample of 148 right-handed normal hearing young adults aged 20 to 28 years were tested to establish cut-off scores, ear differences, gender differences and differences in listening conditions in performances. 20 participants were used for the pilot study and 128 were included in the main study.

Results: The cut-off scores for the DDT were 91.64% in the right and 85.96% in the left for free recall and 69.15% in the right ear and 68.75% in the left ear for directed recall listening condition. The right ear scores were significantly higher than the left ear scores ($p < .05$) in the free recall listening condition, re-establishing the phenomena of right ear advantage. Interestingly, ear differences were not significant ($p > .05$) in the directed recall. Gender differences were not noted for either of the listening conditions. Free recall scores were significantly higher than the directed recall scores ($p < .05$) bilaterally.

Conclusion: Normative cut-offs were obtained for Sinhala DDT. The test appears to be a feasible assessment tool in assessing binaural integration and separation abilities of Sri Lankan young adults.

Parents' Preferences for Services for Children with Mild Bilateral and Unilateral Hearing Loss: A Conjoint Analysis

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Objective: The objective of this paper was to examine parents' preferences for various attributes of service following diagnosis of mild bilateral/unilateral hearing loss.

Background: Newborn hearing screening permits early diagnosis and intervention for children with hearing loss. Children with mild hearing loss, who were typically identified by school age, are now early identified. While literature exists on parents' experiences, and clinical outcomes of children with mild hearing loss, uncertainty remains about how to deliver services to this population.

Methods: A cross-sectional conjoint analysis was conducted with parents of children with mild bilateral/unilateral loss to determine their preferences related to service models. Participants were drawn from an ongoing project investigating communication outcomes in early-identified children with mild bilateral/unilateral loss. Families were recruited in three Ontario regions who met the following inclusion criteria: (a) chronological age under five years at enrolment, (b) permanent mild bilateral/unilateral loss identified by age three. Parents completed a questionnaire in which they selected their preferred service from eight clinical scenarios with various service options.

Results: A total of 51 questionnaires were returned. All eight scenarios were completed for each questionnaire. The coefficient for all attributes in the regression model were significant at the $p < .01$ level, except for the type of support for speech-language development. Specifically, the results for each attribute showed that these parents preferred a service model that included: 1) regular visits to the clinic for support with amplification, 2) therapy sessions at clinic or at home, 3) emotional support at the clinic, and 4) warm and supportive professional communication.

Conclusions: Conjoint analysis is an effective technique to qualify parents' perspectives of clinical services for children with mild bilateral/unilateral hearing loss. Parents' preferences provided insights into the components of a service model that are valued and that providers should consider when providing services for these children.

Cochlear Implantation in Children with Residual Hearing

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Objective: The purpose of this study was to examine the characteristics of children with CI whose hearing was better than audiometric criteria.

Background: The benefits of CIs for children with residual hearing in the severe range result in a better prognosis for spoken language than for those who continue to use HAs. However, decision-making can be challenging for parents who are confronted with a CI decision. Therefore, an understanding of parents' needs for decisional support of this children is necessary. As a first step to support parents, we undertook a study to better understand the characteristics of children who received CI outside audiometric candidacy criteria.

Methods: This study involved a retrospective analysis of clinical data at the CHEO CI program for all children implanted from 1993 to 2016. Inclusion criteria were pre-operative PTA \leq 90dB HL in at least one ear. Audiological information, and documented reasons affecting CI were extracted.

Results: A total of 364 children underwent surgery. Of these, 76 (20.9%) had residual hearing in at least one ear. The median age of CI was 4.3 years, and the median preoperative PTA was 88.0 dB HL. Of 76, 72.4% had documented progressive hearing loss, 46.1% showed sloping in at least one ear, 34.2% had asymmetrical, and 14.5% had fluctuating thresholds. The major reason of delayed CI candidacy assessment was insufficient hearing levels for CI (38.2%). Decisions to proceed with CI were primarily related to deterioration in hearing levels (53.9%) and to limited benefit from hearing aids (18.4%) and speech/ language delays (18.4%).

Conclusions: In this population-based study, 20.9% of implanted children had usable residual hearing in at least one ear. The primary reason for delaying CI candidacy assessment was degree of hearing loss at diagnosis. The major reasons for proceeding with later CI intervention was related to progressive hearing loss.

Electroacoustic correlates of subjective sound quality for hearing aid processed music

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Objective(s): This study compares hearing impaired listeners' sound quality ratings of hearing aid processed music between several premier hearing aids and the hearing aids' universal and music programs. This study also strives to identify electroacoustic parameters associated with changes in subjective sound quality.

Background: Listening to music is an enjoyable aspect of many people's lives. However, facilitating music listening in hearing aid wearers is not fully understood, and making music enjoyable through hearing aids can be challenging. Hearing aids are often thought of as devices which improve speech perception rather than other complex sounds such as music. Music can be broader and more variable than speech in the intensity and frequency domains. As a result, hearing aids optimized for speech may not amplify music as effectively. Manufacturers often include dedicated music programs in their products. However, a music program's electroacoustic behaviour is not always transparent, and its efficacy improving music sound quality is often left unmeasured. Sound quality differences between hearing aids and programs, and electroacoustic correlates which drive those differences, are therefore of interest to academics, clinicians, and manufacturers.

Methods: Hearing impaired listeners rated the sound quality of music samples recorded via the universal and music programs of five hearing aids. Recordings were individualized using each hearing aid's proprietary fitting formula. Recordings were analyzed using various electroacoustic measurements.

Results: Sound quality differences were most apparent between hearing aids. A music program improved ratings for two hearing aids, although the magnitude of improvement was less than the difference between a high- versus low-rated hearing aid. Electroacoustic correlates are currently being analyzed.

Conclusions: Optimal music sound quality appears to be a question of hearing aid selection, rather than music program selection. However, it is possible that measurable electroacoustic adjustments may be related to music sound quality, which may inform clinical fine-tuning.

Exploring the Self-Regulatory Behaviors of Elementary Students with Hearing Loss in Inclusive Classrooms

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Objective(s): To explore the relationship relationships among students' hearing loss, academic achievement and self-regulation (SR), classroom background noise levels, teachers' perceptions of inclusion of students who are hard of hearing (HH) and features of classroom instruction that support SR.

Background : To date, very little research has attended to studying SR in children with hearing loss, yet research indicates that strong self-regulatory skills are needed for success in and outside of the classroom.

Methods: An exploratory, mixed-method and multi level research design was employed using data from 10 teachers on 131 students, 8 of who had a hearing loss.

Results: Results indicated that a) hearing status predicted SR, b) SR predicted academic achievement for normal hearing (NH) and hard of hearing (HH) students, c) HH students' received lower SR ratings than NH peers, and d) classroom background noise levels were negatively related to the use of features of instruction to support SR and to teachers' knowledge and understanding of hearing loss.

Conclusions: These results highlight the importance for further teacher education to emphasize a) the effects of hearing loss on learning and SR, b) the influence of classroom background noise levels on HH and NH students' success, and c) effective strategies for creating an inclusive classroom.

Cortical auditory responses in children with sequential bilateral cochlear implants

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Objective: To evaluate cortical auditory asymmetries within the first year of sequential bilateral cochlear implantation.

Background: Multi-channel evoked potential recordings have shown that the lack of appropriate stimulation in the opposite ear of unilateral cochlear implant users leads to abnormal cortical development which may not be reversed by adding a second cochlear implant.

Methods: Cortical responses were recorded in 19 children who were first implanted by 3 years of age and received a second implant in their opposite ear 4.95 ± 2.56 years later. Responses were evoked by the speech stimulus /da/ presented in free field in both the unilateral and bilateral conditions at the time of the second implant activation and then after 3, 6 and 12 months of bilateral implant use. The active electrode was placed at Cz and referenced to the opposite mastoid of the stimulated implant and at Oz for the bilateral condition. Eye-blinks were monitored in a second channel. Individual cortical responses obtained for the three conditions (first, second and bilateral cochlear implants) were plotted against each other. Areas of difference between the waveforms were calculated from 45-200ms and 200-350ms latency for each recording time point.

Results: Large differences were initially present between the two unilaterally evoked responses. Over time, no changes were found at 45-200ms and significant decreases at 200-350ms latency were restricted to the first 3 months, leaving a significant difference at 1 year. The bilateral response was initially more similar to the response to the first implant as shown by a significant area differences at 45-200ms latency. This difference decreased slightly over time but remained significant at 1 year.

Conclusions: Limited effects of the second cochlear implant in children receiving bilateral cochlear implants sequentially were revealed in a one-channel montage by persistent cortical asymmetries over one year of bilateral implant use.

Test-retest characteristics of cVEMP and oVEMP measures

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Objective(s): Evaluate test-retest reliability of cVEMP and oVEMP in adults between 20 to 60 years old.

Background: The use of cVEMP and oVEMP to assess the saccule and the utricle is increasing in audiology practice. However, up to now, data is sparse as to test-retest reliability, which could be crucial when it comes to monitoring pathologies in patients. Moreover, aging has been suggested to influence cVEMP and oVEMP amplitude, which could also influence data.

Methods: We evaluated 15 participants between 20 and 60 years old using cVEMP and oVEMP at baseline and 5 days later. We retrieved amplitude (P1-N1), asymmetry ratio, P1 and N1 latencies for both cVEMP and oVEMP. cVEMP was performed using EMG control device and amplitude and asymmetry ratio were assessed both with or without pre-stimulus rectification. Inter-class correlation using a two-way random model with absolute agreement and average measures was used to analyze test-retest reliability.

Results: The test re-test reliability of both raw and rectified P1-N1 amplitudes of the cervical VEMP are excellent (respectively ICC: 0.936 and ICC: 0.932). The asymmetry ratio both raw and rectified showed a poor reliability (respectively ICC: -0.08 and ICC: 0.095). The test-retest reliability of N1-P1 amplitude and asymmetry ratio of the ocular VEMP are excellent (respectively ICC: 0.973 and 0.892). No significant correlation has been found between age and cVEMP or oVEMP characteristics.

Conclusions: The results from our study suggest that both rectified and raw amplitudes from cVEMP recordings and amplitude and asymmetry ratio for oVEMP recordings could be use for test-retest analysis in this population. However, caution is needed when it comes to cVEMP raw and rectified asymmetry ratios. Finally, our results suggest no significant effect of age on cVEMP and oVEMP between 20 and 60 years of age.

Vestibular and postural evaluations to reduce risk of falls following cochlear implant surgery

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Objective: The goal of the present study was to investigate the impact of unilateral cochlear implantation on postural control in relation to the vestibular status before CI surgery.

Background : Cochlear implant is a device that can partially restore hearing in severe hearing impaired patients. Unfortunately, it also represents a relevant risk for structural damage to the vestibular receptors of the implanted ear and risk of falls post-surgery. To our knowledge, very few studies investigated the complete vestibular function and postural control longitudinally in relation to cochlear implant surgery.

Methods: We recruited 17 participants (four CI candidates and 13 hearing controls) and performed complete vestibular evaluation (cVEMP, oVEMP, vHIT) and postural evaluation using a force platform, prior and following unilateral cochlear implant surgery.

Results: Our study suggests that an increase in postural sway following cochlear implant was present only for the participants that received the implant in the ear with the better vestibular function. cVEMP and oVEMP measures in the implanted ear prior to unilateral cochlear implantation may help to predict postural control performance following surgery.

Conclusion: A thorough evaluation of the vestibular function, as described in the present study, could not only be helpful to make a more accurate prognosis of the risks of fall following cochlear implantation, but also to provide proper vestibular rehabilitation for at-risk patients.

Auditory effects among 18-45 year old workers of a textile plant in Sri Lanka.

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Objectives: To determine auditory effects among textile workers and to establish associations between the degree of hearing loss and exposure duration, degree of hearing loss and noise level and the proportion of hearing related complaints.

Background: Noise is one of the most common physical hazards in industrial settings. The prevalence of NIHL is on the rise with the increase in duration of exposure and the increase in the severity of hearing loss.

Methods: A cross sectional descriptive study using purposive sampling method was carried out. An interviewer administered questionnaire and DPOAE hearing screening on 127 (72 female and 55 male) textile workers of the selected textile plant in Seeduwa, Sri Lanka was done (Age: $M= 31.16$, $SD=7.75$). Noise measurements were done in six sections of the factory and average noise levels were obtained. Diagnostic hearing evaluations were done for 60 (57.75%) subjects, who referred from the DPOAE hearing screening test.

Results: The degree of hearing loss and the exposure duration has a significant association in the high frequency region of 4 kHz to 8 kHz ($p < 0.05$). Noise levels fluctuate between 90.3 ± 0.8 dBA and 50.6 ± 0.52 dBA. 30.83% of workers having NIHL. Most of the workers (33.9%) complained difficulty in conversation in noisy backgrounds. Other complaints as tinnitus, dizziness, ear fullness and headache were reported in less than 30%.

Conclusion: Textile workers who were exposed to noise for more than 15 years were affected with NIHL (Permanent Threshold Shift) in the high frequency region. Administrative controls and engineering controls need to be implemented to manage hazardous noise levels in industrial settings. Hearing Conservation Programs should be initiated and implemented for textile workers.

ANALYSIS OF AUDITORY BRAINSTEM RESPONSES IN CHILDREN WITH AUDITORY PROCESSING DISORDER

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Objective: To investigate the auditory brainstem neural integrity in children suspected of having auditory processing disorder (sAPD).

Background: ASHA recommends including electrophysiological measures in an APD assessment battery but few audiologists do so, possibly because of limited published evidence for its utility. This study expands on previous work showing that some children with sAPD have measurable physiologic deficits at lower levels of the auditory system.

Methods: ABRs were recorded at 80 dB nHL (13.3 and 57.7 clicks/sec) from 20 adults, 22 typically developing children and 108 children sAPD. The ABRs were analyzed using traditional clinical measures [absolute latencies (I, III and V), interwave intervals (I-III and III-V) and a shift in wave V latency with an increase in stimulation rate] and using a model proposed by Ponton et al (1996) that offered a more detailed analysis of axonal conduction time (I-II and III-IV interwave intervals) and synaptic transmission (II-III and IV-V interwave intervals).

Results: There were no significant differences between TD children and adults. Some children sAPD showed clinically significant delays in absolute latencies, interwave intervals and significant rate dependent shifts. Examination of responses delineating axonal vs synaptic transmission showed frequent delays in synaptic factors and fewer instances of delays in axonal conduction for children sAPD.

Conclusion: The ABR analysis examining responses for axonal and synaptic delays revealed more children with brainstem anomalies and offered greater insight into underlying mechanisms. This study provided evidence of a synaptic pattern of abnormalities in a significant portion of children sAPD. Synaptic delays may originate in the first auditory synapse (wave I) suggesting abnormal cochlear functioning in these children. Such observations could provide objective evidence of factors potentially contributing to listening difficulties that are frequently reported in these children. Results provide supportive evidence for the value of click-evoked ABRs in comprehensive APD assessment batteries.

Acoustics of French-English Bilingual Infant-Directed Speech (IDS)

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Background: Early bilinguals strive to maintain language-specific phonemic categories, but may also merge categories to decrease processing load (MacLeod & Stoel-Gammon, 2005). Infant-directed speech is the type of speech infants hear most. Do early Canadian French-English bilinguals produce monolingual-like vowels and consonants, in the context of IDS?

Objective(s): The present study focused on the comparison of read IDS produced by French-English bilingual and English monolingual parents of 5 to 10 month-old infants. We also investigated the interaction between L1 and L2, when L1 is acquired simultaneously or before the age of five.

Methods: English monolingual (n=7) and early French-English bilingual (n=7) mothers were asked to read a picture book containing target phonemes /b/, /p/, /a/, /i/ and /u/ to their infants (M_{Age} = 8.2 months). Vowel formants and Voice Onset Time were analyzed using PRAAT (Boersma & Weenink, 2002).

Results: French-English bilinguals produced native-like sounds for all but French voiced bilabial stop. In addition, there were no significant differences in bilinguals' French and English productions. Bilinguals produced the second formant of /i/ with more variability when speaking English than when speaking French.

Conclusions: Our results are in line with Flege's Speech Learning Model (Flege, 1995): bilinguals cannot completely separate their two phonetic systems. Furthermore, age of acquisition, environment and language use may consist of contributing factors in producing monolingual-like speech.

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Hearing status & noise exposure levels of workers at a washing plant in Dankotuwa, Sri Lanka.

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Objectives: To determine the noise levels the workers are exposed to during their shifts, to evaluate hearing related complaints and audiometric measures of the workers, determine the association between the job category and the hearing status and determine the association between the exposure duration and hearing status.

Background: Among the worldwide adult population with disabling hearing loss, 16% were found to be associated with occupational noise (Nelson, Nelson, Concha-Barrientos, & Fingerhut, 2005).

Methods: The study included 107 male and female workers between 20 and 50 years engaged in different job categories. Purposive sampling method was used to recruit participants. Study tools were Sound Level Meter, Interviewer-administered questionnaire, the hearing screening test and the diagnostic hearing tests (Pure Tone Audiometry, Speech Audiometry, Immittance Audiometry otoacoustic emission testing).

Results: Noise levels within the plant were found to be between 69.9 and 100.3 dB (A). Among washing plant workers, 43 (40.18%) were found with abnormal audiograms. Among those who had abnormal audiograms, 34 (31.77%) had NIHL in right ear and 30 (28.03%) in the left ear. 37 (34.57%) workers were suggestive of noise-induced hearing loss.

Conclusions: The washing plant is a hazardous place for hearing health, thus preventive measures, such as hearing conservation programs must be adopted.

Effect of electrode montage on speech-evoked envelope following responses

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Objective(s): This study aimed to investigate the effect of electrode montage choice on speech-evoked Envelope Following Responses (EFRs).

Background: Evoked potentials in infants are commonly recorded using a non-inverting forehead midline electrode, an inverting ipsilateral mastoid electrode, and a contralateral forehead ground electrode (infant montage). Whereas EFRs in adults are often recorded using a non-inverting Cz electrode, an invertinginion electrode, and a ground collarbone electrode (adult montage). A difference in electrode montage may affect response and noise amplitudes, and have clinical implications for EFR detection. A suboptimal electrode montage may decrease efficacy and accuracy of EFR responses while an optimal montage may enhance detection.

Methods: Twenty normal hearing adults participated in this study after passing a hearing screening at 15 dB HL. The stimulus used to evoke the EFRs was a male-spoken token /susashi/. Phonemes were modified to elicit 8 individual EFRs – six from the vowels and two from the fricatives. The vowels were altered to elicit two EFRs simultaneously by lowering the fundamental frequency (f₀) of the vowels' first formant relative to the f₀ of the second formant. The /susashi/ stimulus was presented in opposite polarities for 450 sweeps (30 minutes) in each montage. The order of electrode montage and test ear was randomly selected.

Results: Response amplitude did not vary by montage used, however, noise amplitude was higher in the infant montage than in the adult montage by a mean difference of +4.29nV (SD = 9.80nV). Response amplitude and noise varied significantly by carrier but the interaction with electrode montage was non-significant. The infant montage had 1-3 fewer detected responses across all carriers except in /u/ F2 where response detection was the same across montages.

Conclusions: Electrode montage choice could affect noise amplitude marginally. Further analysis will explore possible causes for change in detection rates by montage.

Barriers and facilitators to cultural competence in early hearing loss services: A qualitative analysis

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Background: Increasing diversity in Canada has direct implications for early hearing loss services (EHLS). Efforts to improve cultural competence in EHLS should be informed by evidence on how cultural differences can affect services, however there is limited empirical research in this area.

Objective: The objective of this study was to explore practitioners' experiences with providing services to minority culture families.

Method: A qualitative research design with the use of semi-structured interviews was used to gain insight into practitioner perceptions of barriers and facilitators to the provision of culturally competent care.

Results: A total of 19 practitioners participated in this study. Three themes emerged from the interview data: characteristics of a culturally competent practitioner, barriers to service provision, and facilitators to service provision.

Conclusion: This is the first study to contribute to research on culturally competent care in early hearing loss services. Practitioners encountered barriers throughout the process of service delivery with language barriers affecting every stage however, they were also able to mitigate many of these challenges. The findings will hopefully inspire future investigators to contribute to a research field that has received little attention.

Poster Sessions – Non-Student Competition – includes abstracts

Presenter	Presentation Title
Bill Hodgetts	This test is really hard: Altering hearing performance in noise with just a few words
Danielle Glista	The Ling 6(HL) v2.0 Test: Corrections for listening condition and clinical case examples
Dumini de Silva	Socio-demographic and hearing aid related factors that influence use of hearing aids
Karin Bork	Occurrence and types of childhood permanent hearing loss after early complex cardiac surgery
Farhad Forouharmajd	Human hearing system, noise-induced hearing loss and ear protectors
Olawale Ogundiran	Congenital deafness being poorly managed: A case series of three sets of twins in a state secondary school for persons with special needs in nigeria
Dumini de Silva	Disease-specific health related quality of life in senior citizens with hearing loss living in Colombo, Sri Lanka
Victoria Milloy	Using auditory brainstem responses for gap in noise detection: A comparison of methods
Matthew Bromwich	Reducing hospital audiology waitlist using semi-automated tablet audiometry – A pilot study
Zahra Jafari	The adverse effects of auditory stress on mouse uterus receptivity and behaviour
François Bergeron	Development and normalisation of an international French version of the AzBio sentence test
Gabriel Lagos Riveros	Diagnostic functionality and psychometric properties of the HINTS protocol: A review
Héloïse Lessard-Dostie	The performance of adults With hearing loss on the <i>Test De Mots Dans le Bruit</i>
Josée Lagacé	The effects of bilingualism on the <i>Canadian Digit Triplet Test</i> in adult population
Mona A. El-Kady	Expression of inflammatory markers, ICAM1, IL1 β and TNF- α in cochlear hair cells treated by interferon- α
Ryan Kalef	A Canadian evaluation of real life satisfaction of hearing aids with direct connectivity
Sarah Downing	Evaluation of a wireless contralateral routing of signal system for unilateral cochlear implant recipients
Sheue Lih Chong	Third party hearing disability at pre-and post-hearing aid provision
Sheue Lih Chong	Onward referral of adults with hearing loss seen in a community-based mobile hearing clinic: Comparison of referral recommendation made by audiologists
Victoria Milloy	Using mismatch negativity event-related potentials for gap in noise detection: Applications for clinical research

This Test is Really Hard: Altering Hearing Performance in Noise with Just a Few Words

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Objective(s): Does the manipulation of expected difficulty of a test alter hearing performance in noise for normal hearing listeners?

Background: In many ways, the audiological performance and preference for certain devices or settings can be altered by the expectations and biases that both the patient and the clinician bring into the context of clinical care. In this experiment, we sought to determine if changing a few words in the instructions impacts a sensitive hearing measure.

Methods: Subjects were given one of two envelopes that described the Hearing in Noise Test (HINT) they were about to complete. The instructions were identical with one small change: in one set of instructions the subject was told “The test that you are about to complete is very easy for people with normal hearing like you” and in the other set of instructions they were told that “The test that you are about to complete is very difficult even for people with normal hearing like you.”

The experimenters were blinded to which set of instructions was given. We predicted that participants given the “this test is really hard” instruction would try harder and perform better on the HINT. At the end of the experiment participants were asked to make a mark on a visual analogue scale (VAS) indicating how difficult they thought the test was.

Results: A mean difference of 0.52 dB SNR ($t_{(47)} = 2.013$, $p < 0.025$; Cohen's $d = 0.5$) was found in the direction that we predicted (lower HINT scores indicate better performance). This difference in HINT *performance* was present even in the absence of differences in *perceived task difficulty* on the VAS. In other words, both groups thought the test was equally difficult, but their actual performance differed.

Conclusions: Performance on a sensitive audiological outcome measure can be altered by simply changing a few words in how the test was introduced.

The Adverse Effects of Auditory Stress on Mouse Uterus Receptivity and Behaviour

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Objective: This study aimed to examine the effect of two types of gestational stress on uterus receptivity and behavioural performance in mice.

Background: Stress during gestation has harmful effects on pregnancy outcome and can lead to spontaneous abortion. Few studies, however, have addressed the impact of gestational stress, particularly auditory stress, on behavioural performance and pregnancy outcome in rodents and human.

Methods: Pregnant C57BL/6 mice were randomly assigned to either auditory or physical stress conditions or a control condition from gestational days 12-16. The auditory stress regimen used loud 3000 Hz tone, while the physical stressor consisted of restraint and exposure to an elevated platform. Three behavioural tests were performed in the dams after weaning. Uterine receptivity was investigated by counting the number of sites of implantation and fetal resorption. Also, the offspring survival rates during the early postnatal period were calculated.

Results: Auditory stress caused an increase in anxiety-like behaviour, reduced time spent exploring new object/environment, and reduced balance when compared to the physical stress and control groups. Auditory stress also caused higher rates of resorbed embryos and reduction of litter size.

Conclusions: Our results suggest that the adverse effect of noise stress is stronger than physical stress for both uterus receptivity and behavioural performance of the dams.

The Ling 6(HL) v2.0 Test: Corrections for Listening Condition and Clinical Case Examples

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Background: The aided audiogram is a common clinical tool used to evaluate listener performance with amplification. Aided threshold measures are easy to perform and require minimal testing time. There are several known disadvantages to standard procedures used in measuring aided pure-tone thresholds with modern hearing aids, including the use of non-speech stimuli and a lack of standardized sound field calibration. The Ling 6(HL) Test is a modified aided threshold measure that tests hearing threshold levels for pre-recorded speech stimuli, incorporating sound field stimulus calibration in dB HL. Possible applications include the evaluation of performance in aided-unaided conditions, across different aided conditions and with different types of amplification devices.

Objective(s): The purpose of this study is to expand the clinical utility of the Ling 6(HL) Test, beyond that of the originally developed testing set-up, to include scoring guides for common clinical listening conditions: Sound field testing at 0° and 90° azimuths and for testing with ER-3A foam-tip insert earphones.

Methods: Normative data was collected for 20 normally hearing adult listeners in a sound booth, across the listening conditions of interest and with v2.0 of the Ling 6(HL) Test.

Results: Threshold values differed across listening conditions, resulting in the development of stimulus-specific correction values per specified test set-up. Scoring and interpretation guides were developed accordingly and have been applied to amplification case studies demonstrating the clinical utility of the test across devices and amplification conditions.

Conclusions: The Ling 6(HL) v2.0 Test is available as a measure of speech sound detection ability for the sounds /m/, /u/, /a/, /i/, /j/ and /s/. Normative data collected extends use and scoring ability to include sound field threshold testing for set-ups including, standard, visual reinforcement audiometry (VRA) and conditioned play audiometry (CPA), as well as for testing with insert earphones.

Development and normalisation of an international French version of the AzBio sentence test.

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Objective(s): The AzBio was developed to (1) provide an unbiased evaluation of individuals with extensive exposure to traditional sentence materials, (2) allow for evaluation of performance in a large number of conditions, (3) create lists of sentences with similar levels of difficulty for within-subject comparisons, and (4) provide an estimate of performance that was consistent with the patient's perception of their performance in everyday listening environments (Spahr et al., 2012). Since its introduction, the AzBio has largely been diffused among English speaking cochlear implant teams, especially because of the high complexity of the material that prevents the ceiling effect observed with the use of common clinical materials when assessing contemporary devices. This project aims to develop and normalise an international French version of the test.

Methods: Similarly to the original version, the initial French AzBio sentence corpus includes 1000 sentences based on up-to-date, adult topics and current social ideas. The corpus was generated through inputs from collaborators from different regions of France and Canada; the final list constitutes a consensus on the familiarity of the lexicon in all regions. This corpus was recorded with two female and two male talkers known for their intelligibility despite any regional accent. The final test construction process followed the same steps used for the original test, that is 1) the mean intelligibility rating for each sentence was estimated by processing each sentence through a five-channel CI simulation and calculating the mean percent correct score achieved by 15 normal-hearing listeners, 2) sentences from each talker were sorted by percent correct score, and 165 sentences were selected from each talker and then sequentially assigned to 33 lists, each containing 20 sentences (5 sentences from each talker), and 3) list equivalency was validated by presenting all lists, in random order, to 30 normal hearing users and 30 hearing impaired persons. Normal-hearing and hearing impaired listeners were recruited in equal numbers in France and Canada.

Results: The results of the validation study with normal hearing participants and hearing impaired users will be presented. The content of the final equivalent lists will be shared.

Conclusions: The project expands the AzBio access to international audiological clinics, supporting the assessment of French speaking patients while offering a common cross cultural evaluation standard.

Diagnostic functionality and psychometric properties of the HINTS protocol: a review

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Background: Acute vestibular syndrome presents characteristic symptomatology of a peripheral vestibular alteration, however, in some cases it presents etiology of central origin.

Objective: To describe the diagnostic utility and psychometric properties of the HINTS protocol in the differential diagnosis of acute vestibular syndrome.

Methods: Narrative review with a qualitative approach. Out of a total of 46 texts, 4 original articles were selected, extracted from specialized health databases, filtering according to key words verified in Descriptor in Health Sciences and Medical Subject Headings. Two search strategies were used: ((HINTS) AND (AND) (AND) and ((head)) AND (nystagmus) AND (test skew) AND (HINTS). Subsequently a critical reading was applied with the CASPe guides and they were given level of evidence and degree of recommendation according to NICE guide.

Results: 100% of the texts belong to original articles of which 75% were published between the years 2013 and 2016. According to the NICE guide, 75% of the articles were cataloged with a level of evidence type II and degree of Recommendation B and 25% type III, with degree of recommendation C. 100% of the articles showed that the specificity of the HINTS fluctuated between 84.4% and 96%, while the sensitivity varied between 88% and 100% compared to magnetic resonance imaging (the gold standard), whose sensitivity reached 86.7%.

Conclusions: HINTS is a fast and inexpensive exploratory method capable of performing a reliable topographic diagnosis between an acute peripheral vestibular syndrome versus a central vestibular syndrome in subjects with a presence or risk of stroke. This according to its high sensitivity and specificity in contrast to MRI. For this reason the disclosure of the protocol is recommended to serve the emergency services as a supplementary examination to the income evaluation.

Socio-demographic and hearing aid related factors that influence use of hearing aids.

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Objective: This study aimed to find out the Hearing Aid (HA) usage, and the related factors that influence the usage among the HA owners in Sri Lanka.

Background: Hearing loss is an increasingly important public health problem. Even though HAs are the primary rehabilitation option, the majority of adults with hearing loss who obtain HAs do not use it.

Method: Total 115 HA owners in an age range from 18 to 80 years were recruited. Information on demographic and audiological details was obtained through a questionnaire after obtaining the participant's consent. Information on participants' audiological details and HAs were obtained from the study settings (government hospitals and HA dispensing private clinics).

Results: A significant association was found between of HA provider (government/ private), family encouragement, ability to manipulate the HA, perceived handicap, and previous HA usage with whether or not the participant is a continuous user of HA/s.

Poor quality of sound, disturbance in noisy situations, side effects, can hear without the HA were found as most common reasons for dissatisfaction reported by the HA users and poor sound quality, can hear without the device, broken device and not getting the ear mould made were the reasons for giving up the HA by non-users.

Conclusion: People were more likely to continue using their HA when it is obtained from a private clinic, in presence of family encouragement, skilled in manipulating HA, previous HA usage and when the person perceives to be handicapped without the HA. Broken device, poor sound quality, able to hear without the device, and not getting the ear mould made were the most common reasons for giving up on HAs. Poor quality of sound was the most common problem of the HA.

The Performance Of Adults With Hearing Loss On The *Test De Mots Dans le Bruit*
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Objective: The goal of this presentation is to present the preliminary results obtained in a study aiming at the examination of the performance of adults with hearing loss at the *Test de Mots dans le Bruit* (TMB; Lagacé, 2010).

Background: Over the past 20 years, many speech-in-noise tests were developed to get a better assessment of individual's hearing ability in real-life situations. The TMB is a words in noise test that includes four lists of 35 monosyllabic French words presented with a competing babble noise. Normative data are available for adults and children with normal hearing thresholds, but no information is available about the performance of population with hearing loss.

Methods: Pure tone audiometry (PTA) and speech reception threshold in noise (SRT) were collected from 17 French-speaking adults ranging from 46 to 75 years (M: 62, SD:7) with a pure-tone average threshold of 36 dB HL at 0.5, 1, 2 and 4 kHz (PTA_{.5,1,2,4}).

Results: The preliminary analyses indicate that the coefficient of correlation between SRT and PTA_{.5,1,2,4} is .63. Forty percent (40%) of variance in SRT measured with the TMB can be explained by the pure tone average thresholds. Further analyses to investigate the potential effects of amplification history, musical experience as well as linguistic background on SRT were also conducted and will be presented.

Conclusions: In accordance with previous studies, the preliminary results obtained with the TMB suggest that in case of hearing loss, the ability to recognize speech in noisy conditions cannot be predicted by PTA. It thus must be measured. Further evaluations of the TMB are necessary before its implementation in general practice in the case of hearing loss. The TMB will be another tool for the audiologists working with the Canadian French speaking clientele.

The effects of bilingualism on the *Canadian Digit Triplet Test* in adult population

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Objective(s): To determine if the performances of bilingual adults on the *Canadian Digit Triplet Test* (CDTT) are on par with monolingual adults.

Background: Performances on speech in noise tests are highly associated to language proficiency. In some cases, the selection of the appropriate test and interpretation of the results is challenging. For example, many bilingual listeners do not master the language to the same degree as the native monolingual listeners. Their performance on speech tests may then be lower than the monolingual normative data, but it is difficult to determine if the lower scores are related to the language competencies or indicative of a hearing deficit.

A Canadian English and French version of a digit triplet test in noise has recently been developed (CDTT; Ellaham et al., 2016) and normative data for monolingual adults have also been collected for each version. There are some indications that closed-set speech tests, such as the CDTT, are more effective in evaluating basic speech recognition abilities in noise with bilingual populations than open-set tests.

Methods: One hundred (100) French speaking adults with normal hearing thresholds and different level of expertise in English were tested with both versions of the CDTT. A questionnaire about the linguistic experience was also completed by all the participants to determine the relative proficiency level in both languages, as well as the language dominance.

Results: Speech recognition thresholds measured with the French and English version of the CDTT were compared with respective normative data set.

Conclusions: Bilingualism is found in all parts of the world. Canadian population is no exception to this situation. For example, 87% of the francophone population living outside the province of Québec is bilingual. There is hence a need for effective clinical tools and guidance for speech audiometry in noise for the bilingual population.

Occurrence and types of childhood permanent hearing loss after early complex cardiac surgery

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Objectives: To report the occurrence of childhood permanent hearing loss (PHL) among survivors after complex cardiac surgery at six weeks or less with cardiopulmonary bypass, and to demonstrate the types of loss.

Background: PHL among survivors of neonatal intensive care is 2-4 per 100, higher than for those receiving well-baby care, 1-3 per 1000. Newborn complex cardiac surgery is not currently considered as a risk indicator for PHL.

Methods: This prospective inception cohort (1996-2015) study from The Western Canadian Complex Pediatric Therapies Follow-up Program provides long-term audiology follow-up by registered pediatric-experienced audiologists at a 6-8 months post-surgery, age two years, and as required thereafter to complete diagnoses. PHL at any one of the frequencies of 500 to 4000 Hz is defined as responses of >25-decibel hearing level in either ear. Occurrence rates are given as percentages of assessed survivors with 95% confidence intervals (CI). Types include permanent conductive and sensorineural losses. Prospectively collected surgical and demographic data for individual patients were entered into multivariate logistic regression to determine predictors of PHL; odds ratios (OR) are given.

Results: Survival was 706(83.4%) of 841 children; follow-up, 691(97.9%). PHL occurred in 41 children, 5.9% (95%CI 4.3%,8.0%). Of these cases, 4 had permanent conductive loss (3 unilateral); 37, sensorineural loss (8 unilateral). By cardiac defect, PHL rates were: bi-ventricular, 4.0% (95%CI 2.5%,6.1%); single ventricle, 10.8% (95%CI 6.8%,16.1%). With syndromes/genetic abnormalities associated with PHL, rates were: 19.5% (95%CI 11.8%,29.4%) 31% (95% CI 21.5%, 41.9%); without, 4% (95%CI 2.6%,5.9%). OR for predictors: syndromes/genetic abnormalities, 8.603(95%CI 3.929,18.838); single ventricle defect, 4.317(95%CI 2.035,9.084); and prolonged ventilation, 1.030(95%CI 1.014,1.045).

Conclusions: Infants surviving complex cardiac surgery are at high risk of PHL. While over 40% with PHL have known syndromes/genetic abnormalities associated with hearing loss, others do not have easily identifiable risk indicators. Early cardiac surgery should be considered a risk indicator for PHL.

**Expression of inflammatory markers, ICAM1, IL1 β and TNF- α
in cochlear hair cells treated by interferon- α**

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Objective: Real time-PCR was used to determine if the expression of some inflammatory markers such as ICAM1, IL1 β and TNF- α in the HEI-OC1 auditory hair cell line treated by interferon- α is would explain the reported hearing loss associated with interferon therapy.

Background: Previous studies have reported hearing loss in patients undergoing interferon-alpha (IFN- α) therapy. The mechanisms by which IFN- α causes hearing loss remain poorly understood.

Method: The cochlear cells were treated by IFN- α (0, 200 & 2000U/ml) for 6, 12, 24 & 48 Hrs. Differential gene expression patterns encoding interferon-alpha-1 (IFN- α -1), interferon- γ (IFN- γ), intercellular adhesion molecule-1 (ICAM1), interleukin-1 β (IL1 β) and tumor necrosis factor- alpha (TNF- α) were assessed by real-time polymerase chain reaction (PCR).

Results: The results revealed a significant expression of inflammatory genes, including ICAM1, IL1 β and TNF- α . led to initiation of an inflammatory response, which might be the underlying mechanism involved in the hearing impairment previously reported in patients undergoing IFN- α therapy.

Conclusion: The results of our study shed the light into an avenue of therapeutic intervention that can be utilized to protect the inner ear from the inflammatory reaction of some medications that are known to cause hearing loss. Future research is needed to investigate other inflammatory markers. In addition, the results imply that pre-treatment hearing evaluation and close monitoring of hearing function in patients undergoing long-term high-dose of IFN- α therapy are necessary to avoid or to minimize its adverse effect on hearing.

Human hearing system, noise-induced hearing loss and ear protectors

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Background: For many years, the ear protectors were using to preventing the audio and non-audio effects of received noise from occupation environments. Despite performing hearing protection programs there are many people which still suffer from noise-induced hearing loss. This study was conducted with the aim of determination of human hearing system response to received noise and the effectiveness of ear protectors on preventing of noise-induced hearing loss.

Methods: Sound pressure microphones were placed in a simulated ear canal. The severity of noise measured inside and outside of ear canal. The noise reduction values due to installing ear protectors were calculated in the octave band frequencies and Labview programmer.

Results: The results of noise measurement inside and outside of ear canal showed a different in received sound levels by ear canal. The effectiveness of ear protectors have been considerably reduced for the low frequency limits. A change in resonance frequency also was observed after using ear protectors.

Conclusions: The study indicated the ear canal structure may affect the received noise and it may lead a difference between the received sound from the measured sound by a sound level meter, and hearing system. It means the human hearing system may probably respond different from a sound level meter. Hearing protectors efficiency decline by increasing the noise levels and thus, are not suitable to protect workers against industrial noise particularly low frequency noise. Hearing protectors may be solely a reason to damaging of hearing system in a special frequency via changing of human hearing system acoustical structure. We need developing the subjective method of hearing protectors testing, because their evaluation are not designed based on industrial noise or in the field.

Congenital Deafness being Poorly Managed: A Case Series of Three Sets of Twins in a State Secondary School for Persons with Special Needs in Nigeria

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Objective: The aim of this study was to review, assess and discuss a comprehensive management of congenital deafness.

Background: Congenital deafness is one of the most prevalent chronic conditions in children which might be attributed to environmental and prenatal factors. Congenital hearing loss can be caused by genetic or non-genetic factors; accounting for about 50% and 25% respectively. Generally in Nigeria, it would take an average of 1 to 5 years to identify hearing loss, whereas in many advanced countries of the world, universal newborn hearing screening has been implemented whereby hearing loss is being detected through physiological and electrophysiological testing and the genetic basis for deafness is being determined within months in a child with inherited deafness through genomics.

Methods: This is a study of three sets of twins with congenital deafness in a secondary school for students with special needs. Data were collected through interview and audiological investigations were done with a tympanometer, audiometer and otoacoustic emission machine.

Results: Case 1a: Tympanometry – Type A bilaterally, PTA – profound SNHL bilaterally, OAE – refer bilaterally. Case 1b: Tympanometry – Type A bilaterally, PTA – profound SNHL bilaterally, OAE – refer bilaterally. Case 2a: Tympanometry – right ear - Type A, left ear – Type Ad, PTA – profound SNHL bilaterally, OAE – refer bilaterally. Case 2b: Tympanometry – right ear - Type A, left ear – Type Ad, PTA – profound SNHL bilaterally, OAE – refer bilaterally. Case 3a: Tympanometry – Type A bilaterally, PTA – profound SNHL bilaterally, OAE – refer bilaterally. Case 3b: Tympanometry – Type A bilaterally, PTA – profound SNHL bilaterally, OAE – refer bilaterally.

Conclusion: In developed countries, neonatal hearing screening programmes enable early hearing loss detection and intervention which produce long-lasting beneficial effects. In this wise, a child with a congenital deafness should be habilitated before 6 months of age.

A Canadian evaluation of real life satisfaction of hearing aids with direct connectivity

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Objective(s): A Canadian-based clinical study to measure the efficacy of a hearing aid with a front-end transformer to extend the input dynamic range, post 16-bit architecture, Smartphone connectivity for direct audio streaming to hearing aid(s), remote control and fine tuning.

Background: A Canadian Evaluation of Real-Life Satisfaction of Hearing Aids in Challenging Environments (2016) was the first such Canadian study using to measure the efficacy of a hearing aid with a front-end transformer to extend the input dynamic range, post 16-bit architecture. The outcome demonstrated statistically significant improvement in satisfaction scores when using this hearing aid compared to previous hearing aids on experienced users. Such clinical studies are necessary to strengthen the body of evidence for efficacy of hearing aid use in real life situations.

Methods: Procedural elements were consistent with A Canadian Evaluation of Real-Life Satisfaction of Hearing Aids in Challenging Environments (2016) taking into account previous future considerations to strengthen the study. More clinics were involved with a wider sample size. A third questionnaire form was added along with questions regarding direct connectivity functions.

Results: Results indicate improved satisfaction scores, strengthening the previous findings. Results indicate statistically significant improvements when streaming signal using the direct connectivity functionality compared to options with previous instruments. These include patients who were already using an instrument with direct streaming functionality, patients using an intermediary device for streaming functionality and patients who were not regularly engaged in streaming prior. Specific results included improvement in overall satisfaction ratings, ease of use and intuitive design.

Conclusions: The study again clearly indicated significantly improved satisfaction of a hearing aid with a front-end transformer to extend the input dynamic range, post 16-bit architecture hearing aids compared to patients current hearing aids. Improved satisfaction and ease of use of the direct connectivity features, demonstrates the need and practicality of use in real life environments.

Evaluation of a wireless contralateral routing of signal system for unilateral cochlear implant recipients

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Objectives: To examine the effectiveness of a Phonak Naída Link CROS device in Advanced Bionics (AB) Naída cochlear implant (CI) recipients.

Background: In North America, 78% of AB recipients are unilateral CI users. The Naída Link CROS (contralateral routing of signals) device can allow these individuals to experience some of the benefits of bilateral hearing. By providing access to input from the unimplanted side, the CROS device should help overcome the loss of input due to headshadow and in turn improve speech understanding and reduce the stress and fatigue associated with hearing with only one ear.

Methods: Ten adult unilateral CI recipients of AB CII or HR90K implants were fit acutely with a Naída Link CROS on their unimplanted ear. Speech understanding was evaluated with and without the CROS device in noise at conversational levels (65 dB A). Target AzBio sentences originated from S_0 , S_{ipsi} and S_{contra} , and competing 20-talker babble was presented from a circular 12 speaker array. Effectiveness of beamforming was also evaluated with signal from front and noise from all 12 speakers.

Results: With the CROS device off, speech scores were lowest when speech was presented from the unimplanted side (S_{contra}) and highest when speech was presented from the implanted side (S_{ipsi}). Results showed listening with the CROS device improved speech scores in the S_{contra} as well as S_0 conditions such that scores were now closer to those in the S_{ipsi} condition. Results also show that when S_0 , beamforming with CROS further improves speech scores as compared to beamforming with CI only.

Conclusions: For unilateral recipients who cannot or do not want to opt for bilateral or bimodal hearing, the wireless CROS device could effectively allow access to some of the benefits of listening with both ears.

Third Party Hearing Disability at Pre- and Post-Hearing Aid Provision

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Background: Hearing loss is a common disability worldwide. Hearing loss has negative impacts on hearing impaired individuals and their significant others. Negative impact of hearing loss on significant others is known as “*third party hearing disability*”. The current study aimed to 1) determine third party hearing disability among significant others at pre- and post-hearing aid fitting and (2) identify factors that contribute to third party hearing disability.

Methodology: To address the first aim, 186 hearing impaired individuals were recruited in a randomized control trial study. Eighty-six hearing impaired individuals in the intervention group received hearing aids while another 100 hearing impaired individuals in the control group did not receive hearing aid. The Significant Other Scale of Hearing Disability (SOS-HEAR) questionnaire was administered on significant others of the hearing impaired individuals at pre- and three months post-hearing aid provision.

To address the second aim, 212 pairs of hearing impaired individuals and significant others were recruited. The factors of interest were related to hearing profile, demographic characteristics and presence of self-reported chronic diseases.

Results: Significant others from the intervention group had significantly greater reduction in SOS-HEAR score than the control group at three month post-hearing aid provision ($U = 2872$; $p < .001$). Five factors were found to be significantly associated with severe third party hearing disability. These factors included severity of hearing loss in the better ear, self-perceived hearing handicap, duration of hearing loss, self-reported eye diseases in hearing impaired individual and gender of significant other.

Conclusion: Third party hearing disability was common among significant others. Hearing aids provision to hearing impaired individuals had significantly reduced third party hearing disability after three months of hearing aid use.

Onward Referral of Adults with Hearing Loss Seen In a Community-Based Mobile Hearing Clinic: Comparison of Referral Recommendation Made by Audiologists and an ENT Physician

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Background: It is a common practice in Singapore for hearing impaired individuals be medically evaluated by an ENT physician before be fitted with hearing aids by an audiologist. It is to ensure patient's ear-related medical need is addressed prior to hearing aid fitting. This has made community hearing services not feasible in the absence of ENT physician's involvement. The current study aimed to investigate heterogeneity of onward referral recommendation made by audiologists and ENT physician.

Method: A total of 544 patients were recruited from two community-based mobile hearing clinics. Audiologists performed Pure tone audiometry, tympanometry and otoscopy examination on the patients and made recommendation if an onward referral to ENT clinic is required. Audiologist's recommendation was guided by a set of referral guideline. The test results together with four still images of otoscope examination and a brief medical history were saved in a secure server. An ENT physician viewed the result retrospectively and made recommendation if an onward referral is indicated. The referral recommendation made by audiologists and ENT physician were compared.

Results: Using ENT physician's recommendation of onward referral as a reference, audiologists made accurate recommendation for 80.0% of the cases. The true positive rate and true negative rate were 63.1% and 17.1% respectively. The false negative rate of audiologist's recommendation for onward referral to ENT clinics was 2.9% and the false positive rate was at 16.9%. A moderate agreement ($\kappa = .509$, $p < .001$) between the recommendation made by audiologists and ENT physician were found.

Conclusion: There was a significant agreement between recommendation of onward referral to ENT clinic made by audiologist and ENT physician with low false negative rate. This suggests that audiologists when guided with a guideline are competent in deciding if an onward referral is necessary.

Disease-specific health related quality of life in senior citizens with hearing loss living in Colombo, Sri Lanka.

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Objective: This study aimed to report the perception of disease specific health-related Quality of Life (QOL) and a presence of an association between demographic and hearing related variables with QOL of older adults with untreated hearing loss living in Colombo.

Background: Hearing loss has become the second leading cause of burdening diseases among adults over 60 years in the world (WHO, 2002). HL can have adverse consequences on the social, functional and psychological well-being of an elderly yet is often ignored.

Method: This cross-sectional study included 100 participants with hearing loss of age 60 years and above who have not received auditory rehabilitation. Purposive sampling method was used to recruit the participants from hospitals and private clinics providing audiological facilities. Demographic, hearing related information and Hearing Handicap Inventory for Elderly (HHIE; Ventry & Weinstein, 1982) after translating to Sinhala language was collected.

Results: Majority perceived to have a significant hearing handicap according to HHIE scores. Among the participants, the situational hearing handicap level was higher than the emotional hearing handicap level. The association between demographic variables and HHIE scores revealed that only education level, duration of hearing loss, and degree of hearing loss were significant.

Conclusion: These findings suggest a negative impact of untreated hearing loss on disease-specific QOL where the immediate demand of rehabilitation is a requisite. The lower level of education, higher severity, and duration of hearing loss were predictors for reduced QOL.

Using mismatch negativity event-related potentials for gap in noise detection: applications for clinical research

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Objective: To optimize the protocol for measuring mismatch negativity waves using a gapped stimulus.

Background: Event-related potentials (ERPs) are measured changes of electrical activity that are time-locked to a specific event such as an auditory stimulus (Näätänen & Picton, 1987). One of the waveforms that can be derived from an ERP is the mismatch negativity wave (MMN) which is known to reflect the accuracy of preconscious detection of change between an infrequently occurring auditory standard and a rare deviant (Novak et al., 1990; Näätänen et al., 1992; Tiitinen et al., 1997). This study aimed to optimize the use of the MMN for the purpose of measuring the discrimination of gaps within a background noise.

Methods: During a pilot study, a standard white noise alternated with 6 different deviants with embedded gaps varying in width from 2 to 40 ms. An MMN was elicited by the wider gaps. For the present study, we explored the effects of changes in intensity of the standard and of a masker that served to “fill” the gap. The two intensities were 60 or 80 dB SPL in different conditions. The masker was a modified filtered noise centred at 4000 Hz at a level of 60 dB SPL (peak intensity).

Results: The results replicate previous research showing that the intensity of the stimuli does cause an overall decrease in the amplitude of the MMN (Schröger et al. 1995) but the effect of gap width is not altered. Importantly, the masker caused an attenuation of the MMN. It also reduced the robustness of the P1 and P2 compared to low intensity and no masker conditions.

Conclusions: The MMN can be elicited efficiently using the optimal paradigm. Testing times can be reduced from several hours to about 30 minutes. This MMN is best recorded at higher stimulus intensities and for wider gaps. Filling in the gap will result in an attenuation of the MMN suggesting the gaps are then more difficult to perceive.

Using auditory brainstem responses for gap in noise detection: a comparison of methods.

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Temporal resolution is the ability to detect changes of amplitude or spectral content of sound over a period of time (Viemeister and Plack 1993). A typical way of assessing the detection of change is using double stimuli that are separated by a small silent gap, where the smallest gap detected is the gap threshold (Picton, 2013). Previous studies have shown that a clear ABR can be produced using gapped stimuli with a latency that is similar to the normal click response (Poth et al. 2001; Werner et al. 2001). When using broadband noise with embedded gaps, Werner et al. (2001) showed that the wave V disappeared when the gap was 2.4 msec which was similar to the psychometric gap threshold of 2.9 msec. The problem was that the correlation was only 0.39. In order to improve the correlation, since both Poth et al. (2001) and Werner et al. (2001) used a “sequential” method where a constant number of sweeps are maintained and the waveform is collected twice, we propose an alternative “concurrent” method where the ABR is collected once based on the residual noise calculated between two buffer channels. 10 normal hearing subjects with measured hearing thresholds below 25 dB HL were tested using the Vivosonic Integrity V500. Stimuli were filtered noises centered on 750 and 3750 Hz, with an embedded silent gap width of 2 to 50 ms, placed at the midpoint of the noise. Residual noise of the ABR waveform was compared between the sequential and concurrent methods. Use of the concurrent method appears to provide less residual noise than the standard clinical sequential method for various gap sizes. Based on these results, further testing of the gap in noise ABR can be conducted for an investigation of the effects of the gaps on the ABR waveform.

Reducing hospital audiology waitlist using Semi-Automated Tablet Audiometry – a pilot study

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Objective: To determine if a blitz clinic using semi-automated tablet audiometry is effective in reducing the audiology waitlist at the Children's Hospital of Eastern Ontario (CHEO). Secondary objectives involve assessing patient feedback, including ease of use and user satisfaction.

Background: Thirty-two million children worldwide are affected by hearing loss. Delayed identification and treatment can impact children in the areas of: speech, language, social and emotional development. Recently, the demand for elective audiology assessments at CHEO surpassed clinical capacity. It was determined that elective referrals for typically developing children, ≥ 6 years of age, would be redirected to community providers. In order to address existing referrals, blitz clinics using tablet audiometry were run.

Methods: Participants included 106 children ≥ 6 years of age on the CHEO audiology waitlist. Blitz clinics consisted of minimum response level testing using a tablet audiometer (SHOEBOX Audiometry, Clearwater Clinical Limited), tympanometry and otoacoustic emissions. Communicative Disorders Assistants completed the testing and results were reviewed and interpreted by audiologists. Optional surveys were provided to patients during appointments.

Results: Of the 106 patients who participated in the blitz clinics, 98 (92%) had normal hearing and were removed from the standard audiology waitlist. Eight children were assessed by audiology, including six with hearing loss. 52 of 106 patients completed the patient surveys. 46 (88.4%) of responders rated semi-automated tablet as easy to use, and 49 (94.2%) of responders were satisfied with the testing method.

Conclusions: A blitz clinic using tablet audiometry was found to be an effective way to address existing referrals for patients ≥ 6 years of age on the audiology waitlist. The procedure was generally well received in terms of ease and user satisfaction. Future studies should assess the effectiveness of training nurses and community members to screen patients.