GROUP 1: TECHNOLOGY AND INTERVENTION

POSTER 1

Evaluating the Efficacy of Sensor-Based Directionality for Adolescents with Hearing Loss through Ecological Momentary Assessment (EMA)

Jensen-Pickett, Zoe; Tryon, Jaedyn; Henry, Melissa; Lewis, Dawna; Simon, Abigail; Corbin, Nicole; McCreery, Ryan

Objectives: Initial work in our laboratory demonstrated speech-recognition benefit for adolescents with hearing loss when using hearing aids with sensor-based directionality. The goal of this study was to assess the efficacy of sensor-based directionality through self-report by having participants answer EMA surveys in real-world listening environments.

Design: Eighteen adolescents, 12-18 years old, with mild to severe bilateral hearing loss and past hearing aid use were enrolled in this study. Participants were fitted with bilateral Oticon Intent™ hearing aids that include a sensor-based directionality feature. Hearing aids were verified to DSL-5 targets based on pure-tone thresholds obtained in the past six months. Participants and their families were blinded to whether the sensor-based directionality feature was activated. The order of feature activation was randomized. The participants were taught how and when to answer the EMA surveys. They were given an Android smartphone with the survey application downloaded. For two weeks, the participant was prompted with approximately eight surveys a day – every 95 minutes from 8AM to 9PM. The surveys asked about their listening environments, acoustic conditions, listening difficulties, and listening fatigue. After one week with the study hearing aids, the participants met with an audiologist via a remote programming appointment. During this appointment, the sensor-based directionality feature was activated or deactivated (whichever the participant had not used for the past week). The participant continued to wear the hearing aids in daily life and answer surveys for another week.

Results: For our EMA analysis, we excluded any participants that answered fewer than two surveys a day. A linear mixed model was conducted with the remaining 745 EMA surveys. Results indicated that participants rated low levels of listening difficulty across both conditions, but they rated difficulty significantly lower when the sensor-based directionality feature was activated. Additionally, listening fatigue was low in both conditions, but was rated significantly lower when the feature was on.

Conclusions: Overall, participant self-report showed small but consistent benefit when using sensor-based directionality in adolescents with well fitted hearing aids. Our findings indicated that the benefit from sensor-based directionality observed in the laboratory was aligned with the EMA reports.

POSTER 2

A Comparison of Remote Microphone Technologies for Pediatric Hearing Aid Users

Neumann, Sara; Calise, Sabrina; Standaert, Lisa; Schnittker, Jean Anne; Roh, Min; Nelson, Johanna; Zhu, Xiuming

Children have difficulty understanding speech in background noise, reverberation, and at a distance yet they spend a majority of their school day in these adverse listening environments. Remote microphone systems (RM) can help improve speech understanding and reduce listening fatigue. The purpose of this study was to compare the speech intelligibility in noise performance of school-age children with hearing loss using Roger remote mics and a traditional fixed directional remote microphone when in simulated traditional classroom setting and small group setting.

Methods: Twenty-five pediatric hearing aid users, ages 8-12 years, with mild to severe sensorineural hearing loss evaluated with AZ Bio Sentences in noise at a +4, +2 and –2 dB SNR without RM (no RM) and then tested with both microphones (Roger, traditional RM) in a simulated teacher condition and a small group condition. Participants were also asked to evaluate preferences based on sound quality, comfort in noise, speech clarity, and overall preference in both conditions.

Results: In the simulated classroom setting, pairwise t-test results at each level of SNR shows significant difference between devices except Roger and Traditional RM at 69/65 SNR 4dB. In the simulated classroom setting, significant differences were found across conditions. Roger outperformed traditional RM and no RM), while the no RM conditional was significantly better than the traditional RM condition, suggesting better performance with HA alone in a small group environment.

POSTER 3

Benefits of One Versus Two Remote Microphone Receivers for Children with Normal Hearing in Complex Listening Environments

Simon, Abigail; Lewis, Dawna; Jensen-Pickett, Zoe; Tryon, Jaedyn; McCreery, Ryan

Children with hearing loss (CHL) and children with normal hearing (CNH) can have difficulty understanding speech in the presence of background noise and reverberation. Substantial evidence supports the benefits of remote microphone (RM) systems for CHL to improve audibility and speech understanding. Increasingly, evidence supports the use of RM technology for CNH with special listening needs. However, no published studies have examined the benefits of utilizing monaural versus binaural RM receivers for CNH.

Our goal was to determine if CNH demonstrate improvements in speech understanding when utilizing monaural versus binaural RM receivers in speech-shaped noise (SSN) and in SSN plus reverberation (SSN+R). We hypothesized that 1) CNH will have better speech recognition in SSN than in SSN+R conditions and 2) CNH will have improved speech recognition in both acoustic conditions when utilizing binaural RM receivers.

We recruited thirty-five CNH between ages 6;0-12;11 years old with typical development and no reported listening difficulties. Participants was fitted with Phonak Focus II RM receivers paired to a Phonak Roger Touchscreen microphone. Children completed four speech recognition conditions: one RM receiver in SSN, one RM receiver in SSN+R, two RM receivers in SSN, and two RM receivers in SSN+R. In addition, participants completed measures of cognition (PEBL Flanker and Switcher).

Speech perception testing was completed in an anechoic chamber. Forty AZBio sentences per condition were presented from a loudspeaker at 0°azimuth and masker loudspeakers were positioned at 45°, 90°, 135° and 180° azimuth. Sentence presentation level was a constant 60 dB SPL. The noise level began at +5 signal to noise ratio (SNR) and was adaptive. Reverberation time was 300 ms for SSN+R conditions. The SNR for 50% correct (SNR50) was obtained for each condition.

Participants demonstrated better speech recognition in SSN compared to SSN+R, such that the average SNR50 in SSN was 6.1 dB lower than in SSN+R. Across acoustic conditions, participants demonstrated an average of 2.8 dB improvement in speech understanding with use of binaural RM receivers. Although the interaction was not statistically significant, the benefit of binaural receivers was larger in SSN (3.8 dB lower) than in SSN+R (1.7 dB lower). Measures of cognition were not correlated with speech perception performance.

Overall findings support existing literature for positive speech perception benefits from RMs in challenging listening environments and provide preliminary evidence for the benefit

of binaural RM receivers for CNH. Future studies will investigate potential benefits of RM systems for CNH with reported listening concerns.

POSTER 4

Cross-Frequency Interactions in Band Importance Functions

Rogers, Anastasia; Buss, Emily; McCreery, Ryan; Bosen, Adam

Hearing aid prescriptions are designed to optimize access to important speech ques. The importance of speech cues within spectral frequency bands is usually measured with the assumption that importance is independent across bands – that is, one band's importance does not change based on the context of speech cues in other frequency bands. However, previous research indicates that pairs of bands contain synergistic or redundant information, challenging this assumption of independence. The goal of our study was to quantify the size of cross-frequency context effects in speech recognition. We hypothesized that adjacent frequency bands contain redundant speech information and frequency bands that are far from one another contain synergistic information, so redundant/synergistic interactions would have small/large effects on speech recognition. Young adults (19-29 years) with normal hearing listened to and repeated monosyllabic words that were filtered to include or remove randomly selected combinations of frequency bands (4 or 5 out of 21 bands, with band frequency ranges defined by the Speech Intelligibility Index Critical Band Procedure). Their responses were recorded and phonetically transcribed to measure speech recognition accuracy for filtered words. We tested whether interactions between frequency bands affected recognition accuracy by comparing two models: one assuming that band importance is independent for each band and another that included effects of pairwise band interactions. The interaction model fit the data better than the independent model, and in the interaction model the importance of each band by itself was relatively small when compared to the effect of cross-band interactions. These results indicate that contextual interactions between frequency bands dominate speech recognition. Incorporating such interactions into the design of hearing aid prescriptions has the potential to better tailor amplification strategies to various configurations of hearing loss and thereby improve speech recognition outcomes.

POSTER 5

Characteristics of Hearing Aid Fittings in Adolescents

Hong, Jean; McCreery, Ryan; Wiseman, Kathryn; Walker, Elizabeth

Objectives: Hearing aids (HAs) play a crucial role in providing auditory access and supporting appropriate speech and language development among children who are hard of hearing. While past research studies have characterized standard clinical practice for hearing aid fittings in infants and children, the specific characteristics of hearing aid fittings in adolescents remain largely unknown, as this age group is often understudied. This presentation has three research questions – 1) What is the proximity of HA fittings to prescriptive targets among adolescent HA users? 2) What percentage of participants have aided audibility values outside of the DSL normative range? 3) What factors predict aided audibility? We hypothesized that 1) as the deviation from prescriptive target increases, the aided audibility will decrease, and 2) aided audibility will be related to severity of hearing loss and deviation from prescriptive target.

Design: We analyzed HA fitting data from 165 adolescents (ages 12 to 20) with mild to profound hearing loss. Proximity of fitting to prescriptive targets was quantified by calculating the average root-mean-square (RMS) error of the fitting compared with Desired Sensation Level (DSL) prescriptive targets for 500, 1000, 2000, and 4000 Hz. Aided audibility was quantified using the Speech Intelligibility Index (SII) at 65 dB SPL (average speech). We conducted a regression analysis to examine the associations between aided audibility (dependent variable) and RMS error and PTA (predictor variables), while controlling for age.

Results: Sixteen percent of fittings from both left and right ears combined had an RMS error less than 3 dB, 25% had an RMS error between 3 dB to 5 dB, and 60% had at least 1 ear that deviated from prescriptive targets by more than 5 dB RMS. Aided audibility for the right ear was significantly predicted by RMS error ($B = -0.264$, $p<0.001$) and right PTA ($B = -0.795$, $p<0.001$). The same model for the left ear showed similar statistical patterns with RMS error ($B = -0.305$, $p<0.001$) and PTA ($B = -0.782$, $p<0.001$). Overall, the models used for both ears accounted for approximately 82% of the variance

Conclusion: Adolescents in the study had a wide range of fitting outcomes in terms of proximity to prescriptive targets (RMS error) and aided speech audibility (SII). The current study highlights the importance for clinical audiologists in achieving optimal audibility outcomes for adolescents with hearing aids, particularly to identify impact of deviations from prescriptive targets on speech audibility.

Group 2: Psychosocial Impacts of Hearing Loss

POSTER 6

Examining Lived Experience by Adolescents and Young Adults with Hearing Loss and Those with Typical Hearing

Ardinger Stibal, Lily; Sweeney, Victoria; Peng, Z. Ellen

In-lab research with well-controlled experimental tasks and conditions will likely miss important aspects of children's functional hearing in their everyday auditory environments. In this online study, we survey functional spatial hearing by adolescents and young adults 12-30 years old based on their everyday lived experiences. The online survey hosted on REDCap includes three published questionnaires: (1) the Speech, Spatial, and Quality of Hearing Scale (SSQ), (2) the Vanderbilt Fatigue Scale (VFS), and (3) the Hearing Environments and Reflection on Quality of Life (HEAR-QL). Additional items are included on demographics, hearing history, music enjoyment, and general daily experiences. In this poster, we will present preliminary survey findings from a group of normal-hearing adolescents and young adults and a group with hearing loss: 18 of which use hearing aid users and 11 of which are cochlear implant users. One participant uses a Bone-Anchored Hearing Aid (BAHA) and one uses no devices. Because of the need to process degraded auditory inputs in real-time, we hypothesize that adolescents and young adults with hearing loss (HL), even fitted with hearing aids or cochlear implants, will experience and report more challenges than their typical hearing (TH) peers in various communication scenarios in real-world listening.

POSTER 7

Reading Motivation in Adolescents with Hearing Loss and Typical Hearing

Wilson, Paige; McCreery, Ryan; Rose, Emma; Walker, Elizabeth

Reading motivation is made up of several aspects, including intrinsic motivation, extrinsic motivation, social reasons for reading, and self-efficacy. Previous studies have examined the effect reading motivation has on reading comprehension in typical hearing children; however, there are limited data on reading motivation in adolescents with hearing loss. Our research aims will address the following questions: 1) Are adolescents' motivation to read influenced by hearing status or socio-economic status? 2) Which aspects of motivation to read predict reading comprehension in adolescents with hearing loss and adolescents with typical hearing? We used the Motivation for Reading Questionnaire (MRQ) to assess reading motivation in 170 adolescents with hearing loss and 87 adolescents with typical hearing, ranging in age from 12-19. This tool assesses 11 different aspects of reading motivation and examines these aspects through three major categories: self-efficacy, intrinsic-extrinsic motivation, and social reasons for reading. Data analysis is currently underway. Results of this study will provide additional insight into factors driving individual differences in reading comprehension for adolescents who are deaf or hard of hearing and their same-age hearing peers.

POSTER 8

Comparing Self-Perceived Temperament in Adolescents with Cochlear Implants to Their Parents

Wittenback, Hannah; Crow, Sarah; Scott, Molly; Warner-Czyz, Andrea

Introduction: Temperament refers to innate emotions, behaviors, social interactions, and personality that shape an individual's interactions within their environment. Hearing status (deaf and hard of hearing (DHH) vs. typical hearing) may influence temperament in children and adolescents. Parents report lower levels of effortful control (self-regulation) in children who are DHH versus hearing peers in toddlers (1.5-3 years; Castellenos & Houston, 2024) and young children (3-7 years; Bowdrie, Holt, & Houston, 2024). Effortful control positively correlates with spoken language outcomes in young children who are DHH (Bowdrie et al., 2024). Few studies examine temperament and behavior in older children who are DHH and how this relates to their communication skills. Previous studies in younger children rely on parent assessment of temperament, but older children can provide self-ratings, allowing a better understanding of temperament from multiple perspectives. This study compares the effect of respondent (child vs. parent proxy) on ratings of temperament and evaluates the relationship between temperament ratings and communication skills in pediatric cochlear implant (CI) users.

Methods: Participants included 76 long-term CI users (9-15 years) and 36 parents of CI users. CI users had a mean age of 11.6 years and a mean activation age of 2.5 years. All participants completed the Early Adolescent Temperament Questionnaire-Revised to rate temperament via six domains (attention, affiliation, depressive mood, fear, frustration, and shyness) on a five-point ordinal scale, yielding a mean score for each domain. Participants also rated the CI user's communication skills (speech perception in quiet, speech perception in noise, speech intelligibility) on a 10-point Likert scale.
Results: A multivariate analysis of variance revealed a significant effect of respondent on temperament, with parents rating CI users as having significantly higher levels of fear ($p=<.001$) and shyness ($p=.013$) versus the pediatric CI users. No significant differences emerged between parent proxy and child self-report on any other domains. Additionally, temperament did not correlate with any ratings of communication skills by children or parents ($p>.05$).

Conclusion: Parent proxy and pediatric CI users' ratings of temperament show considerable concordance. Differences by respondent on the fear and shyness domains may reflect the projection of parent concerns about social skills, conflation of poorer communication skills with shyness, and/or the CI users' lack of awareness of these concepts. The lack of a significant relationship between temperament and communication skills diverges from previous studies of younger children, suggesting communication skills in older children with CIs likely rely on multiple demographic and audiologic factors. A better understanding of parent-child perceptions of temperament may help audiologists tailor expectations and approaches to best suit children's individual needs.

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POSTER 9

Listening-Related Fatigue in Adolescents with Prelingual Deafness and Long-Term Device Experience

Easwar, Viji; Zhang, Vicky; Gavrilis, Jason

Adolescents with hearing loss, irrespective of hearing loss degree or device worn, are considered to be at risk for listening-related fatigue, however, the factors that influence it are still poorly understood. The goal of the present study was to evaluate subjective fatigue in adolescents with hearing loss and identify factors associated with increased fatigue. We invited adolescents enrolled in the Longitudinal outcomes of children with hearing impairment study (LOCHI) to participate. Adolescents and their carers completed the self- and parent-versions of the Vanderbilt Fatigue Scale (VFS), respectively, along with numerous other audiology and language assessments. We received a total of 282 VFS surveys, of which 119 were completed for adolescents using cochlear implant(s), 140 were completed by those using hearing aid(s), 4 were completed by those using bone conduction devices and 19 were completed by those who did not use a device. The average age of respondents was 17.1 years (range: 15.9–19.3 years). Preliminary analyses indicate a high positive correlation between self-report and parent-report of subjective fatigue in both mental and physical subdomains. Among cochlear implant and hearing aid users, the proportion of adolescents who reported high fatigue, based on the number of 'extreme' responses in parent-reported surveys, was 51.8 and 43.5%, respectively. The proportion was similar in self-reported surveys (50 and 46.8%, respectively). Regression analyses to identify influential predictors were conducted for cochlear implant and hearing aid users, as these groups had a sufficiently large number of respondents. Self-reported fatigue was higher in adolescents with greater reported communication difficulty, lower health-related quality of life, increased anxiety and depression symptoms, and in females. Parent-reported fatigue was higher in adolescents who experienced greater reported communication difficulty and increased anxiety and depression symptoms. Device type, consistency in device use, frequency of school support, and vocabulary skills did not significantly influence subjective fatigue. Together, these preliminary analyses suggest that listening-related fatigue is a concern in adolescents with hearing loss, even among experienced device users. Psychosocial and communication difficulties may be influential factors.

POSTER 10

Examining Mechanisms of Listening Effort in Children with Hearing Aids

Gianakas, Steven; Wiseman, Kathryn; Walker, Elizabeth

Children who are hard of hearing often need to exert more effort during listening, especially in more difficult environments. Such effort goes undetected during clinical testing as clinical measures are not sensitive to the demands of real-world listening. For example, children not only need to listen to a teacher in a noisy classroom, but also simultaneously take notes. In the current study, we examined differences in listening effort between children with typical hearing and children with hearing aids as they completed multiple tasks at the same time. We further examined how individual factors such as working memory and vocabulary, influence effort in children with hearing aids. Thirty school-age children with typical hearing and fifty-nine children who are hard of hearing participated in a dual-task paradigm. During the task, each child listened to sentences in varying signal-to-noise ratios (SNR) and performed a secondary task of responding to words on a screen. Dual-task cost was calculated from the response times across the various listening conditions and baseline (secondary task without listening to speech). Children also reported their subjective listening effort and completed measures of expressive vocabulary, working memory, and auditory access. We hypothesized that auditory access, measured by the speech intelligibility index, would moderate the relationship between cognitive factors (working memory and vocabulary) and listening effort. Children with hearing aids showed greater dual-task cost than children with typical hearing, indicating greater effort. For children with hearing aids, dual-task cost and subjective ratings of effort increased as a function of more difficult SNRs. Preliminary analysis revealed that auditory access does not moderate the relationship between cognitive factors and effort. The results of this study align with previous work, indicating that more difficult listening environments can yield greater effort in children and that children with hearing loss exert more effort than their typical hearing peers.

Group 3: Speech Understanding and Communication

POSTER 11

The Impact of Environmental Demands on Conversational Skills in Preschoolers who are Deaf or Hard of Hearing

Oster, Monika-Maria

The ability to have meaningful conversations is a primary goal in the treatment of children who are deaf or hard of hearing (DHH). While prior research has demonstrated associations between conversational skills, language, and executive function (EF) skills, it has done so primarily within highly controlled settings with minimal environmental distractions or additional demands on the DHH child. However, the settings children converse in include varying degrees of auditory and visual competition and other demands. These environmental competitors and demands may limit the conversational exchanges children can successfully engage in, because parts of the conversation may be missed or misheard. Furthermore, varying environmental demands may require the use of different EF skills. For example, children who are DHH may need to ignore distractions and actively shift attention to their conversational partner in more distracting and demanding environments. Whether conversational exchanges and their association with language skills and EF are influenced by the demands of the auditory environment has not been systematically evaluated. This proposal will present methodological considerations for quantifying the demands of the auditory environment as well as pilot data from preschoolers who are DHH relating the environmental demands to conversational exchanges, language skills and EF.

Information about the auditory environment was obtained through the Lena Environment Analysis (LENA) within a preschool setting. To quantify the demands of the auditory environment, LENA results were used to calculate the proportion of time (within 5-min intervals) when competing sounds were present, such as unclear / overlapping speech, electronic sounds, or noise. Intervals with a higher proportion of competing sounds were assumed to be more demanding than intervals with lower proportions of competing sounds. The LENA automated analysis was also used to obtain a measure of conversational skills, specifically the number of conversational turns. Language skills were evaluated using the Clinical Evaluation of Language Fundamentals Preschool (CELF-P), and EF was evaluated through the Behavior Rating Inventory of Executive Function - Preschool (BRIEF-P).

At the time of this proposal, pilot data was available for 8 children and more data is being prepared to increase statistical power. The results showed that, on average, children took significantly less conversational turns during more demanding times compared to less demanding times. In addition, the association between conversational turns and EF appeared to be influenced by the demands of the environment, such that better EF, specifically shifting, was related to higher numbers of conversational turns in more

demanding environments. In contrast, language skills in this small sample were not significantly related to the number of conversational turns, regardless of the environmental demands.

The results of this research will provide the basis for a thorough evaluation of the impact of environmental demands on conversational skills in preschoolers who are DHH and its potential mediating role in the association between conversational, foundational language, and EF skills. The results are potentially highly relevant clinically, because of their potential to inform assessment and design of novel, real-world communication interventions for DHH children.

POSTER 12

The Effect of Background Noise on Word Learning in Preschool-Age Children

Gordon, Katherine; Lowry, Stephanie; Matuszeski, Meghan; Cortex, Diana; Kim, Tan Bi; Grieco-Calub, Tina

Intro: Most word-learning studies have been conducted in quiet laboratory settings. However, the everyday environments where children learn language, such as classrooms and homes, are not quiet. Thus, our understanding of how children build vocabulary knowledge under more naturalistic conditions knowledge is limited. In the current study we focus on the ability of preschool- and kindergarten-age children to learn words in background noise. Preschool and kindergarten is a critical age during which children are establishing the foundation of academic vocabulary knowledge in classroom environments.

Methods: We presented 4- to 6-year-old children with four lab-created word forms linked to unfamiliar objects across three training sessions administered on consecutive days. Current sample size is n = 51 (total planned sample size n = 80, n = 20 per condition). Children completed learning in one of four between-subject listening conditions: quiet, SNR +10, SNR +5, or SNR 0. To assess learning rate of forms, children were asked to name objects at the beginning and end of each session (e.g., What is this one called?). To assess learning outcome, children were asked to name objects 5 minutes after the last training session. The 5-minute delay was introduced to assess what children had learned from training, not just what was currently active in working memory. For all productions, we coded the percentage of phonological features produced correctly relative to the target form.

Results: We conducted two mixed-effects models to assess: the overall performance and rate of word learning during training (end of session performance for the 3 sessions) and the outcome of word learning (5-minute delay after session 3). All models included percentage of phonetic features correct as the outcome variable. During the training sessions, children in the 0 SNR condition performed worse than children in the other conditions in their overall level of performance, but not learning rate. Five-minutes after the last training session, children in the 0 SNR condition performed worse than children in the other conditions. Regarding individual factors, age in months was positively related to learning rate. Verbal working memory (NWR) was positively related to overall level of performance during training, but not rate. Performance at the 5-minute delay, after the final training session, was positively related to age in months. Additionally, performance after the 5-min delay was negatively related to children's threshold for recognizing familiar words in noise (NU-CHIPS).

Implications: These results indicate that children are more resilient to background noise when learning words in a more favorable SNR. However, less favorable listening conditions (e.g., 0 SNR) will negatively affect children's overall ability to learn the phonetic features of

word forms during training, but not learning rate. Thus, it will take children more exposures/training sessions to develop a precise representation of word forms when words are presented in less favorable listing conditions (0 SNR). Understanding both the group-level and individual-level effects will inform classroom practices to support word-learning in real-world environments. This work provides the foundation for future research to understand the ability of children who are hard of hearing to learn words in classrooms. Based on this knowledge, we can better identify the children who struggle the most with learning words in noise and can recommend appropriate audiological and language interventions to support word learning

POSTER 13

Spatial Release from Speech-on-Speech Masking in Children with Mild Bilateral Hearing Loss

Henry, Melissa, R; Smith, Maggie; Corbin, Nicole; Lewis, Dawna; Walker, Elizabeth; McCreery, Ryan

Clinical measures of speech recognition are not sensitive to the listening difficulties children with mild bilateral hearing loss (MBHL) encounter in their everyday environments. As a result, there is uncertainty regarding the benefit of intervention for this population, which leads to a persistent delay in amplification for children with MBHL. One environment frequently encountered is the classroom, whereby children are required to attend to a target talker among other competing talkers. In such environments, children experience improved masked speech recognition when the competing talkers are spatially separated from the target talker (Buss et al. 2017). This phenomenon, known as spatial release from masking (SRM), is associated with parents' reports of their children's everyday listening difficulties (Corbin et al. 2021). There are few studies of SRM in children with MBHL, which is a critical void given the potential for SRM to highlight this population's real-world listening difficulties. Our study compared magnitude of SRM for children with normal hearing (NH) and children with MBHL both with and without hearing aids. Initial results indicated reduced SRM for children with MBHL compared to NH, with higher aided speech intelligibility index (SII) associated with greater SRM. Clinical applications of this task will be discussed.

POSTER 14

Effect of Reverberation on Spatial Acuity in Bilateral Cochlear Implant Users

Durbin, Darby; Sweeny, Victoria; Scarlett, Trevor; Peng, Z. Ellen

Bilateral cochlear implants (CIs) provide some access to spatial hearing for individuals with severe to profound hearing loss. One aspect of spatial hearing is the ability to discriminate a small spatial separation between two closely placed sounds, known as spatial acuity. In indoor auditory environments, important binaural cues are distorted by reverberation, resulting in poorer spatial acuity in normal-hearing (NH) listeners. Here, we assess the impact of reverberation on spatial acuity by measuring the minimum audible angle (MAA) in child and young adult users of bilateral cochlear implants using simulated reverberant environments through auditory virtual reality. Depending on a variety of individual factors such as device type, implantation date, and how consistently the CIs are worn, CI listeners might not have access to all the spatial cues a NH listener does. MAA will be compared between bilateral CI and NH listeners when tested using two tokens (i.e., speech-shaped noise and disyllabic word) and under three different levels of reverberation (i.e., anechoic, low-reverberation, and high-reverberation).

POSTER 15

Reverberant Auditory Cue Access for spatial Unmasking by Cochlear Implantees

Sweeney, Victoria; Peng, Z. Ellen

This study aimed to measure the impact of reverberation on the release of speech-on-speech masking provided by individual auditory cues, including head shadow, binaural redundancy, and interaural differences by bilateral cochlear implant (CI) users. Prior work shows bilateral CI users receive the largest intelligibility benefit from monaural head shadow, while some take advantage of binaural cues. With reverberation degrading the magnitude of both monaural and binaural cues, we predict reduced benefits for all cues in reverberation compared to free-field. We further explore classification of bilateral CI users based on their use of monaural versus binaural cues.

The procedure used in this study mimicked the design used by Peng and Litovsky (2021). Eleven young bilateral CI users from 11-22 years old participated in the study. Participants were tested in virtual acoustic space that was simulated using non-individual head-related transfer functions with and without reverberation. For reverberation, a small classroom with typical size and interior absorption was simulated in ODEON, with the direct path from sound sources to the listener and all reflection patterns off room surfaces properly modeled. Speech stimuli were target AuSTIN sentences with a two-talker speech babble masker. Speech reception thresholds (SRTs) were measured in four configurations, with two target-masker spatial separations (co-located vs. spatially separated 180˚) and two ear conditions (binaural vs. monaural). Auditory cue benefits were calculated by comparing SRTs across the four conditions.

On the group level, listeners show elevated (poorer) SRTs in reverberation compared to anechoic, with a larger increase when maskers are 180˚ separated than co-located. For speech-on-speech masking, all bilateral CI users demonstrate unmasking benefits from monaural head shadow. On average, binaural redundancy and interaural differences provide much smaller unmasking benefits. There is large individual variability in how listeners use auditory cues for unmasking. Participants who receive a larger intelligibility benefit from the monaural head shadow or binaural redundancy cue generally demonstrated a smaller benefit or even interference from interaural difference cues. When reverberation is introduced, intelligibility benefits become smaller for head shadow but slightly larger for binaural redundancy, likely due to the reduced interaural level differences. This study supports previous work which demonstrates that bilateral CI uses primarily rely on the monaural head shadow cue for SRM, with attenuated benefit when exposed in reverberation. Preliminary clustering analysis shows classification of listeners based on benefit versus interference in their use of interaural differences for unmasking. Bilateral CI users experience challenges in reverberation for both speech perception and their access to spatial cues for improving speech-in-speech understanding.

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POSTER 16

Voice Emotion Recognition in Children Who Wear Hearing Aids Speech Perception Development in Pediatric Cochlear Implant Users: Insights from Longitudinal Clinical Data

Haggerty, Amberlee; Gianakas, Steven P.; Henry, Melissa R.; Chatterjee, Monita; Wiseman, Kathryn B.

The ability to perceive and identify voice emotions is important for social communication and developing relationships. Standard tests of audiology focus on what is said, but do not include how a message is conveyed. Thus, individuals that appear to perform well in the clinic may have difficulties in the real-world when it pertains to understanding the emotion and true meaning of a message. Voice emotion recognition is diminished in children with cochlear implants and, to a lesser extent, children with hearing loss (Chatterjee et al., 2015; Cannon & Chatterjee, 2019). Linguistic ability predicts voice emotion recognition performance of children with hearing loss, but it is unclear whether their performance is also influenced by their aided and unaided hearing (Cannon & Chatterjee, 2019).
To elucidate the relationship between audio-only emotion recognition and aided and unaided hearing, we measured voice emotion recognition performance in children with hearing loss who wear bilateral hearing aids. We hypothesize that children with hearing loss who wear hearing aids will have diminished voice emotion recognition performance that can be predicted by their individual aided and unaided hearing (SII), expressive vocabulary, and short-term memory performance. We also hypothesize that their voice emotion recognition performance will follow a developmental trajectory, similar to their language development.

Methods: Participants were children ages 6-14 with hearing loss. Children included in the study met the following criteria: (a) wears bilateral hearing aids, (b) only communicates using English, (c) are between the ages 6;0-14;11; and (d) do not have a history of cognitive or motor impairment. We performed pure-tone audiometry to obtain pure-tone thresholds for each ear from 250-8000 Hz. Air conduction thresholds were tested using ER-3A insert earphones with foam tips or circumaural headphones. We completed hearing aid verification to collect unaided and aided SII at 55-, 65-, and 75-dB SPL. If children had a recent audiogram or hearing aid verification completed in an audiology clinic within 6 months of the visit, we obtained their records from their clinician. Expressive vocabulary was measured by the Weschsler Abbreviated Scale of Intelligence-Vocabulary (WASI) and short-term memory was measured by the PEBL Corsi Blocks Task. Participants also completed a voice emotion recognition task (Emognition v 2.0.3; Cannon & Chatterjee, 2019). The stimuli used for this study were sentences read by a female talker using adult-directed speech. Each trial consisted of 12 sentences read in 5 emotions (happy, scared, neutral, sad, angry) for a total of 60 sentences per trial. Participants selected the emotion they heard by clicking a button on a touchscreen monitor. Participants completed 2 trials for a total of 120 sentences.

Results: Preliminary results showed a positive association between age and emotion recognition abilities, indicating that children with hearing aids were better at recognizing emotions as they develop. Moreover, emotion recognition abilities were associated with better short-term memory and greater expressive vocabulary, but there was no relationship with aided or unaided hearing as measured by the SII. However, overall accuracy and relationship with these predictors varied by each emotion.

POSTER 17

Speech Perception Development in Pediatric Cochlear Implant Users: Insights from Longitudinal Clinical Data

Kao, Chieh; Ambrose, Sophie; Baudhuin, Jacquelyn; Bosen, Adam; Henry, Melissa; Janky, Kristen; Kelly, Elizabeth; Patterson, Jessie; Simmons, Jeffrey; Sweeney, Victoria; Wiseman, Kathryn; Peng, Z. Ellen

For children with severe-to-profound hearing loss fitted with cochlear implants (CIs), speech perception is an important metric to evaluate fitting outcomes. In clinical settings, CI audiologists choose developmentally appropriate speech perception materials as a child with CI develops speech and language abilities over time. These medical records provide invaluable insights into how speech perception develops longitudinally in pediatric CI users. In this study, we performed a retrospective medical record review to examine speech perception development by pediatric CI users from the BTNRH CI Program. Using a hierarchical scoring system to account for developmental changes of 24 clinical speech tests of varying difficulty levels, we analyzed data from 236 pediatric CI patients using their best test scores from each audiology appointment to evaluate the developmental trajectory of speech perception. Several key individual factors are included in modeling speech perception development, including chronological age, hearing age, age at first CI implantation, hearing configuration, etiology, comorbidities, primary language, race, and socioeconomic status.

Group 4: Clinical Assessment and Practice

POSTER 18

Outcomes Among Spanish- and English-Speaking Children with Hearing Loss

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Introduction: With the introduction of universal newborn hearing screening and improved hearing technology in the past 25 years, children with hearing loss (HL) are diagnosed at a younger age and experience better outcomes than in previous decades. Most research on pediatric HL, however, focuses on children who are White, monolingual English speakers, even though one in four children in the Unites States is Hispanic. Recent research has shown that Spanish-English bilingual children with hearing aids use their devices less than their monolingual English-speaking peers, especially at older ages (Wiseman et al., 2025). It is unclear which factors drive this difference in device use, as well as the extent to which other auditory outcomes may differ due to language status. The goal of this preliminary study was to identify predictors of a variety of listening- and language-related outcomes across a diverse sample of children with HL.

Method: Participants include children with HL, ages 0 to 20 years. All children with hearing devices who are seen by the House Children's Hearing Center in Los Angeles, CA, are invited to participate, as long as they use spoken English and/or Spanish. Children may have additional disabilities and any degree and configuration of unilateral or bilateral HL. Participants and their caregivers complete a battery of assessments based on their age, including measures of speech recognition in quiet and noise, vocabulary size, listening-related fatigue, hearing-related quality of life, auditory skills in everyday life, and mental health. Information about clinical interventions is extracted from medical records. It is planned that participants will be seen annually over 5 years to characterize longitudinal predictors of development.

Results: Data collection is ongoing; 18 participants have been recruited thus far. Participant ages range from 8 months to 15 years, 67% of participants are Hispanic, and 50% of participants speak Spanish. Most participants (89%) use one or two hearing aids, and 11% use a bone conduction device. Preliminary results suggest a trend of datalogged hearing device use increasing with age among monolingual English speakers ($r = .60$, $p = .09$), but not among Spanish speakers ($r = -.05$, $p = .90$). Spanish-speaking and monolingual English-speaking participants demonstrate similar English speech-in-noise recognition on the Children's English and Spanish Speech Recognition (ChEgSS) Test, with a larger vocabulary associated with better speech recognition ($r = -.75$, $p = .01$). Future analyses will examine demographic and clinical predictors of listening-related fatigue, hearing-related quality of life, and self-reported auditory skills.

Discussion: Preliminary results are consistent with previous research showing different trends in hearing device use among Spanish-speaking and monolingual English-speaking

children with HL. As data collection continues, we will further investigate potential differences in outcomes among children with HL based on language status, as well as predictors of these outcomes. We anticipate that ultimately this study will provide insight into how to best support a diverse range of children with HL, especially those who have been under-represented or excluded from previous research.

POSTER 19

Diverse Genetic Profiles in Hearing loss Patients with Enlarged Vestibular Aqueduct: A Small Cohort Study Using a Targeted Exon Sequencing Panel

Tom, Wesley; Merchant, Gabrielle R.; Patterson, Jessie; Janky, Kristen L.; Kelly, Elizabeth A.; Fernando, M. Rohan

Background: Enlarged vestibular aqueduct (EVA) is an inner ear malformation that accompanies hearing loss and accounts for about 12% of sensorineural hearing loss in children and adolescents. Mutations in genes SLC26A4, FOXI1, GJB2, POU3F4 and KCNJ10 are currently known to cause EVA. The purpose of this study was to investigate the genetic profiles of a small cohort of EVA patients using a next generation DNA sequencing assay, which utilizes a 24 gene targeted exome panel.

Methods: Patients with EVA were recruited from Boys Town National Research Hospital, Omaha NE, USA. All participants underwent air- and bone-conduction audiometry to quantify hearing and collection of a blood sample to allow for genetic analyses. A next generation DNA sequencing assay utilizing a 24 gene targeted exome panel was completed for each patient.

Results: Twelve EVA patients (6 male and 6 female) were recruited for this preliminary cohort study. The average age of patients was 28.5 years (range: 8 – 75) and average age at diagnosis was 18.2 years (range: 1 – 69). Ten out of 12 (91.6%) had EVA in both ears and two patients had unilateral EVA for a total of 22 ears with EVA. Seven out of 12 patients (58.3%) had bilateral cochlear dysplasia (incomplete partition type II) and the remaining 5 had normal cochlear anatomy. Of the 22 ears with LVAS, 6 out of 22 ears (27.3%) had normal hearing, 1 (4.5%) had mild hearing loss, 1 (4.5%) had moderate hearing loss, 4 (18.2%) had moderately severe hearing loss, 7 (31.8%) had severe hearing loss and 3 (13.6%) had profound hearing loss. These data highlight the heterogeneous nature of the hearing loss noted in individuals with EVA.

Nine out of 12 EVA patients (75%) had variants in SLC26A4 gene. No variants were found in genes FOXI1, POU3F4 and KCNJ10. Gene GJB6 is responsible for the majority of non-syndromic hearing loss and 9 out of 12 EVA patients (75%) had variants in this gene. It is interesting to note that variants in gene CEP250, which causes atypical usher syndrome, are present in 11 out of 12 (91.6%) EVA patients tested in this study. EVA is thought to be a chromosomal recessive monogenic condition; however, in this cohort only one case was found with likely pathogenic homozygous mutation in SLC26A4 gene. Eight patients had heterozygous variants of uncertain significance (VUS)/conflicting in SLC26A4 gene. These patients also had other VUS/conflicting in other common hearing loss related genes.

Conclusions: Overall, these findings indicate the diverse nature of the genetic and auditory profiles of EVA patients, warranting further investigation. Additionally, the high prevalence of variants in the CEP250 gene is a novel finding, also warranting further investigation.

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POSTER 20

Auditory Brainstem Latency Data for Level Specific (LS) CE-Chirp Stimuli

Garner, Cassie

Introduction: Auditory brainstem responses (ABRs) are essential for assessing auditory pathways and hearing thresholds, especially in infants and difficult-to-test populations. Recent studies suggest that chirp stimuli, particularly the level specific (LS) CE-chirp, may enhance the evoked response and by design, result in similar latency values across frequencies, unlike traditional tone burst stimuli. This study reviews two years' worth of LS CE-chirp latency data collected in our clinic to offer normative latency data across different frequencies and age groups.

Objective: To evaluate the latency of ABR waves in response to LS CE-chirp stimuli, with the goal of providing normative latency data ranges for clinical use across age groups and frequencies.

Methods: Clinic records were reviewed for normal hearing patients, and Wave V latency values for LS CE-chirps were extracted across different ages and frequencies. Mean latency values and standard deviations were calculated for each group and frequency.

Results: Latencies were found to be longer for lower frequency LS CE-chirps, with values decreasing as the frequency increased, across all age groups. Additionally, latencies shortened with age, suggesting maturation of the auditory system.

Conclusion: The LS CE-chirp stimulus provides more consistent ABR Wave V latency values across frequencies compared to tone bursts, although latency still decreases as frequency increases. The observed age-related decrease in latency is consistent with the trend seen in tone burst elicited ABRs and indicates auditory system maturation. These normative data are valuable for clinicians utilizing LS CE-chirps in ABR testing to assess hearing in various populations

POSTER 21

Implementation of Wideband Tympanometry into Clinical Practice for Children with Otitis Media with Effusion

Khin, Jane; Gibbs, Leah; Al Salim, Sarah; Tempero, Richard; Merchant, Gabrielle R.

Otitis media with effusion (OME) refers to the accumulation of non-infected fluid in the middle-ear space. This condition is very common, affecting up to 80% of children by 4 years of age (Williamson, 2011). When left untreated, OME can have serious consequences, leading to potential hearing loss, delayed speech-language development, and learning difficulties (Aarhus et al., 2015). Timely detection and management of OME may help prevent these negative outcomes; however, it is challenging to assess ear health and hearing status in young children. Even clinical audiologists with extensive training in pediatrics are only able to complete ear-specific hearing evaluations on approximately 28% of children with suspected OME (Merchant et al., 2024). As a result, comprehensive hearing status often remains unknown in this population, making it more difficult for providers to develop plans for care and intervention.

Wideband Tympanometry (WBT) is a non-invasive measure of middle-ear function. One property measured via WBT, known as absorbance, represents the sound energy absorbed by the middle ear system as a function of frequency. It has been demonstrated that WBT absorbance can quantify middle ear effusion volume and predict associated conductive hearing loss in children with OME with high sensitivity and specificity (Merchant et al., 2021; Merchant & Neely, 2023; Sanford et al., 2023). This test is an especially valuable tool for young children and individuals with varying abilities, who may not be able to complete traditional hearing evaluations. Despite these advantages, WBT has not yet been widely adopted into clinical practice. According to a recent survey exploring the use and perceptions of WBT by audiologists practicing in the United States, over 40% of clinicians reported the primary barrier to incorporating this measure in their test protocols was lack of training and/or confidence in measuring or interpreting WBT (Al-Salim, Skretta, & Merchant, 2024). Our laboratory is currently working to incorporate WBT testing in clinical settings by educating audiologists and ENT physicians about this measurement and providing them with resources to facilitate seamless implementation. Our goals in doing so are to improve the identification of OME in children and enable clinicians to make more informed decisions regarding intervention. This poster will highlight evidence supporting the clinical utility of WBT, particularly as it relates to estimating the degree of conductive hearing loss associated with a given episode of OME in children. Additionally, this work will discuss our progress in implementing WBT testing in our audiology clinic at BTNRH and evaluate overall uptake by clinical staff.

POSTER 22

The Use of Video Models and Visual Schedules in the Pediatric Audiology Clinic

McTee, Haley; Porter, Heather; Cottrell, Chelsea; Kaufman, Ashley; Nightman, Katelin; Goehring, Jenny; Lenzen, Natalie

Purpose: Hearing loss impacts language and socioemotional development, literacy and educational progress, communication, and relationships (World Health Organization, 2023). Accurate audiological assessment is an essential part of intervention efforts to address the effects of hearing loss. Audiological assessment includes activities that may be novel to pediatric patients, including visual reinforcement audiometry (VRA), conditioned play audiometry (CPA), conventional audiometry, otoscopy, tympanometry, and otoacoustic emissions (OAE) testing.

Audiological assessment is frequently completed in the pediatric population for a number of reasons, including ear infections, hearing concerns, family history of hearing loss, and follow-up testing for failed hearing screenings. In addition, hearing testing is often performed as part of a series of tests that families encounter when there are concerns for possible autism spectrum disorder, language or learning disorders, behavioral challenges, and developmental delay because some behaviors associated with these conditions may resemble hearing loss. Importantly, children who have these conditions may encounter considerable challenges in the audiology clinic, including those related to anxiety in new environments, difficulty with transitions between tests, performing new tasks, and sensory sensitivities.

Unknown medical environments, fear, and feeling a loss of autonomy and control can result in increased anxiety in healthcare settings and be a barrier to successful visit outcomes (Lerwick, 2016). Video models and visual schedules can increase on-task behaviors, improve transitions, and benefit parent-reported satisfaction with healthcare experiences (e.g., McDonald, 2021, Ong et al., 2022). Therefore, our aim was to create resources to help patients and families prepare for their upcoming audiology appointment and promote on-task behaviors during their appointment.

Methods/Results: Based on McTee et al. (2019), our clinic created video models and visual schedules depicting patients who are diverse in terms of hearing modalities, abilities, age, and race participating in assessments that occur during a typical audiologic evaluation.

Videos were created for viewing prior to audiological appointments to demonstrate various types of audiological assessments and associated activities (e.g., VRA, CPA, computer-based CPA, and conventional audiometry). Resource cards with video links were shared with providers that often refer patients for audiological testing to distribute to patients and families to help them prepare for future audiology appointments.

Visual schedules created for use during audiological appointments were comprised of laminated posters and interchangeable pictures that depict different procedures within an audiology appointment. The schedules can be customized based on the child's appointment. The child can move a specific task from one side of the poster to the other side to indicate that the task was completed.

Conclusions: The video models of audiological assessments can be used to help prepare patients and families for audiological testing. Further, visual schedules can help patients better transition and more comfortably participate in audiological testing, resulting in improved patient satisfaction and outcomes. Videos and visual schedules can be shared with other facilities to adopt or modify for their own use. Future directions involve creating visual schedules and video models for additional audiologic appointment activities and conducting efficacy testing to determine clinician acceptance/use as well as family/patient benefit.

POSTER 23

Characterizing Test-Retest Reliability for Behavioral Audiometry in Individuals with Down Syndrome

LaSpada, Emily J.; Buss, Emily; Leibold, Lori J.; Porter, Heather L.

Objectives: Down syndrome occurs in approximately 1 in 700 newborns annually in the United States (de Graff, Buckley, & Skotko, 2024), and is associated with many co-occurring conditions across the lifespan (for review see, Bull et al., 2022 & Capone et al., 2017). It is the most common genetic cause of intellectual disability (Ilyas et al., 2020), with most individuals with Down syndrome having mild to moderate intellectual impairment (Stancliffe et al., 2012). Hearing loss is one of the most prevalent co-occurring conditions, observed in ~40-80% of individuals with Down syndrome of all ages (e.g., Kreicher et al., 2018; Malt et al., 2013). Although all types of hearing loss occur more frequently for individuals with Down syndrome than individuals who are neurotypical, fluctuating conductive hearing loss occurs often, and is particularly pervasive in childhood (e.g., De Schrijver et al., 2019; Nightengale et al., 2017).

Current standards accept variability of up to 10-dB between successive pure-tone threshold measurements (ANSI S3.21 – 2004); however, supporting data are based on studies of participants without described intellectual impairment (e.g., Steinberg & Munson, 1936; Whitting & Hughson, 1940). The only study to our knowledge evaluating test-retest reliability in listeners who are neurodiverse describes similar variability between listeners with and without mild dementia (i.e., McClannahan et al., 2021). No previous studies have evaluated test-retest reliability for pure-tone threshold estimation for individuals with Down syndrome. The purpose of this study is to evaluate variability in pure-tone threshold measurements in a community-based sample of individuals with Down syndrome for successive measurements obtained in a single test session and for consecutive audiograms obtained over a 3-year period.

Design: Participants are children and adults with Down syndrome ≥5 years of age. Data are collected in our laboratory or in a mobile research vehicle. Sessions are guided by use of social stories and visual schedules, and include otoscopy, 226-Hz tympanometry, and behavioral audiometry for air-conducted, pulsed pure-tone stimuli using a 2-down, 1-up procedure with a 5-dB step size. Hearing thresholds are estimated at 4, 8, and 11.2 kHz; 1 kHz is also measured for listeners with no measurable threshold at 11.2 kHz. Participants who are neurotypical ≥15 years of age are included for comparison of data obtained in successive measurements during a single test session.

Preliminary Results: 95% of threshold differences for successive audiometric thresholds obtained in a single test session were < 10 dB for participants with DS. The range of threshold differences for participants with DS was greater for those measured ~3 years apart compared to those measured ~6 months apart.

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Conclusions: Variability in successive hearing threshold estimates within a single test session for listeners with Down syndrome is similar to listeners who are neurotypical. Differences in audiometric threshold observed between test sessions for individuals with Down syndrome >10 dB are likely attributed to fluctuating hearing sensitivity."

GROUP 5: VESTIBULAR FUNCTION

POSTER 24

The Relationship Among Vestibular, Hearing, and Balance Outcomes in Individuals with Down Syndrome

Casey Vandervelde, Jessie N. Patterson, Heather Porter, Gabrielle Merchant, Kristen L. Janky

Background: Despite the reported high incidence of hearing loss and balance dysfunction in individuals with Down syndrome (DS), almost nothing is known regarding the contribution of the vestibular system to balance and its relationship to hearing loss. The purpose of this study was to determine the prevalence of vestibular dysfunction in individuals with DS and its relationship with balance and audiometric outcomes. It was hypothesized that there would be a higher prevalence of vestibular dysfunction in individuals with DS with sensorineural hearing loss (SNHL) than those without. It was further hypothesized that greater severity of vestibular dysfunction would be related to greater severity of SNHL and greater functional impairments. This study represents an important first step in characterizing the relationship between vestibular dysfunction, balance, and hearing loss in individuals with DS.

Methods: Twenty-seven participants with DS (mean age: 23.3; range: 7 to 38) and twenty neurotypical controls (mean age: 23.3; range: 7 to 47) participated. All participants completed otoscopy, audiometry (pure-tone average (PTA) of 0.5, 2, and 8 kHz thresholds), tympanometry, wideband acoustic immittance (WAI), air- and bone-conduction cervical and ocular vestibular evoked myogenic potential (VEMP) testing, and video head impulse testing (vHIT). Balance and gait testing included gait speed, Timed-Up-And-Go (TUG), and the Single Leg Stance (SLS) with eyes open and closed.

Results: In the 54 ears of participants with DS, 15 ears had normal hearing (mean PTA: 13.4), 8 ears had SNHL (mean PTA: 43.5), 15 ears had conductive hearing loss (CHL, mean PTA: 30.4), and 16 ears had mixed hearing loss (MHL, mean PTA: 36.4). In participants with DS, results showed present cervical VEMPs in 88% of ears (44/50), present ocular VEMPs in 80% of ears (40/50), and normal vHIT in 87% of ears (45/52). Overall, in participants with DS, 35.2% (19/54) of ears demonstrated some degree of vestibular dysfunction (i.e., absent cervical or ocular VEMP, abnormal vHIT). Compared to neurotypical controls, individuals with DS had significantly longer TUG scores ($p = .006$), slower gait speed in the fast condition ($p < .001$), and poorer balance in the SLS eyes open ($p < .001$) and closed ($p < .001$) conditions. vHIT abnormalities were more likely to occur with SNHL.

Conclusions: In this cohort of individuals with DS there was a large degree of variability in both the severity (normal to profound) and type (normal, SNHL, CHL, and MHL) of hearing loss. VEMP response rates increased with bone conduction stimuli, supporting the high prevalence of conductive components in individuals with DS and suggests that bone

conduction stimuli should be used when assessing VEMP. Overall, one third of individuals with DS in this cohort had some degree of vestibular dysfunction with a higher likelihood in those with SNHL.

POSTER 25

Quantifying Vestibular Perception in Vestibular Loss and Pediatric Populations

Choudhry, Bisma; Janky, Kristen; Patterson, Jessie; Fitzpatrick, Denis; Wagner, Andrew

Objective: The aim of this study was to determine whether vestibular perception (VP) could be reliably measured using a clinical rotational chair with minimal modification. It was hypothesized that: (1) individuals with vestibular loss (VL) would show worse VP, and (2) VP could identify sub-clinical VL in individuals who had "normal" vestibular function but exhibited functional deficits. Additionally, we sought to explore whether VP could be measured in children. We hypothesized that VP testing would be feasible in children aged 9 and older, though results would likely be more variable due to attentional differences.

Design: This study included 44 participants: 24 age-matched controls (mean age: 16.8, range: 9 to 45 years, 9 males) and 20 individuals with hearing and/or VL that were separated into the following two sub-groups: 1) hearing loss and normal vestibular function (n = 11; mean age: 14.4, range 9 – 23 years), and 2) hearing and VL (n = 9; mean age: 22, range 8 – 47 years). Of those with VL, 4 had unilateral VL (1 right, 3 left) and 5 had bilateral VL. Participants were recruited from the Human Research Subjects Core database at Boys Town National Research Hospital (BTNRH). Informed consent was obtained from all participants under a protocol approved by the Institutional Review Board at BTNRH (protocol 12-13-XP).

Results: Preliminary findings suggest that both functional outcomes and VP were poorer in participants with VL. Participants with VL required higher chair velocities to accurately detect the direction of yaw rotation. Interestingly, individuals with hearing loss but normal vestibular function also needed higher velocities for accurate detection compared to controls, suggesting possible sub-clinical VL. Additionally, the VP task was feasible in children aged 9 years and older, though their performance was more variable than that of adults.

Conclusion: All individuals with hearing loss, regardless of vestibular status needed higher chair velocities to accurately discriminate the direction of yaw rotation compared to typical controls. This finding in individuals with hearing loss and normal vestibular function suggests that VP testing may be more sensitive for identifying VL compared to standard vestibular assessments. The study also confirmed that VP testing is possible in children aged 9 and older, though results were more variable than in adults. Overall, VP testing using a clinical rotational chair could be a useful tool for detecting VL, including sub-clinical VL, and complement traditional vestibular function tests in both adults and children.

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POSTER 26

Reducing Artifacts in oVemp Testing: A Comparative Analysis of Ground Electrode Positions

Moore, Leila; Zsambok, Lily; Kobel, Megan

Enhanced amplitude of oVEMP responses has been seen with use of a reference electrode on the medial canthus (MC). Past researchers have found that the contralateral MC, relative to stimulus presentation, is not electrically indifferent and have proposed that amplitudes are enhanced due to the presence of inverted responses recorded from the MC. However, if the ipsilateral MC is also electrically indifferent is unknown. We tested 20 healthy female participants (ages 19–36) using an 8-channel evoked potential system. Each participant completed oVEMP testing with the active electrode placed at the infraorbital midline and three different reference positions: 1) ipsilateral MC, 2) contralateral MC and 3) high forehead (Fz). Configurations were also assessed using these three locations as the active recording site. Overall, responses were present in 28% of contralateral MC and 37.5% of ipsilateral MC recordings, which was not statistically significant ($\chi 2(1)=0.643$, $p=0.424$). Additionally, responses were present on 18% of recordings from Fz. Notably, only 60% of waveforms recorded from the MC were inverted. These results suggest that reference contamination may exist when using a reference electrode placed on the ipsilateral or contralateral MC and polarity of response may impact response amplitude.