

Report on Workshop 1 (September 1/2 2021)

Online workshop Hosted by University of Leeds, directed by Dr Alinka Greasley

Introduction

This was the first workshop in the AHRC-funded Aural Diversity Network's two year programme of events. The theme was Hearing Care and Hearing Technologies (full details available at <https://auraldiversity.org/workshop1.html>). The main focus was on how hearing care and hearing technologies currently address hearing differences, and how they might be improved in the future in an interdisciplinary context that includes the arts and humanities alongside technical and scientific fields.

The workshop took place online, as agreed by all the core partners in the light of travel restrictions and other factors related to the pandemic. Zoom was used as a conferencing platform. All discussions and presentations used automatically generated captions. BSL interpreters were present throughout and signed every presentation and discussion.

Future workshops will take place at intervals of 4-5 months, as follows:

- Workshop 2: Hearing Sciences and the Arts and Humanities (University of Nottingham, **13-14 January 2022**. Led by: Prof David Baguley)
- Workshop 3: Acoustics and Psychoacoustics (University of Salford, May 2022. Led by: Prof Bill Davies)
- Workshop 4: Soundscape and Sound Studies (Goldsmiths, University of London & Queen Mary University of London, September 2022. Led by: Prof John Drever/Prof Josh Reiss)
- Workshop 5: Music and Performance (University of Leicester/Attenborough Arts Centre, January 2023. Led by: Prof Andrew Hugill)

In addition, there will be 'catch-up' events, spaced between the workshops to enable people to reconnect, update on their current activities and contribute to the ongoing development of the network. The first catch up session will be **10am-12pm Friday 26th November 2021**.

Participation

The workshop was attended by 66 participants who came from a wide range of backgrounds and disciplinary areas, including: audiology and hearing therapy, audio engineering and technology, hearing sciences, soundscape and music, sociocultural and historical studies, disability studies, acoustics and psychology, literature and humanities, and more. This group have been brought together steadily since the Aural Diversity conference at the University of Leicester in 2019, led by Professor Andrew Hugill who is leading the network. A mailing list has been set up, with 139 members (as of Sept 2021) which provides a channel through which to keep interested parties and stakeholders involved in the ongoing work and events. Anyone with an interest in Aural Diversity can join, and so please pass on the word and get them to contact us if they are interesting in joining the network (info@auraldiversity.org).

Programme

The programme is reproduced in Appendix 1 and is available on the project website (https://auraldiversity.org/Workshop_1_programme.html). The papers were provided in response to a call. The programme features speakers from a wide variety of backgrounds and academic disciplines, as outlined in the descriptions below. In addition, the programme contained "introduction" sessions which gave participants an opportunity to present less formally about themselves. These arose from a similar exercise on the email list which provoked much engagement. All presentations were interpreted by BSL interpreters. Live captions were provided automatically by the built-in zoom tool. All presentations and introductions were recorded and will be shared on the website and via social media.

Day one

The first day started with contributions from the core team. **Andrew Hugill** talked about the development of the Aural Diversity project, its aims and core partners, and how his personal journey with Meniere's Disease kickstarted him thinking about hearing difference. **John Drever** then discussed how he came interested in the concept of 'aural typical', drawing on examples of how his children reacted differently to handdryer noise in public toilets, and his subsequent focus on hearing sensitivity in different contexts. **Alinka Greasley** discussed her work exploring the effects of hearing impairment and hearing aid technology on people's experiences of music, and the ways in which healthcare professionals can use project insights to inform their clinical practice. **Josh Reiss** asked the question 'just how good can hearing be?' and discussed research exploring whether we are able to distinguish between 'high resolution' and 'standard' audio, and various audio engineering projects he was working on. **Bill Davies** then posed the question 'why do some things sound good and others don't?' and discussed how many disciplinary fields, including acoustics where his expertise lies, assume that people all hear in the same way, and the importance of challenging this with the network.

After these core team introductions, **Graeme Gooday** and **Karen Sayer** took us back in history to understand how hearing loss was perceived and managed in the late 19th and early 20th century. They emphasised that the development of hearing aid technology as a 'technical fix' for aural diversity did not address the complex and diverse range of experiences among deaf people, and that technology often made things worse (e.g. invention of telephony). This was followed by a talk by **Heather Dowber** on the latest hearing aid technology from GNResound who emphasised that our ears are as unique as our fingerprints and that technology should not standardise. She discussed recent hearing aid design modifications, such as placing the receiver and microphone in the ear canal to achieve enhancements in sound quality and localisation, greater noise reduction and reduced listening effort.

After these talks, network members were invited to say a few words about themselves. **Ed Garland** told us about his doctoral work exploring the ways in which contemporary authors represent sound in their writing, and about plans for future projects exploring how reading about sound can change a person's experience of their hearing (e.g. tinnitus). **Kai Siedenburg**, Principal Investigator of the music perception and processing lab at the University of Oldenburg discussed his work on musical scene analysis and synthesis for hearing-impaired listeners, which includes a focus on individual differences in perception and processing. **Phil Coleman**, who has expertise in sound engineering, music production, composition and performance described his interests in psychoacoustic engineering, perceptual modelling, sound personalisation and object-based audio. **John Kannenberg**, Director and Curator of the 'museum of portable sound' discussed the work he had been doing to expand the way in which people think about sounds and about his interest in hearing

sensitivities. **Trevor Agus**, from Queen's University Belfast asked 'what features and cues do we use in everyday situations?' and how is this impacted by hearing loss? He also pointed out that he enjoys creating stimuli for controlled listening experiments. **Will Renel**, sound artist and researcher at the Royal College of Art described his interests in documenting the ways in which sounds make people feel included or not, in what the term 'aural diversity' means for design, and how design influences people's auditory experiences. **Ricardo Huisman**, a community sound artist, described his work involving walkthroughs and sound journeys and his emphasis on making art that is accessible for differently abled people.

During the afternoon, **Peggy Syllopp** introduced her 'LikeToHear' project in which she had developed a self-adjustment prototype hearing aid which enabled listeners to adapt certain parameters (e.g. gain, compression) in real-time. She emphasised that gain preferences of individual listeners are not well understood, that behaviour cannot be predicted by audiograms and generalising algorithms, and that further study is needed to assess adjustment of parameters that improve hearing experiences. **Ros Parker**, an audiologist at University Hospitals Birmingham NHS Trust gave a talk about the development of their Patient and Public Involvement group ('PANDA') and how this operated during the pandemic. The group, who contribute to hearing research in various ways (e.g. review study activities, co-applicants on funding bids), is made up of aurally diverse members and Ros spoke of the ways in which they had ensured accessibility with online formats, including technical support and speaker training to ensure members could continue to have their voices heard.

The final session was led by Alinka Greasley, joined by Ros and also **Eleojo Miachi**, Deputy Head Audiologist and Rehabilitation Lead at East Kent Hospital University NHS Trust. The discussion centred on how audiologists currently address hearing difference in clinic, and what changes might be made in the future to improve patient experience. Both audiologists emphasised the need to treat everyone individually, and the importance of history taking and listening carefully to patient priorities and difficulties, though there was acknowledgment of time pressures (e.g. patient numbers, duration of appointments) that can make this challenging. This session also critically discussed the limits of pure tone audiometry (PTA) for assessing hearing, and the possibilities of doing additional tests (e.g. OAEs, acoustic reflexes, speech testing) as a baseline for all patients. Changes to audiological practice as a result of the pandemic (e.g. telecare, flexibility over appointment times) had brought about a welcome shift towards patients having more of a driving role in their own care. Another welcome shift was that NHS audiology departments are starting to introduce hearing aids with Bluetooth/app functionality. This gives patients enhanced control over their hearing aid settings which has been associated with improved listening experiences.

Links to recordings

Day One Part 1:

https://universityofleeds.zoom.us/rec/share/Eobe3wU6BvbS3N2FqEQyxfEXV8FzFtZjg4XonfzIPXAQVuOpJqjbml83DN60tBt9.w7_2fiZX50PKMMnU?startTime=1630486644000

Day One Part 2

https://universityofleeds.zoom.us/rec/share/Eobe3wU6BvbS3N2FqEQyxfEXV8FzFtZjg4XonfzIPXAQVuOpJqjbml83DN60tBt9.w7_2fiZX50PKMMnU?startTime=1630500481000

Day two

The second day started with a ‘coffee and chat’ session that turned into an inspiring conversation about the impact of sight loss on auditory experience. We were joined by **Hugh Huddy**, who had developed a visual impairment in his twenties and described a long process of adaptation to his condition (‘like a tree growing round an obstacle’) and the importance of different types of listening. **John Drever** led a sound walk around Whitechapel in London and Hugh was on the walk. John noted that Hugh appeared to be listening in a more existential way than others. Hugh noted frustration that the sound walk focused on aesthetic listening, and pointed out that whilst the *aesthetics of sound* was one function of his listening, *seeing through sound* including vigilance, tracking where people were and the reflection of sound (e.g. traffic to map location in physical space) was an essential mode of listening.

Our first speaker was **Lena Batra**, a hearing therapist with over 20 years of experience. She described how undergoing hearing therapy when she was younger enabled a shift in perspective from seeing her own hearing loss as an ‘unwelcome visitor’ to accepting hearing loss as a part of her life. She outlined case studies to describe her approach to her own practice which included taking the time to understand what the hearing loss diagnosis meant to a person (acknowledging that people respond in very different ways) and helping them to identify and develop skills to manage everyday environments. We then had a music-focused hour. **Matthew Frost** described his experiences of becoming a professional percussionist and drummer with a hearing impairment. He highlighted particularly memorable reactions from people as he was developing (e.g. being told to remove his hearing protection in an audition for music college, a conductor shouting ‘are you deaf’? across the orchestra) and the impact these on his development, critically discussed the lack of education about hearing health for developing (e.g. school, college) musicians, and outlined how his experiences had led him to pursuing a career as an audiologist. **Samuel Couth** then outlined the low incidence of hearing protection use among musicians, and described a recent project which investigated barriers to and facilitators of hearing protection use among early-career musicians, and employed a specific framework, the ‘Behaviour Change Wheel’ to analyse the musicians’ responses and develop intervention strategies to increase uptake and sustained use of hearing protection.

After these talks, delegates were encouraged to have transdisciplinary conversations in breakout rooms, and to devise potential research questions/topics they considered important for the development of the network. Each group recorded responses on padlet which can be accessed here (www.padlet.com/a_e_greasley/opdt9m2ww6q70y7h).

During the afternoon, **Angeliki Mourgela** outlined limitations of existing approaches to broadcast audio for people with hearing loss (e.g. HAs restore audibility but not intelligibility, subtitles may detract from experience) and discussed her innovative doctoral research to develop and automate an effective audio mixing model for enhancing broadcast audio. **Douglas MacCuthcheon** then posed the question ‘how can we address aural diversity when designing learning environments?’ explaining the effects that poor classroom acoustics can have on children’s learning and discussing potential solutions (e.g. sound-absorbent ceilings) in classroom settings. Of course, such spaces should be designed correctly in the first place, and it was acknowledged that architects and designers could learn from acousticians, the sort of interdisciplinary working that the network is seeking to foster.

The final session was a plenary session led by **Andrew Hugill** and **Alinka Greasley**. Reflecting on the two days, Andrew emphasised that we had met a core aim – to bring together researchers from a wide range of disciplines – and noted that there was general

agreement that these disciplines all benefit from the idea of Aural Diversity. There was discussion of constructing an infographic of ‘hearing types’ for the website, similar to an infographic developed by Andrew and Prof. Peter Rea (Leicester Royal Infirmary) on balance spectrum disorders (<https://www.balancedisorderspectrum.info/spectrum.html>), or perhaps a manual of different hearing types written in an accessible style. Building on this, it was suggested that the website could host some testimony of *lived experiences* of different hearing types to promote awareness and sharing of experiences among the general public, with the broader goal of changing attitudes and societal views of hearing difference. There was then a general discussion of stigma associated with hearing loss (in contrast to sight loss) as a widespread issue in society. This is particularly problematic among certain occupational groups (e.g. rail workers, bus/train drivers, military personnel, musicians) who are more likely to hide their hearing loss, and strategies for reaching these groups were discussed.

Links to recordings

Day Two Part 1:

<https://universityofleeds.zoom.us/rec/share/dboWFV7uiPQgrUbEB9Nzd7YhG1eflrBPLfZfhE1c7pIl6T1F4h09qc2vbxV0551i.ZSx8xvuoOdlbIDfc?startTime=1630575157000>

Day Two Part 2:

<https://universityofleeds.zoom.us/rec/share/dboWFV7uiPQgrUbEB9Nzd7YhG1eflrBPLfZfhE1c7pIl6T1F4h09qc2vbxV0551i.ZSx8xvuoOdlbIDfc?startTime=1630592969000>

Outcomes

An important outcome was a set of potential research questions which will undergo further development as the workshops unfold. Responses to the transdisciplinary chat were diverse, but when combined with some questions that the core team derived before the first network event, it is possible to identify some broad themes:

Defining Aural Diversity

How should aural diversity be conceptualised and theorised? How is aural diversity best characterised – a taxonomy, network, spectrum, or something else? Where are the commonalities and differences found? Can we develop an acceptable set of terms to describe aural diversity? Can we agree on a common language and words to describe concepts? If we are all truly aurally diverse, and those with ‘normal’ hearing still experience the sonic world differently, then can we characterise this? Can we describe categories of hearing?

Methods for studying Aural Diversity

What new interdisciplinary methods are needed to study aural diversity? Can new model listeners and new models of listening be developed? What hearing differences matter? All of us hear differently, but do some hear more differently than others? Are there some measurable differences that do not matter so much? Are there more consequential differences that do not show up on standard tests? How do we decide which differences are most consequential? Is the audiogram as it currently stands the most effective way of discussing hearing difference with patients? Should research be done to reinvent the audiogram? Could developers make a more open system instead of a closed proprietary hearing aid?

Perceptions of Aural Diversity in different disciplines

How is aural diversity perceived in disciplines that deal with sound and hearing and how should they change to accommodate it? How can the acoustic design of places and products be improved for a diverse population? How can we improve hearing care through increased understanding of different needs? How can machine listening and AI broaden to reflect aural diversity? How should music-making work better for aurally divergent people?

Lived experience of Aural Diversity

What does it mean to be aurally divergent? Who is aurally divergent, and what are their biggest problems and surprising advantages? How can new knowledge of aural diversity be used to improve accessibility, inclusion and equality? What standards are needed for aural diversity inclusion in a range of sectors, including environment, health, labour, and the creative industries? How and where will aural diversity be celebrated?

How best can we make someone experience the auditory world of someone else? How can we listen through someone else's ears to inform audio production/ awareness?

Evaluation

The workshop was viewed as a great success, with much feedback received, for example:

"I just wanted to say a huge thank you for the event last week. It was very engaging and interesting and I was delighted to be a part of it and look forward to the continuation and development of the network. It was a pleasure to be involved and I commend the hard work and effort taken to host the event". (Rosalyn Parker, Research Audiologist, Birmingham University Hospitals PPI).

"Please pass my thanks to everyone who helped to bring Aural Diversity 1 and 2 Sept together I found it a really engaging and fruitful experience. The speakers created some of the most interesting and well-crafted presentations I have come across" (Hugh Huddy, RNIB).

"I found it so informative and interesting and such a worthwhile group. It was an honour to be part of it." (Katie Davenport, Senior Audiologist, Airedale NHS Foundation Trust)

"I enjoyed the workshops got lots from it. Looking forward to the next one." (Ele Miachi, Deputy Head Audiologist, East Kent Hospital University NHS Foundation Trust)

Lessons learnt

We provided British Sign Language interpretation to ensure that the event was fully accessible, though it was not clear how many people needed this. Furthermore, despite pinning the interpreter videos on the Zoom main screen throughout, the 'speaker view' recording only picked up the main speaker, and therefore the interpretation was not captured on the recordings. For future events, we need to establish earlier whether anyone requires sign, and set up the recordings differently.

We had planned to use Otter AI Business live captioning software but were not able to secure this in time for the event, and therefore relied on built-in Zoom captioning. This is not sufficiently accurate for an event of this kind. We will trial the Otter AI software for the next event, and then make a decision about its quality before making a decision about workshop 3.

We ‘pinned’ speakers to the main screen during Q&A and plenary sessions, so the audience could see several speakers simultaneously but this did not show up on the recording as intended. In future events, it is preferable to have all panellists contributing on screen.

There were some issues for a visually-impaired participant and in future we will require all speakers to provide text-only versions of all slides, to make it easier to use e-readers.

Finally, we will ask delegates to complete an evaluation survey at the end of a workshop 2.

Action Points

A number of suggestions for future actions were made during the Workshop. Two in particular were subsequently agreed by the core team as needing further action:

1. A programme of interim meetings to give network members opportunities for further informal discussion. It was AGREED that the first of these would be scheduled for November 2021 and would take the form of a 2 hour themed session.
2. The creation of an interactive infographic laying out the field of aural diversity. There was considerable discussion about the scope and implications of this. It was AGREED that PI Hugill would begin development of the infographic and share it with the core team for comment, following which he would undertake more work. Once it has reached a satisfactory state, it will be shared more widely with the network.

Appendix 1

Aural Diversity Workshop 1 Hearing Care and Hearing Technologies 1-2 September 2021

Wednesday 1st September

GMT (London)	
10:00-11:00	Introductions (core team) Principal Investigator: Andrew Hugill + Davies, Drever, Greasley, Reiss
11:00-12:00	Alternatives to technocratic audiology - a historical survey Graeme Gooday and Karen Sayer University of Leeds and Leeds Trinity University, UK
12:00-12:15	Coffee break
12:15-12:45	Keeping Human Intelligence at the Heart of Innovation Heather Dowber GN ReSound
12:45-13:30	LUNCH BREAK
13:30-14:15	Introductions (network members)
14:15-14:30	Coffee break
14:30-15:00	liketohear - qualitative study on individual sound adaptation behaviour Peggy Syllopp and Jan Rennies-Hochmuth sincEARE and Fraunhofer IDMT
15:00-15:30	Delivering Hearing Research and Patient Involvement during Covid-19 and Beyond Rosalyn Parker & PPI member (tbc) University Hospitals Birmingham NHS Foundation Trust & PANDA PPIE Group
15:30-16:00	Discussion: Addressing aural diversity in clinical practice Various healthcare practitioners: Ele Miachi, Ros Parker Chair (Alinka Greasley)

Thursday 2nd September

GMT (London)	
10:00-10:30	Coffee and chat
10:30-11:00	Beyond the audiogram; 3 people...3 stories Lena Batra, Hearing therapist, educator and advisory consultant London, UK
11:00-12:00	"Are you deaf?" A personal reflection from music industry to audiology clinic. Matthew Frost Harley Street Hearing, London UK
	"I think it's really important to protect your hearing, but...": Identifying barriers to hearing protection use in musicians and developing interventions using the Behaviour Change Wheel Samuel Couth (et al.) Manchester Centre for Audiology and Deafness, School of Health Sciences, University of Manchester, UK
	Discussion: approaches to musicians' hearing healthcare Alinka Greasley (Chair), Matthew Frost, Samuel Couth
12:00-12:15	Coffee break
12:15-13:00	Transdisciplinary chat: developing research questions Breakout rooms
13:00-14:00	LUNCH BREAK
14:00-14:30	Perceptually motivated, automated broadcast audio mixing for hearing loss Angeliki Mourgela Queen Mary University of London
14:30-15:00	How can we address aural diversity when designing learning environments? Douglas MacCuthcheon Saint-Gobain Ecophon UK
15:00-15:15	Coffee break
15:15-16:00	Plenary Discussion: Future Developments Chairs (Andrew Hugill, Alinka Greasley)