



# Reserapport

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The IERASG conference was held this year in Köln Germany. Researchers and clinicians in audiology interested in evoked potentials met to disseminate and discuss researcher and trends in audiology as they relate to auditory evoked potentials. Topics ranged from clinical protocols for ABR, cortical potentials for speech discrimination in children, to the use of various evoked potentials for different research groups – concussions, tinnitus, cognitive decline, etc. For me, I was particularly interested in the more clinical discussions, but it was of course interesting to take as much in as possible.

Because the group was made up of such an international audience, I was excited to meet and connect with many different people. I had very enlightening discussions with researchers/audiologists from Serbia, New Zealand, Germany, USA, to name a few. Jenny Hatton and David Stapells were there who were instrumental for developing and maintaining the Early Detection and Intervention program in British Columbia. They have coordinated a universal program in Canada, where all babies are screened and then hearing loss is diagnosed with standardized methods for estimating the audiogram using ABR with tones bursts, all done within one appointment, and using telehealth for ABR. It was inspiring to see what they have achieved. British Columbia is a leader in developing evidence-based protocols for infant audiological diagnostics. They recently updated their protocol, which is available online (<http://www.phsa.ca/health-professionals/clinical-resources/hearing>).

While it will take a book to describe all the interesting topics and talks at the conference, I have written about some that really sparked my interest and insights that I believe are important to disseminate further.

### **1. My poster: Revisiting the passing criteria for transient-evoked otoacoustic emissions used for newborn hearing screening**

I presented a poster about newborn hearing screening results from children with and without hearing loss, who either failed or passed screening. A retrospective analysis of their transient-evoked otoacoustic emissions revealed that certain adjustments to passing criteria will improve the percentage of children with hearing loss who can be detected by screening, with only negligible consequences for the false positives. Interesting discussions were had with Siobhan Brennan, Beth Prieve, and other notable figures in the research community.

## **2. David Stapells presented on the work of the late Susan Small**

A large motivation for me to attend just this year's conference was to meet with and listen to Professor Emeritus David Stapells present on the professional life and research of Associate Professor Susan Small, who was my former teacher and masters supervisor for my 3 years Master in Audiology. Susan did everything possible for her students. She sent me to my first international conference, mentored me in writing two scientific journal articles as first author, and encouraged me to teach a course to masters students soon after I myself had graduated. She was instrumental in starting my research career.

David Stapells presented an overview of Susan's work, which centered mostly on bone-conduction hearing loss among infants. She focused a lot of her research on improving the clinical applications of using bone conduction for ABR and ASSR. For example, Susan first described that bone-conduction thresholds in infants were the same, regardless of if you use a headband or physically hold the transducer, provided that the clinician is trained on how hard to hold it. She also did a lot of work to develop the bone-conduction ABR protocols used around the world. For example, she showed that there is no occlusion effect for infants under 10 months of age and that infants have a 10 dB interaural attenuation, which allows us to bone-conduction ABR without needing to mask in many cases.

Further in Susan's work was her development of using the Acoustic Change Complex to measure speech discrimination in infants. It was clear that her work has had significant impact, as many students from around the world presented on similar topics.

## **3. Student Talks**

The student talks were enlightening to see for what the future trends might look like in auditory evoked potentials. The main trend is that students are really focused at looking at objective measures to predict auditory processing, such as speech perception and temporal resolution. For example, one student presented pilot data on the use of click trains and ABRs to measure the temporal resolution of the lower auditory system. Another student showed the best protocol for using the acoustic change complex, which she plans to now use in a large validation study to predict speech discrimination.

#### 4. Historical interviews

There was an interesting thing that was done at this conference. The clinical use of evoked potentials started in the early 1970s. Now, many of these researchers with so much wealth of knowledge and wisdom are growing older. So, they implemented a few sessions where they recorded and played recorded interviews with some retired leaders in the field. The first, was with Hillel Pratt. There were a couple of notable points in that interview. One was a discussion about the difference between interdisciplinary and multidisciplinary. The difference between that multidisciplinary includes individuals with multiple different backgrounds and knowledge coming together to solve a common problem or work toward a common goal. Interdisciplinary, on the other hand is either where one individual draws from multiple different areas (e.g., audiology is an interdisciplinary area), or that individuals work independently in a group. The other one was a discussion about implementation of electrophysiological methods into practice. Hillel made two reflections. First that this might be because evidence is lacking, and second because it requires the technique to be validated, which takes time and resources.

The next interview was with Jerry Northern and Deborah Hayes, which many may recognize from their work on the seminal textbooks in pediatric audiology. Some meaningful points from that research were first regarding the cross-check principle, which has been emphasized by both interviewees. Cross-checking is something that we do in many areas of audiology but is particularly important in pediatric audiology. There was some discussion about the historical statement by Jerry Northern about the gold standard of behavioural measurements, to which there were some objections about that this should be the one true measure of hearing function. Instead, a cross-check principle should be applied in which all pieces of a pediatric hearing assessment should confirm one another. For example, bone conduction and tympanometry, ABR with pure-tones confirmed with behavioural VRA, etc. Another meaningful point was in regard to the uptake of OAE and ABR so quickly into the clinical field and how other clinical diagnostic methods are so slow. The difference, they think, being the concurrent research about the need for earlier intervention. The need for a clinical tool needs to drive the uptake.

Finally, Barbara Cone asked the interviewees what they perceived as being the unmet challenges in the field of pediatric audiology. Deborah Hayes commented that we as audiologists and researchers should not lose sight of

what we are attempting to achieve with early detection and intervention, which is language development. Language development should be the principal goal for all discussion around early detection and intervention. Although I partially agree with this statement, I also disagree, because I think that the goal should not only be about language development. It is clear that we have come a long way with that goal in mind, but I think the focus should actually be on communication and quality of life. Language development of course plays a vital role in communication and quality of life, but it is not the only factor. A child may develop language like a normal hearing peer, but still struggle socially and academically if the listening situation at school or in their day to day lives are not optimally accommodated for their hearing loss and hearing technology.

#### **5. Kristin Uhler's keynote speech on using evoked potentials to predict language outcomes**

Kristin Uhler from the university of Colorado in Boulder discussed discrimination between speech sounds using evoked potentials. She brought up some important points that only about half of children with hearing aids are adequately fit to hearing threshold targets. She also mentioned that lower socioeconomic status regardless of hearing status lead to more missed appointments that lead to poorer outcomes. Kristin also reminded us about the 1-3-6 milestones – but she also mentioned that EHDl guidelines also say that once children are identified with hearing loss that hearing aids should be fit within one month, which is a benchmark that is often forgotten.

The motivation for her research is due to the large standard deviation in language outcomes for children who meet the 1-3-6 milestones. She referenced work by Anu Sharma who looked at the impact of CI implant age on the P1. Interesting the P1 in this group only falls in the normal range for children who are implanted under 3 years of age.

Why do we care about speech perception? Well we know that babies with normal hearing have in utero exposure to speech perception, and children are generally poorer at discriminating language as they get older. Children are universal language discrimination until age 4-7 months for vowels and 8-10 months for consonants. The age of hearing aid fitting is important, but also the amount of hearing aid wear time. Surprisingly the average time for hearing aid use is 4 hours, on average for babies, which varies substantially from one baby to another. Also, Kristin Uhler discussed listening environment. Infants and young children who are in day care are exposed to difficult listening environments.

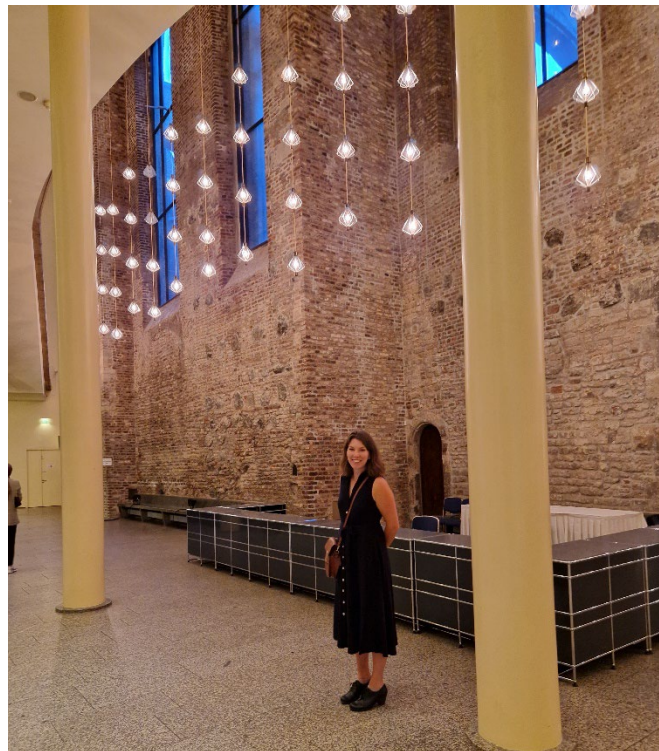
The studies presented discussed the use of auditory-evoked potentials to predict later speech development. First the question was which potentials to use? In their lab, they tested both the acoustic change complex and the mismatch negativity response and found, if they used some different filter settings (1-18 Hz) than typical, they could get a very nice MMR on sleeping infants. The acoustic change complex was not as clear, but Kristin postulated that it might actually be useful and predict different aspects of language processing, but more research is needed to be done about this.

Describing their experiment, Kristin and her colleagues recruited infants with permanent bilateral hearing loss from mild to severe hearing loss and no additional disabilities. Again, surprisingly, the infants tested in this study were sleeping. They first looked at the alpha band response using aided and unaided to ensure that the MMR measures audibility by comparing the deviant response for children with mild and moderate hearing loss, aided and unaided. Based on this check they concluded that this measure could indeed predict audibility using the stimuli used. Ba/da (consonant discrimination) and a/i (vowel discrimination).

Next, the question was, can the MMR predict later speech discrimination? This is interesting because MMR is not a measure of perception, it's a measure of encoding. Kristin Uhler has looked at high-frequency brainwaves and the MMR to answer this question. She compared then behavioral speech discrimination between the two speech sounds using a head turn task at around 9 months of age. The outcomes were classified into class based on the level of the outcomes of each indicator (predictive which was the MMR and the target which was the head-turn task). The MMR predicted the head-turn by 73% accuracy. If one were to widen the classification criteria somewhat, then the accuracy would increase to 92%. Finally, these two tasks were compared to words produced, and significant correlations were observed with the MMR for a/i and ba/da. This was the case for both children with hearing loss and (interestingly) children with normal hearing. Surprisingly, MMR predicted this language outcome for normal hearing children. The question remains, who are these normal hearing kids that fall in the lower ends of the correlation curve? More research will be done, and perhaps a new tool will develop that can be used to predict language delays in childhood.

## 6. Social events

Dinner at the historical Gürzenich wine-cellar was a highlight where Susanne Purdy distributed a number of comical awards, including the “conciseness award” - the person with the abstract that went the furthest over the word limit, the “punctuation award” – the person who used the most unusual punctuation marks, and the “time award” - the person who was furthest away from keeping their presentation within the time limits. A wonderful dinner was served accompanied by music and even a sign-language choir. Finally, a concert at the Cologne Cathedral rounded out the social calendar with an exclusive concert by the girl’s chorus of cologne.



*Entry to the historical Gürzenich wine-cellar*

Thank you very much to NAS for funding this trip to Köln to participate in this conference!

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