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Effects of hearing aids on music perception

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Motivation for PhD

- Many hearing-aid users complain that they are not satisfied with their hearing aids for listening to music
- Hearing aid signal processing and fitting has mainly been designed to optimise speech intelligibility
- **Speech and music signals differs.** Music signals are more varied depending on type of instruments and types of music. Some music has much larger dynamic range than speech
- **Expectations are different for music and speech.** Speech is essential for daily communication whereas music is for pleasure

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Aims and Design of survey

Aims of study

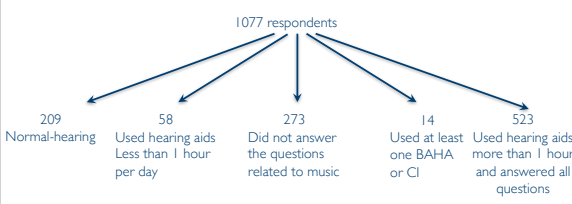
- To assess the extent to which hearing aids improve or worsen the experience of listening to live and reproduced music, and to establish the nature and prevalence of any problems

Study design

- The questionnaire was generated using Survey Monkey and was active on the Internet from 13th March 2013 to 21st January 2014
- The survey consisted of 21 multiple-choice and one open question

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Study Population



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graph TD
    A[1077 respondents] --> B[209 Normal-hearing]
    A --> C[58 Used hearing aids Less than 1 hour per day]
    A --> D[273 Did not answer the questions related to music]
    A --> E[14 Used at least one BAHA or CI]
    A --> F[523 Used hearing aids more than 1 hour and answered all questions]
  
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Study Population

1077 respondents

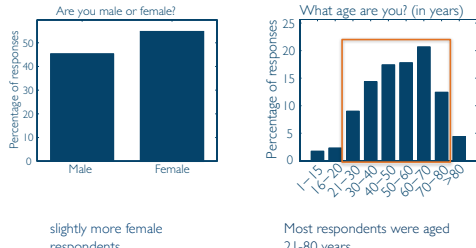
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Only results from these 523 respondents will be presented here



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Respondent Demographics



Are you male or female?

Gender	Percentage of responses
Male	~45%
Female	~55%

slightly more female respondents

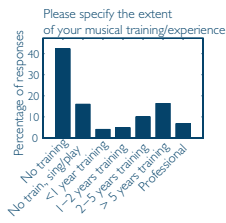
What age are you? (in years)

Age Group	Percentage of responses
1-15	~1%
16-20	~2%
21-25	~8%
26-30	~14%
31-35	~16%
36-40	~17%
41-45	~18%
46-50	~18%
51-55	~17%
56-60	~12%
61-65	~10%
66-70	~5%
71-75	~2%
76-80	~1%

Most respondents were aged 21-80 years

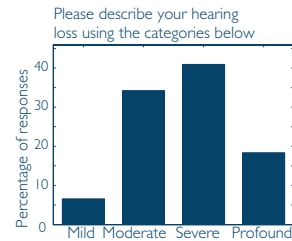
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Musical Training

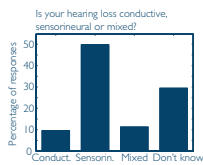


More than half of the respondents did not have any musical training

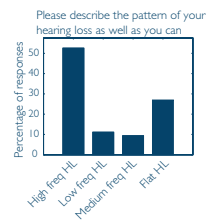
Distribution of Severity of Hearing Loss



Distribution of Types and Patterns of Hearing Loss

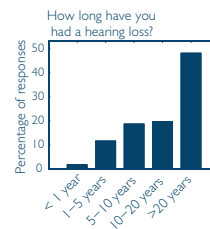


Nearly half of the respondents reporting having a sensorineural hearing loss



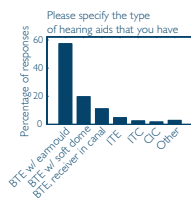
More than half reported that they had greater hearing loss at high than at other frequencies

Amount of Time that the Respondents had a Hearing Loss



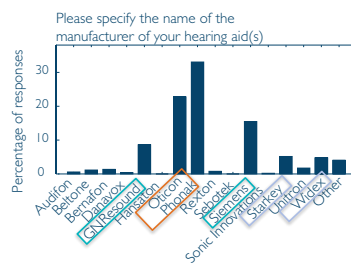
87% of the respondents had a hearing loss for more than 5 years

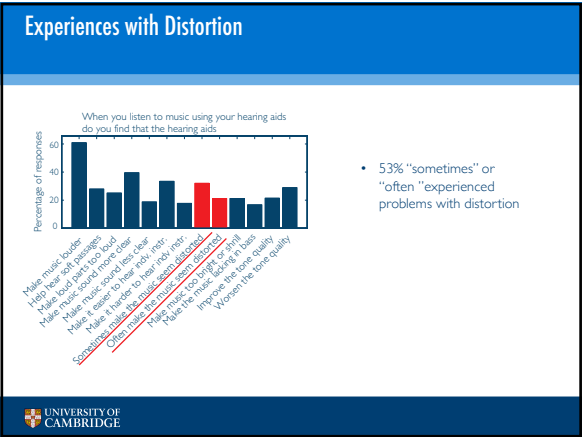
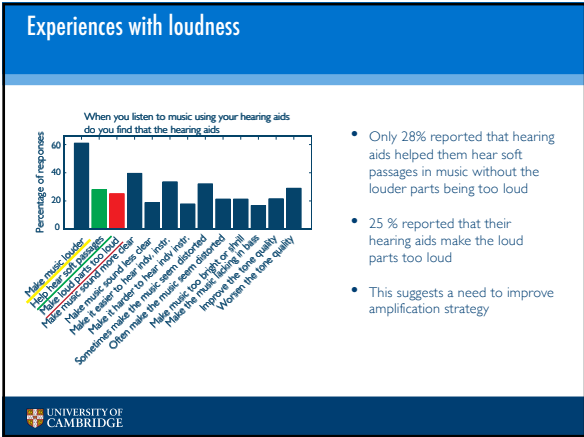
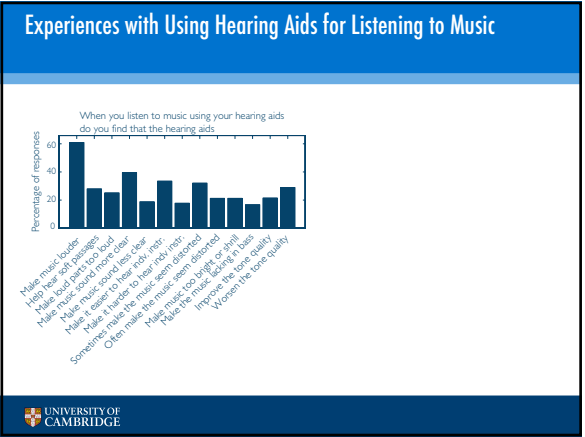
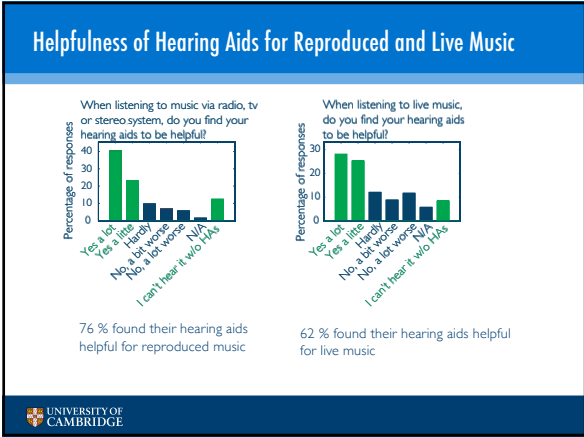
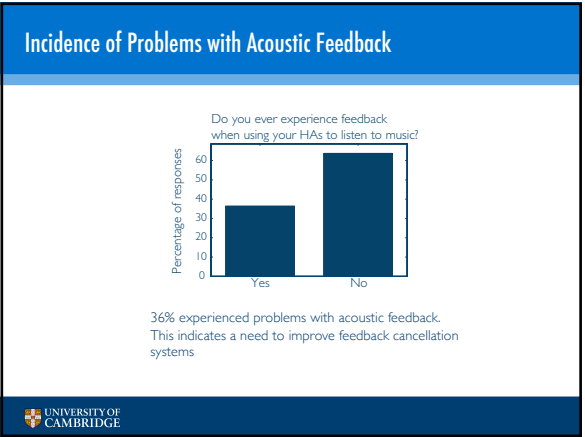
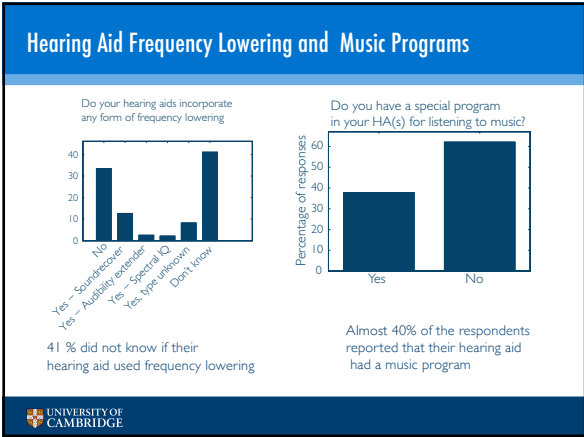
Distribution of Type of Hearing Aids



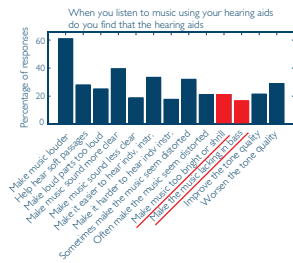
88% of the respondents wore behind-the-ear hearing aids

Hearing Aid Manufacturers



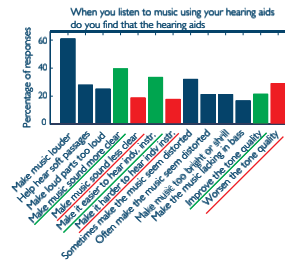


Experience with frequency response



- 21% reported that their hearing aids make music seem bright or shrill
- 17% reported that their hearing aids make music seem lacking in bass
- → Too much gain at high relative to low frequencies

Experiences with Clarity, Tone Quality, and the Ability to hear out Individual Instruments



- Larger proportions found that their hearing aids make music sound more clear and that they make it easier to hear individual instruments
- Smaller proportions found the opposite
- However, slightly larger proportions found that hearing aids worsen tone quality
- Indicates that many find that their hearing aids improve music enjoyment but also that some find that hearing aids worsen this

Conclusions

- o Most respondents find their hearing aids helpful when listening to music
- o But the the results also indicate a need to:
 - Improve feedback cancellation systems
 - Improve the amplification strategy
 - Improve tone quality which perhaps could be done by improving the balance between gain at high and low frequencies

Limitations of the study

- The reliability of the responses is limited, especially with regards to information about hearing loss and hearing aids.
- The use of multiple-choice questions and the limited number of questions means that the information obtained is not very detailed
- It is not possible to infer causality from survey data e.g. it is not possible to know to what extent the problems reported are caused by the hearing aids themselves and to what extent they are caused by poor fitting.

However, the study has revealed some interesting trends than can inspire more controlled studies and hearing aid development in the future

More information...

Music and Hearing Aids

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Acknowledgements



Thanks for listening!