Hearing Aids for Music
Exploring the music listening behaviour of people with hearing impairments
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Principal Investigator

Talk outline
• Aims
• Methods
• Challenges
• Strategies
• Project outputs

Some observations...
• Music listening and performance is ubiquitous in society and fulfils various functions (Sloboda, Lamont & Greasley, 2009; Salimpoor et al., 2013)
• Musical engagement can have significant health and well-being benefits (MacDonald, Kreutz & Mitchell, 2012)
• More research on music perception with a CI than HA (Tozer & Crook, 2012)
• Hearing aids are designed for speech – acoustical properties of speech and music differ (Chasin & Russo, 2004)
• Deaf musicians report difficulties listening to and performing music with their HA technology (Fulford, 2013)

Aims
• Explore how music listening experiences are affected by mild, moderate, severe and profound deafness and the use of HA technology
• Provide evidence of the issues currently affecting HA users with regard to music listening so that technical improvements can be targeted at particular difficulties and listening settings

AHRC funding application
Alinka Greasley (PI)
Associate Professor of Music Psychology
Harriet Crook (Co-I)
Lead Clinical Scientist for Complex Hearing Loss
Robert Fulford (PDRF)
Research Fellow in Music Psychology

HAFM team
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Project team

Core team
- Adinka Greasley (PI): Associate Professor of Music Psychology
- Harriet Crook (Co-I): Lead Clinical Scientist for Complex Hearing Loss
- Jackie Salter (PDRF) (2016-2017): Deaf Education

Advisory board
- Lena Bartra (Hearing therapist, freelance)
- Guy Brown (Professor, Computer Science, University of Sheffield)
- Paul Checkley (Clinical Director, Harley Street Hearing)
- Brian Moore (Emeritus Professor, Auditory Perception, University of Cambridge)
- Ruth Swanwick (Professor, Deaf Education, University of Leeds)
- Rachel van Besouw (Lecturer, Hearing Science, University of Southampton)
- Paul Whittaker OBE (Founder of Music and the Deaf, freelance)

HAFM study methodology

S1 Clinical Survey
- NHS (Sheffield Teaching Hospitals) and private clinic (Harley Street Hearing)
  STH (n=84) / HSH (n=89)
  Participants n=176 (age range 21 – 93)
  Mean age = 60.35 (SD=18.07), STH=64.68, HSH=56.41
  Gender overall: 56% male 44 % female, STH=45% male, HSH=65% male
  Method
  Brief questionnaire completed at their appointment (or later using SAE)

S1A Audiology Survey
- 99 practitioners
  Public (62%), Private (23%), Public + private (10%), third sector (1%)
  Age range 22-71, M=39.18 (SD=11.50)
  Years practising >10 years (51%), 3-4 years (29%), 1-2years (9%), < 1 year (4%)
  Method
  Online survey which explored training level and background, experiences discussing music listening issues, experiences optimising HAs for music-listening

S2 Interview Study
- N=22
  13 NHS, 9 private
  Categorisation
  10 mild, 10 moderate, 2 severe (BTA 5 frequency av.)
  9 musicians, 13 non-musicians
  Method
  Interview covering history of hearing loss, past and current music listening practices, how HL has influenced listening over time, and experiences of HA fitting
  Collection of audometric data

S3 Online survey
- N=998 (snapshot)
  Participants n=998 (age range 21 – 93)
  Mean age = 57.93, 54% female
  Method
  Questions on music listening habits, hearing level and use of HA technology, experiences of music in live and recorded settings, discussions with audiologists, videos for accessibility (7%, n=57)
  Requested for latest audiogram (10%, n=98)
HAs enable music appreciation

• Many HA users did not report problems with music listening
  – Mild hearing loss levels
  – Non-musicians

“Without my hearing aids, there’s nothing there except the thump, thump, thud bits of a track. They do improve it vastly.”

“I would probably give them [HAs] a 9 out of 10, I used to struggle with lyrics but I can hear the words clearer.”

HAs rated as helpful for...

• HAs mostly rated as 'fairly' or 'very' helpful for aspects of music appreciation when listening to **RECORDED music** (N=738)

Overall rating for HAs

(1 ‘Not at all helpful’ to 10 ‘Extremely helpful’)

• HAs rated as ‘somewhat useful’ for ‘Hearing and Understanding Lyrics’ and ‘Picking out instruments’ in **LIVE music contexts** (N=631)

Live contexts more problematic

**Recorded music**

• Listener able to control auditory input
  – Volume adjustments
  – Mode of delivery

• Properties of the music
  – Compression
  – Level of complexity
  – Limited dynamic range

• Familiarity with music
  – Artist, musical features, lyrics

**Live music**

• High pitches distorting
  – Large gain at top end

• Feedback
  – Those with greater HL

• Sound levels controlled by others
  – E.g. sound engineer

• Music and speech
  – Artist talks between songs
When listening to RECORDED music, how often do you experience the following difficulties? (N=738)

**Difficulties following lyrics (esp. new music)**
- Problems in live contexts
- Feedback
- Pitch variation
- Problems hearing quiet passages
- Discomfort from loud sounds

**Challenges**
- Social exclusion and isolation
- Loss of music as part of life or hobby
- Speech and music combined

**Strategies (HA users)**
- Removing HAs
- Moving in relation to the sound source
- Adjusting the volume
- Changing the program
- Use of ALDs

Do you listen with or without HAs in the following settings? (N=631)

- Live: acoustic
- Live: amplified
- When playing instrument/singing

When you are listening to LIVE music with your hearing aids how often do you...? (strategies)(N=631)

- Adjust volume
- Adjust program
- Move away from sound source
- My HA does this automatically
Use of Assistive Listening Devices with HAs for recorded music (N=238)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loop (T-setting)</td>
<td>45</td>
</tr>
<tr>
<td>Inductive earhooks (T-setting)</td>
<td>30</td>
</tr>
<tr>
<td>Direct Audio Input (with lead)</td>
<td>25</td>
</tr>
<tr>
<td>Radio aid system (e.g. Roger pen)</td>
<td>20</td>
</tr>
<tr>
<td>Streaming (e.g. Bluetooth, wireless)</td>
<td>10</td>
</tr>
</tbody>
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Understanding of HL and HA technology and acclimatisation

- Individual differences in level of understanding of HL and HA technology
  - Unrealistic expectations
  - Confusion over channels/programs
  - Make/model/type of aid/type of fitting
- Individual differences in mindset
  - Resilience, willingness to try/experiment
- Limited agreement about HL level
  - Descriptors, audiologist description, PTA data (n=83)
  - < 50% agreement with PTA (BSA 5 Av.)

Discussions with audiologist

- Very few discussions taking place, limited positive outcomes
  - No sig. diffs between public and private
- 85% of practitioners in S1A report asking patients about music
- 61% HA users (n=518) in S3 report having discussed music
- Increased experimentation and tailoring more effective

Musicians and HAs

- Musicians highly experienced listeners
  - Adjustment to HL and HAs takes more time
- Process of acclimatisation is key
  - Need to learn to listen again – timescale?
- Strategies incl.
  - Managing expectations
  - Adjustment and experimentation
  - Use of resources in clinic
  - Encourage use of ALDs
    - E.g. Roger pen to hear conductor

Patient leaflet

- Understanding your HL
- Why is music challenging?
- How can my HAs help me?
- What other Assistive Listening Devices might help?
- How can I make the best out of listening situations?
- Top tips for music listening
- Persistence pays off!
- Making the most of your audiologist
- Existing resources
S4: Evaluation study

S5: Resource evaluation study
- NHS and private clinics
- Evaluate leaflet
- Rate usefulness
- Map behavioural change

Project outputs

Conference aims

To bring together hearing aid users, researchers, audiologists and manufacturers to examine current issues and potential solutions in the perception of music through hearing aids

- Learn from each other!
- Plenary session dedicated to:
  - Summarising current issues
  - Exploring solutions
  - Future research directions
  - Potential collaborations

Requests:
- Leaflet evaluation form
- Plenary session contribution
- Conference evaluation form