Poster Sessions – Non-Student Competition – includes abstracts

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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/, /ʃ/ 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%CI6.8%,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, IL1β 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, IL1β 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 molicule-1 (ICAM1), interleukin-1β (IL1β) 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, IL1β 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 mplant 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) recipeients.

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.