

The **SPACE** Project: Speech **P**erception by **A**utistic **A**dults in **C**omplex **E**nvironments

Hannah Guest, George Bendo, Graham Hanks, Alexandra Sturrock, Emma Gowen, and Chris Plack

Project genesis



www.autism.manchester.ac.uk

www.facebook.com/autismatmanchester/

- Brings together clinicians, researchers, and the autistic community to understand and shape autism research
- Expert-by-Experience **advisory group**
- Members **George Bendo** and **Graham Hanks** identified lack of adequate research on speech perception

Evidence

Longstanding **personal reports** of speech-perception difficulties among autistic population

But **unclear evidence**: inconsistent reports, weak effects

Perhaps this is unsurprising?

- **Underpowered** studies (often <20 autistic participants)
- Rarely corrected for **multiple comparisons**
- **Hypotheses** not sufficiently shaped by autistic experience
- **Listening conditions** isolated, not integrated
- **Data-collection methods** not designed and refined to suit the needs of autistic participants

Aims and approach

To shed light on autism-related differences in speech perception, via...

- A more collaborative approach
- Detailed attention to autistic experience
- Listening tasks and research hypotheses based on autistic insight
- Criticism from autistic people on every aspect of our research methods
- Adequately powered research

Collaboration

- 2 auditory researchers (HG & CP), 2 autism researchers (AS & EG), and 2 autistic researchers (GB & GH)

Project overview

Self-report phase

- Purpose: ***hypothesis generation***
- Two studies conducted:
 - (1) Semi-structured interview
 - (2) Online questionnaire

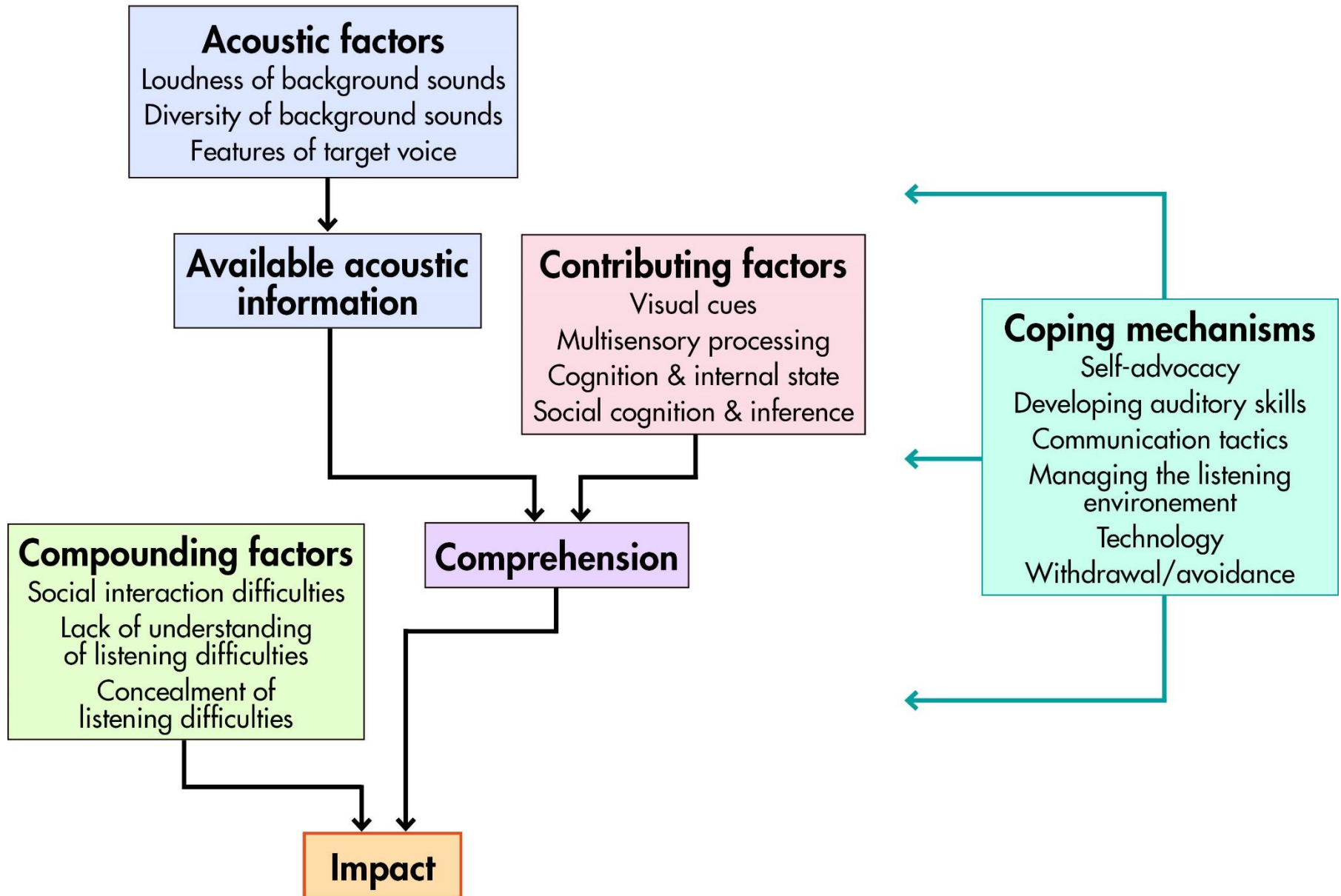
Laboratory phase

- Purpose: ***hypothesis testing***
- RQs and methods based on self-report data
- Seeking funding

Interview study: Methods

- 9 autistic participants without diagnosis of hearing loss
- Semi-structured interview
- Thematic analysis (by an autism researcher, an auditory researcher and an autistic researcher)
- Revealed 6 themes, 28 subthemes, 73 tertiary themes

Interview data: Themes & subthemes



Theme 1: Auditory anomalies

Difficulty focusing on target voice

“It’s frustratingly hard to focus on somebody when people are talking around me, even if they're being very quiet”

Drowning out of target voice

“I don’t really go to the movie theatre... The bass overtakes the rest of it, and it’s just, like, rumbly.”

Difficulty orienting to target voice

*“There might be three or four conversations going on. Despite trying to pay attention to one conversation, it's **very** hard to distinguish who's speaking to me. And also, it's not always possible through eye contact to work out where the conversation is coming from.”*

Auditory overload

*“I’m not afraid of the crowd, I’m afraid of the **noises** of the crowd”*

Themes 2 & 3: Contributing factors

Room size & reverberation

“If I’m in the lecture hall and someone is talking, the echo introduced by the lecture hall itself is enough to make it very difficult for me to understand.”

Visual cues

“If I can't see them start the conversation, I will not pick up that they're talking to me at all.”

Distraction by other senses

“I was trying to listen to the speaker, but someone near me had this really strong perfume or something... it was so distracting”

Theme 4: Compounding factors

Lack of understanding by communication partners

*“You're in a crowded environment and you're asking people, ‘**Can we keep it down a little bit?**’ And everyone is going, ‘**Well it’s just as hard for us**’... But I don't think it affects them like it affects me! To them it's probably just an annoyance, whereas to me, it's affecting my entire evening.”*

Lack of understanding by clinicians

*“I often thought, maybe I've just got a problem with my hearing... And then you're told again and again, “**No, no there's nothing wrong**” and you're trying to work out then why can't I hear someone? Why can't I have a normal conversation?”*

Theme 5: Impact

Social participation

“If I were to go to a party, I can’t understand people. So I can’t effectively socialise, whether I go or not.”

Impression made on others

“People probably think I don't care very much sometimes, like I'm not paying attention.”

Emotion

“It’s very stressful because I’m missing stuff, and my head starts going, ‘You’re not reacting right’ or ‘They asked you something and you don’t know what they’re saying’.”

Theme 6: Coping mechanisms

Communication tactics

*If I say ‘**sorry?**’ or ‘**say that again**’ and they repeat themselves and I still can’t understand them, now I recognise to tell them ‘**speak louder**’, or ‘**slow down**’*

Technology

*“If we’re out at a restaurant, I’ll wear high fidelity earplugs... So I can hear **him** talk to me, but it lessens the background noise.”*


Managing the listening environment

“In classes where we have group discussions, I’ll typically extract my group from the classroom and won’t return.”

Research Article

Autism &
Developmental
Language
Impairments 

Chasing the conversation: Autistic experiences of speech perception

Alexandra Sturrock* 

Division of Human Communication, Development and Hearing, School of Health Sciences, The University of Manchester, Manchester, UK

Hannah Guest* 

Manchester Centre for Audiology and Deafness, School of Health Sciences, The University of Manchester, Manchester, UK

Graham Hanks

Department of Psychology, The University of Sheffield, Sheffield, UK

George Bendo

Department of Physics and Astronomy, UK ALMA Regional Centre Node, Jodrell Bank Centre for Astrophysics, The University of Manchester, Manchester, UK

Christopher J Plack 

Manchester Centre for Audiology and Deafness, School of Health Sciences, The University of Manchester, Manchester, UK

Emma Gowen

Division of Neuroscience and Experimental Psychology, School of Biological Sciences, The University of Manchester, Manchester, UK

Autism & Developmental Language
Impairments
Volume 7: 1–12
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: [10.1177/23969415221077532](https://doi.org/10.1177/23969415221077532)
journals.sagepub.com/home/dli



Internet survey: Methods

79 eligible participants

- Aged 18-55
- No diagnosis of hearing loss
- Diagnosed autistic or seeking diagnosis

19 multiple-choice questions

- Quantitative analysis

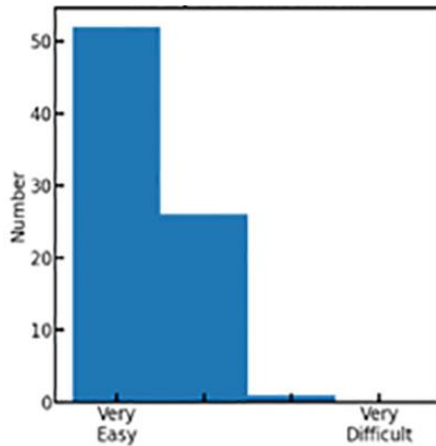
3 open-ended questions

- Content analysis

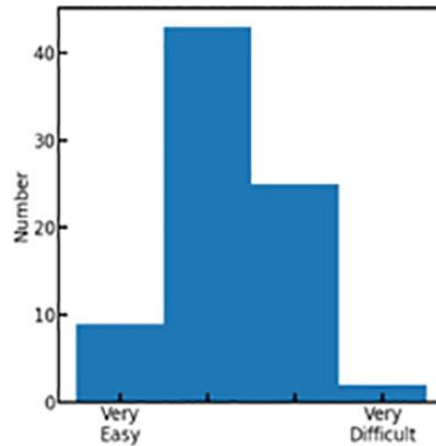
Internet survey: Quantitative results

How easy would you find it to hear and understand what's being said in...?

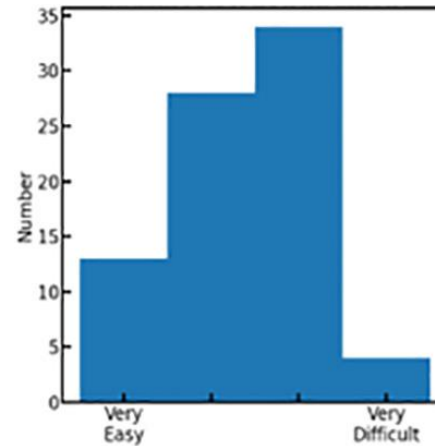
Quiet environment



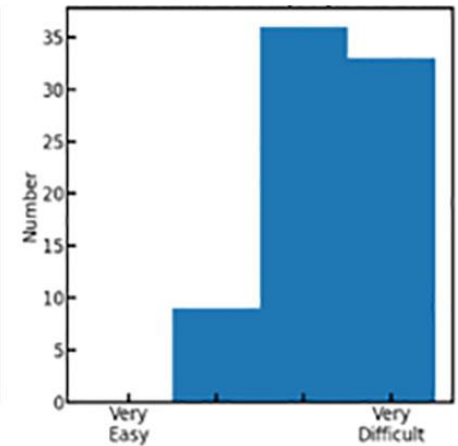
Moderate mechanical noise



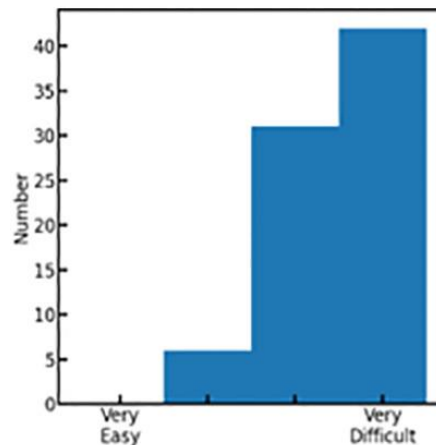
Moderate-volume music



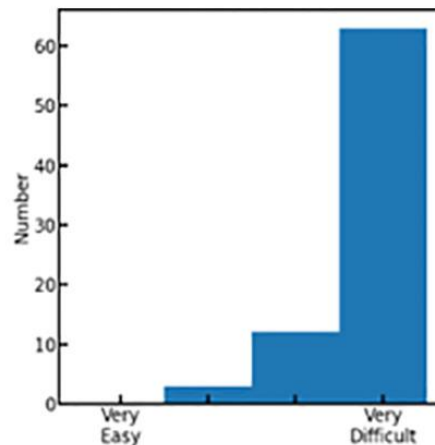
One or two people talking



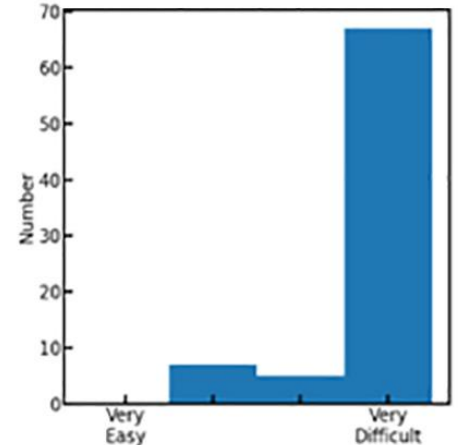
Loud mechanical noise



Loud music

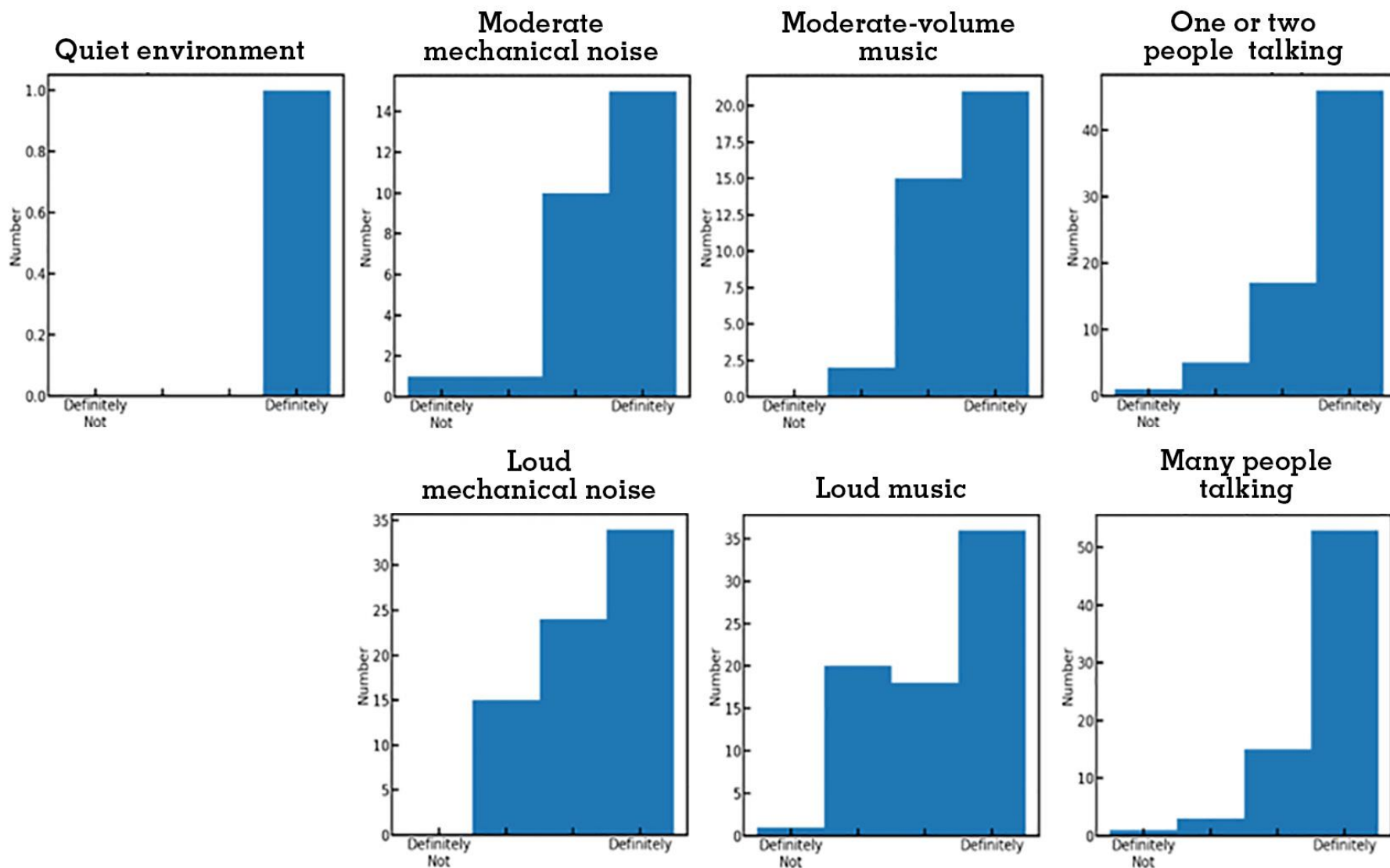


Many people talking



Internet survey: Quantitative results

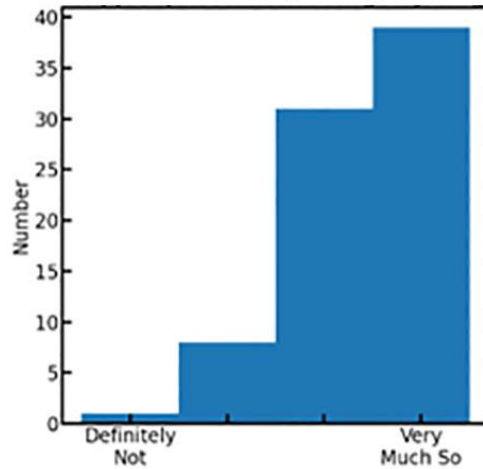
Do you get the impression that the following listening situations cause you **GREATER** difficulty than most people your age?



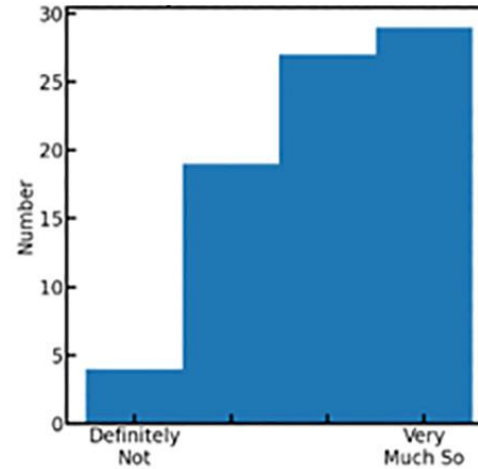
Internet survey: Quantitative results

Have listening difficulties ever...

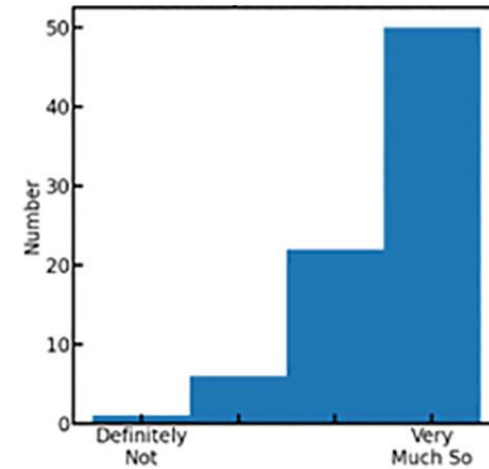
Stopped you from doing anything?



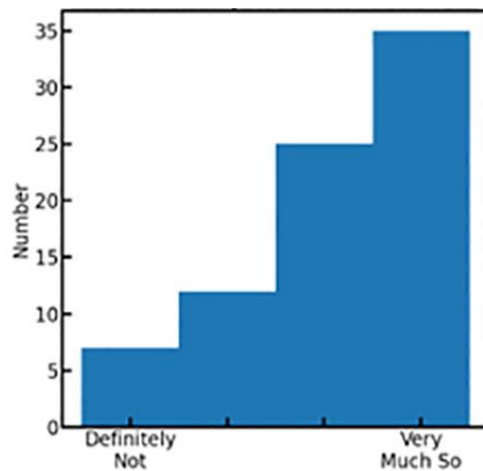
Affected your education or career?



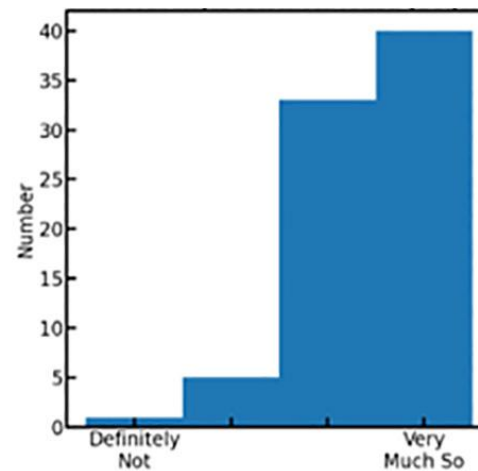
Affected your social life?



Affected how you feel about yourself?



Affected the impression you make on others?



Internet survey: Quantitative results

Particular listening difficulty when just **one background conversation** is taking place.

Almost equivalent to the difficulty of being in a location with **loud** music or **loud** machinery.

Internet survey: Open questions

Q: Are there any listening situations you find particularly easy or difficult?

Q: Is there anything that makes listening harder or easier?

- Vast majority of responses appear to reinforce interview data
- But also some fresh themes

Internet survey: Open questions

Misophonia

“The more I try to filter out an irritating sound (repetitive noises, loud music, someone chewing food etc) the louder it seems to get.”

Inadequacies of standard audiological tests

“I had a hearing test for background noise interference that didn't diagnose mine because the test was flawed... it was not at all representative of the challenges I have in a real place like a cafe or large room.”

Internet survey: Open questions

Difficulty with telecoms and broadcast audio:

“Phone/video calls - if you're speaking to me on the phone and there is any kind of noise going on in the room that I am in... I will really struggle to hear you.”

“Also television shows or radio: often a lot of background noise, many different accents, mouths are not clearly visible.”

Self-selection bias? People who struggle with telecoms/broadcast audio unlikely to volunteer for our Zoom interview?

Implications

Findings indicate listening difficulties with significant impacts

- Important implications for **social participation**
- Potentially bi-directional interactions with **emotional well-being**, **self-perception**, and **social fatigue**
- The above are potentially of great importance due to...
 - **Social interaction difficulties** being a core feature of autism
 - High prevalence of secondary **mental health problems** in this group

Research priorities: Quality research

- **Adequately powered** research to establish existence and nature of autistic speech perception difficulties
- Hypotheses should be **based on autistic experience**
- **Data-collection procedures** must be designed to suit both autistic and neurotypical participants
- Differential measures should **disentangle factors** that might contribute to listening difficulty
- Should allow for **heterogeneity** among autistic sample

Research priorities: Collaborative research

- **Autistic researchers** have been vital to our team (for design, outreach, analysis, interpretation, and more)
- **Shape study procedures** to suit autistic (as well as neurotypical) participants
- Reduce the likelihood of **neurotypical over-shadowing** of autistic voice in qualitative data
- Offer **insight** into the impact on autistic individuals
- Legacy: research experience **draws on** and **develops** research abilities of each collaborator

Research priorities: Quantitative research

Designed 2 parallel studies on speech perception:

- **Laboratory**
- **Online**
- Both use contrasting listening conditions, testing for effects of various masker types, spatial information, loudness, and predictability of target speech
- **Lab study** allows greater range of contrasts (and hence hypotheses)
- **Online study** allows far larger sample size (and hence exploration of heterogeneity)

Research priorities: Coping strategies

Gather strategies used by autistic people to overcome and/or manage listening difficulties

- Self-report data indicate that strategies tend currently to be **self-taught**, achieved through trial and error, often into adulthood
- Systematic compilation of successful strategies could be fed back to the community to support **self-help**
- And could support development of **clinical guidance** (which is currently lacking)

Potential impact

“I know hundreds of autistic people and difficulty with auditory processing with background noise is the only universal characteristic I have been able to find”

- Leneh (autism advocate & Autism@Manchester member)

Acknowledgements

NIHR | Manchester Biomedical
Research Centre

AUTISM
@MANCHESTER



Aspire
The Female Autism Network