



# HEAR-ECO E-newsletter

## January-May 2021

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### Introduction

This will be the final newsletter of the HEAR-ECO project, as December 2021 will mark the official end of the European Research Council's MSCA HEAR-ECO project, and some of the ESRs will leave the project soon. But do not despair, HEAR-ECO activities will still continue for a while! ESRs connected to the University of Nottingham (Defne Alfandari, Sergio Aguirre and Tirdad Seifi Ala) will be finishing up their theses and the VU University medical center ESRs (Bethany Plain, Patrycja Książek and Hidde Pielage) will continue for at least another year of research.

In this newsletter, we cover what has happened in the period since the previous newsletter, look back at the past three years and look towards the future. But first, the ESRs would like to express our appreciation to everyone who made this project possible and gave us support throughout the project. Firstly, a huge thanks to the consortium (including all supervisors) for giving us this opportunity and helping us find our way as researchers. Furthermore, our thanks go to all supporting staff of the VUmc, UoN Glasgow and Eriksholm for their help with our experiments, analyses and/or international administration. We would like to express our gratitude to those who participated in our studies. And last but not least, a heartfelt thanks to all colleagues who gave us warm welcomes and supported us throughout the project.

During three years of HEAR-ECO a lot has happened! Spread over the 6 ESRs, there have been:

- 12 international moves;
- 4 network-wide training events;
- 19 conferences attendances;
- 6 HEAR-ECO studies, in which roughly 230 people have participated;
- 7 lockdowns across the three countries;
- 8 bikes bought;
- 555 GB of data collected;
- 2 (and one delayed) marriages;
- and 5 first-author publications by the ESRs (more to come!).

## Network-wide training events

During the first half of 2021, two network-wide training events were held, HEAR-TRAIN 3 and 4. In both cases, the ESRs, project seniors and invited presenters met on Microsoft Teams. The ESRs would like to extend their thanks to those involved in organizing and providing content for both HEAR-TRAIN 3 & 4.

### **HEAR-TRAIN 3**

**Dates:** 8<sup>th</sup> - 29<sup>th</sup> January 2021

**Place:** Microsoft Teams virtual meetings

**Involved:** All ESRs & seniors (organized by Lauren Hadley and Gabrielle Saunders)

**External presenters:** Adele Horrobin, Bob Carlyon, Claudia Freigang, Henrik Schmidt, Lucie Whitfield, Mel Lough, Merete Hartvig Petersen, Padraig Kitterick, Sam Couth, Søren Laugesen, Tony Simmonds

In HEAR-TRAIN 3, the programme covered “planning your career”, “becoming an engaging presenter” and “understanding research”. The ESRs learned about career prospects in both academia and industry after the PhD stage. Thanks to the efforts from the organizers, the ESRs had an opportunity to listen to stories from successful people in various relevant careers. Furthermore, the ESRs discussed traits of engaging presentations and practised presenting their work in laymans terms to a Public Patient Involvement Panel. Finally, the ESRs learned more about the inner workings of research, that is, publishing, open science and critical thinking when interpreting findings. It was a very interesting, enriching and fun event!

### **HEAR-TRAIN 4**

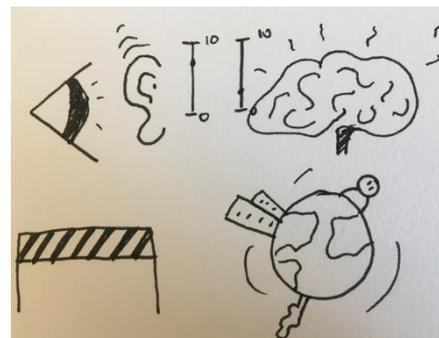
**Dates:** 26<sup>th</sup> April - 27<sup>th</sup> May 2021

**Place:** Microsoft Teams virtual meetings

**Involved:** All ESRs & seniors (organized by Adriana Zekveld)

**External presenters:** Lotte Proot, Neeltje Peters, Trevor Cox

HEAR-TRAIN 4 was the final planned network-wide event and therefore an opportunity to internally disseminate the work done within the HEAR-ECO project. All ESRs were given a timeslot to present a summary of their PhD work. An impressive number of insights were generated in the past three years! Beyond this knowledge sharing, HEAR-TRAIN 4 also contained interesting training sessions. For instance, the ESRs and seniors learned how to use drawing to optimise scientific communication, and also listened to a fascinating talk about acoustic phenomena. If you want to know where on earth one can listen to singing sand dunes, just ask a member of HEAR-ECO!



**Figure 1.** Example of drawing to convey the concept of listening effort!



Figure 2: Screenshot from HEAR-TRAIN 4, following presentations by Defne, Patrycja and Sergio

## Other announcements and events

### New Publication

The publication resulting from the groundwork completed by Patrycja is now available online in Trends in Hearing! Patrycja’s work explores various methods of analyzing pupillometry data collected during listening tasks. Read all about it here:

<https://doi.org/10.1177/23312165211009351>.

Trends in Hearing  
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Original Article



#### Effect of Speech-to-Noise Ratio and Luminance on a Range of Current and Potential Pupil Response Measures to Assess Listening Effort

Patrycja Książek <sup>1,2</sup>, Adriana A. Zekveld<sup>1</sup>, Dorothea Wendt<sup>2,3</sup>, Lorenz Fiedler <sup>2</sup>, Thomas Lunner<sup>2</sup>, and Sophia E. Kramer<sup>1</sup>

#### Abstract

*In hearing research, pupillometry is an established method of studying listening effort. The focus of this study was to evaluate several pupil measures extracted from the Task-Evoked Pupil Responses (TEPRs) in speech-in-noise test. A range of analysis approaches was applied to extract these pupil measures, namely (a) pupil peak dilation (PPD); (b) mean pupil dilation (MPD); (c) index of pupillary activity; (d) growth curve analysis (GCA); and (e) principal component analysis (PCA). The effect of signal-to-noise ratio (SNR; Data Set A: -20 dB, -10 dB, +5 dB SNR) and luminance (Data Set B: 0.1 cd/m<sup>2</sup>, 360 cd/m<sup>2</sup>) on the TEPRs were investigated. Data Sets A and B were recorded during a speech-in-noise test and included TEPRs from 33 and 25 normal hearing native Dutch speakers, respectively. The main*

### Sue Watson competition winner

Sergio, Tirdad and Defne recently presented their research at the annual Sue Watson competition at the University of Nottingham. The Sue Watson Postgraduate Presentation Prize is given out after an oral presentation which postgraduate research students do between the 18-to-24-month stage of their studies. The presentation is made to an audience of fellow research students, supervisors, and other researchers from the School of Medicine. The presentations are marked by a panel of judges and cash prizes are awarded for the best presentations. They are also an opportunity for students to organise their data into a form which can be presented to their peers under formal conditions. Tirdad won the 1<sup>st</sup> prize in the competition. Big congratulations, Tirdad!



## **Future of Hearing Healthcare conference**

**Date:** 17<sup>th</sup> & 18<sup>th</sup> March 2021

**Place:** Online

**Involved:** ESRs Bethany and Patrycja

This was an online conference covering a broad range of topics, showcasing the developments and technological advances that are predicted to shape hearing healthcare in the next 10 years. The most relevant of these for HEAR-ECO was a talk about biometrics in Hearing Health from a company named Valencell. They have implemented a photoplethysmography (PPG) sensor into an ear level wearable device, which measures various different parameters, including the heart rate, from the wearer. With an interest in physiological signals and measuring in more ecologically valid settings, this talk was very interesting and had a clear overlap with HEAR-ECO! We also heard from various hearing aid manufacturers about novel advances in voice tech integration, deep neural networks in sound scene analysis and upcoming hybrid hearing device / headphone technology. Beyond hearing devices, other topics ranged from gene therapy and hair cell regeneration, to telehealth hearing rehabilitation apps and multisensory integration using auditory and vibrotactile information. It was inspiring to hear about all the ongoing innovation in our field; it is clear that we are entering a really exciting phase of technological developments in hearing healthcare.

## **Upcoming virtual reality experiment**

**Date:** June 2021 onwards

**Place:** VUmc, the Netherlands

**Involved:** Hidde and supervisors

During the final year of the project, Hidde will set up a new study which utilizes Virtual Reality (VR) technology. This project will be a continuation of his work on the effects of social context on listening and listening effort (first paper out, see the previous newsletter!). This time though, the social context will be added virtually, instead of an addition of real people to the speech perception task. This will cost less resources and give the experimenter more control of the social context manipulation. However, several technical hurdles must first be cleared before this experiment can come to fruition.

The main aim of the study will be to replicate findings from the 'physical' setups that have been used before to assess the influences of social context on speech perception. Hidde will focus on pupil size measures as he did before. Bethany will also weigh in on the project by adding cardiovascular measures to the experiment. Bethany and Hidde have worked on a combined study before, providing them with prior experiences on the combination of pupil and cardiovascular measures, which is vital to make good design choices.

Below are some of Hidde's thoughts on the project:

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*"If you think about it, the whole of HEAR-ECO is about ecological validity. That is, the project is concerned with a speech perception testing tool that accurately reflects real-life speech perception abilities. What tool is better than VR to approach realism from the lab?"*

*Designing the study was (and still is) a fun challenge. I am developing the study in Unity and had to teach myself about the basics of game design. For me, this was a very different way of programming and problem solving which I had to get used to. However, as I see it, game engines such as Unity open up many possibilities for research.*

*It is exciting for me how new and novel this study is. For starters, adding a social context to speech perception tasks had already rarely been done. Then, using VR in audiological tests is not exactly common. And then we top it off by measuring the pupil size as an index of cognitive load, which has not been done in VR research a lot either. While taking such a novel approach is exciting, this also means there are a lot of unknowns. For example, we will have to assess if a VR speech perception task is even an adequate alternative to standard tests before we start introducing a social context.*

*We will start 'small'. With that I mean that we will start with simple visuals and a lab-like virtual setting, nothing too fancy. This defeats the ecological validity argument a bit, but we cannot start out with participants freely walking around and interacting with virtual people. Besides the technical requirements for such a virtual environment growing exponentially, too many variables will be introduced at once, we won't know what is happening. First, we must know if we can replicate our earlier findings in VR. In the future more complex scenarios can be considered."*

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Testing is planned to start in June. This will be the last experiment conducted under HEAR-ECO.

## Reflections from the ESRs, as HEAR-ECO draws to a close

- **Tirdad:** I have had a wonderful 3-year journey in HEAR-ECO. I came to the project expecting to grow only in my respective field, but the project offered me much more. It gave me a lot of new opportunities for learning and growth in the field of auditory cognition and hearing aids. After 3 years, I look back and see how far I have come since the day I heard of my acceptance in the project. It was not just the scientific aspect that made HEAR-ECO an appealing experience. We had a lot of fun, too! For me, traveling to Amsterdam for HEAR-TRAIN 1 was probably the best experience in HEAR-ECO. We had workshops, courses, presentations, climbing trees, bowling and much more. It was a great event that helped us bond socially. These 3 years were filled with many more good experiences and I will always cherish being part of this group.
- **Hidde:** I was actually surprised about the attention that my work has received. What started as an odd little idea (adding multiple people to a speech perception test) was well received by a lot of people. I am hoping that my work sparked interest into a social cognitive psychology perspective in audiological research. As for myself, my interests are always many and far apart, who knows what I will be doing next.

- **Patrycja:** The past three years in the HEAR-ECO project were intense, yet thrilling. At the end of the project, a few themes come to mind when describing the experience: a unique perspective into diverse research environments, exciting and multidisciplinary research as well as work that goes beyond individual effort. Working in such a multidisciplinary group has provided lots of growth opportunities in communicating my own research, yet it also showed that often we need multiple divergent perspectives to explain complex phenomena (in here, listening effort). Finally, I'm extremely happy to have met great colleagues in the project and I surely hope to stay in touch with fellow ESRs after the project's end!
- **Sergio:** Throughout these three remarkable years in the HEAR-ECO project, I had gathered so much more than what I expected when initiated in the project. The multidisciplinary and multicultural environment, as well as the project's inherent integration with industry created a fertile ground to learn a lot about auditory cognition, social hearing, and acoustics. Although, undoubtedly, the most important part was acknowledging that hearing science is much more than just hearing devices and technology. Hearing science is based on real people and their daily needs. I will carry many good moments with me, especially with the other ESRs that I can today refer to as my friends. Certainly, the project has accelerated our careers as researchers and bonded us with this spectacular team of supervisors and project supporters.
- **Bethany:** It's hard to believe that HEAR-ECO is ending! It's been a real pleasure to be part of the project, working with world-renowned researchers and contributing to a field that is so important and relevant in hearing healthcare. There have been some steep learning curves along the way, but with my fellow ESRs' and supervisors' guidance I have grown and developed new skills (yes, MATLAB, I'm thinking of you!). Thanks to everyone involved in the project for your warmth, support and patience!
- **Defne:** Working between audiology and (neuro)psychology, between UK and Denmark, and between industry and academia has given me unique opportunities to develop both personally and professionally. I feel grateful to have been part of this innovative training program.

## Closing remarks

Well, reader, we've reached the end of the final HEAR-ECO newsletter! Thank you for supporting the project. We look forward to sharing more of our findings with you in the coming months and years, as the work is published. Here's to HEAR-ECO!

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