

Low-gain hearing aids for listening-in-noise difficulties in “normal hearing” individuals



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- Hello everyone.
- Today I will talk about a study we have conducted at the National Acoustic Laboratories in Sydney, Australia investigating the value of low-gain hearing aids as a possible intervention for people with hearing difficulties in noisy venues but with normal audiograms.

The impact of these hearing difficulties



AJA

Research Article

Discovering the Unmet Needs of People With Difficulties Understanding Speech in Noise and a Normal or Near-Normal Audiogram

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- 280 questionnaires
- 29 personal interviews

I quite often feel that **I am not doing a really good job** because they (clients) come in wanting an answer and I can't give it to them

I find concerned if I know I'm going to be going to an event where this sort of situation is likely to arise. It does take some of the pleasure of being around people

It would be useful to have research that could lead to an **evidence-based guidelines** for management, and effective rehabilitation programs



It just makes me feel disinclined to go out, and when I do I tend to avoid restaurants and cafes and anything which is likely to be a crowd of people, unfortunately



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- Statistics show that **1 out of 10 people** that come to a hearing clinic reporting communication difficulties in noisy situations do not have a measurable hearing loss.
- The mismatch between their hearing experience and their clinical assessment causes **strong frustration** both in the people with hearing difficulties and the clinicians who treat them.
- Research conducted at NAL via a series of questionnaires and personal interviews revealed that these hearing difficulties have a strong impact on their **quality of life**, often leading to having to put an **extra effort and enjoy conversations less**. For example, one participant reported "I find concerned..."
- Participants also reported that missing information in conversations provokes frustration and anxiety, and that their hearing difficulties eventually **changed their behaviour**. One participant mentioned "It just makes me feel..."
- Clinicians generally reported to have **insufficient training or resources** to effectively attend this population, and **87% did not feel totally confident**

recommending treatment options to these clients. At interview, one clinician responded “I quite often feel...”

- They also highlighted that **there is no uniform or standardised protocol** based on scientific evidence to manage these clients. As reported by one clinician “It would be useful to have...”
- Taking into account these learnings, we aimed to investigate the value of low-gain hearing aids as an intervention approach for people with hearing difficulties but normal audiograms.

Study design



A double-blinded **randomised controlled trial**

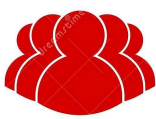


Control



- 14 participants
- 9 females
- [19,63] yr
- Mean = 40.8 yr
- 0 dB gain

Experimental

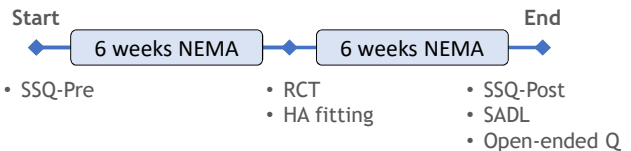


- 13 participants
- 8 females
- [31,63] yr
- Mean = 44.8 yr
- +8 dB gain



NEMA surveys

- Understand
- Participate
- Frustration
- Benefit
- Satisfaction
- Noise level



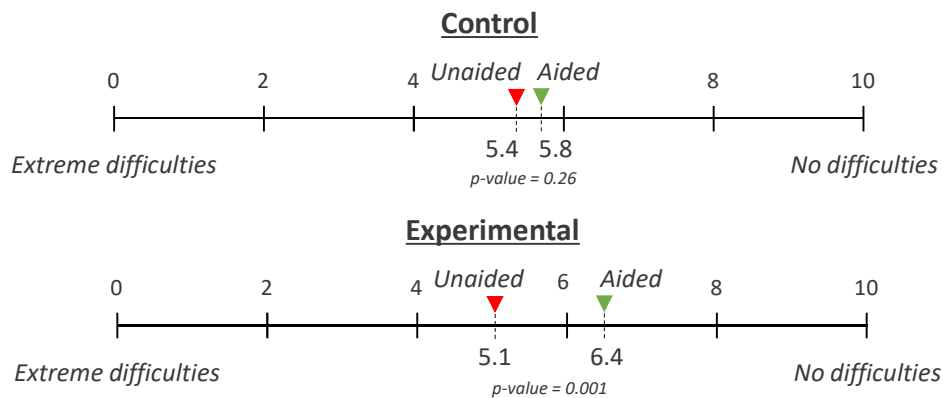
Research questions

1. Do low-gain hearing aids reduce reported speech-in-noise hearing difficulties?
2. What is their overall satisfaction with the hearing aids?
3. What was their experience like in real-life situations?
4. What personal insights can we learn from their experience using the hearing aids in noisy venues?

- At the start of the study, our participants completed the **Speech, Spatial and Qualities questionnaire** so we could measure their self-reported hearing difficulties.
- During the following 6 weeks, participants were asked to **attend the typical noisy venues where they usually have hearing difficulties**, and complete a brief survey asking them about different elements of their hearing experience such as how much they could understand in the conversation, their level of participation, how frustrated they were, and other questions.
- This survey was administered on their phones via an App called **NEMA** – that stands for NAL Ecologically Momentary Assessment. This is a very powerful tool that allowed us to measure their experience in real life situations, in the same exact time and place where they are having hearing difficulties.
- After they trialed the NEMA App in noisy environments, our participants were **randomly assigned to one of two groups**, following a double-blinded randomised controlled trial – double-blinded because neither the researchers or the participants knew about which group they were assigned to.

- Participants in the **control** group were fitted with Phonak Marvel M50 hearing aids with an approximate 0 dB gain – kind of a placebo group.
- Participants in the **experimental** group were fitted with the same hearing aids, but this time, with a gain of 8 dB.
- They were then asked to trial the devices in situations where they have hearing difficulties, and complete a series of surveys via the NEMA app describing their experience, similar to what they did in the first phase of the study.
- At the end of the study, they completed the SSQ questionnaires related to their experience using the hearing aids, the SADL questionnaire to learn about their satisfaction with the devices, and an open-ended questionnaire to learn more about their hearing experience with the hearing aids.
- This way, we could respond to four important research questions.
- By comparing the SSQ outcomes before and after trialling the hearing aids, we could investigate if low-gain hearing aids reduce the self-reported hearing difficulties of our participants.
- The SADL questionnaire would inform us about their overall satisfaction with the devices.
- The NEMA surveys would let us understand their experience in real-life situations, with and without hearing aids,
- And the open-ended questionnaires would give us interesting insights of the possible benefit of the devices and whether or not they would continue using them in similar situations in the future.

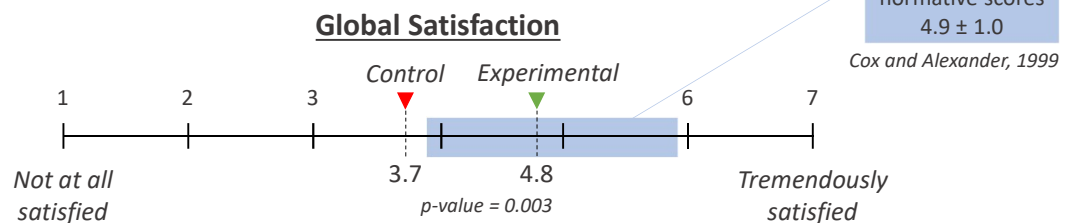
SSQ Speech dimension



Low-gain hearing aids reduced self-reported speech-in-noise hearing difficulties

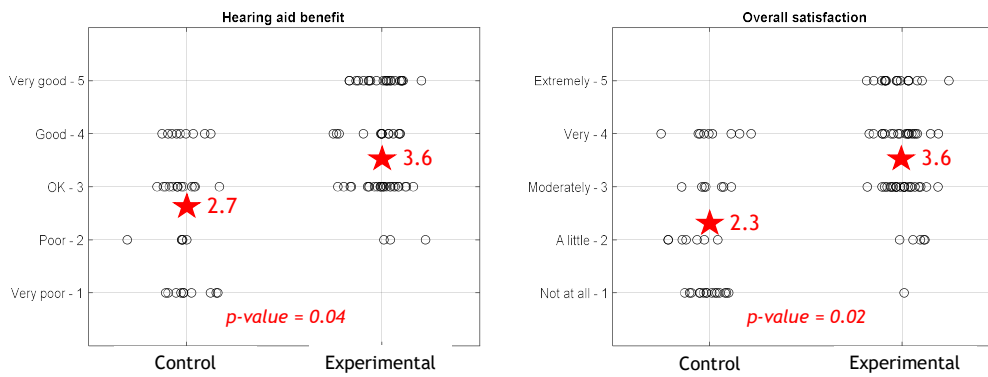
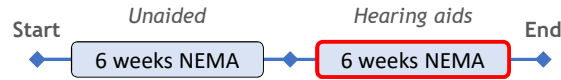
- The Speech dimension of the Speech Spatial and Qualities questionnaire evaluates speech understanding difficulties in conditions of competing sounds, with several people involved in conversations.
- In a scale 0 to 10, where 0 represents “Extreme difficulties” and 10 is “No difficulties” ...
- ...we see that the self-reported hearing difficulties of our participants before being fitted with hearing aids is 5.4 for the control group and 5.1 for the experimental group. These two scores are statistically comparable, which makes sense because participants were randomly assigned to each group. These figures also indicate that our participants indeed reported to have hearing difficulties.
- In the control group, we see that the benefit provided by the placebo hearing aids is marginal. Stats show the two scores are statistically comparable.
- The situation in the experimental group is different, with hearing aids reducing their hearing difficulties from a score of 5.1 to 6.4, being this difference statistically significant.

- These results are consistent with our prediction, and support that low-gain hearing aids reduce self-reported speech-in-noise hearing difficulties.



Providing a mild gain increases global satisfaction from 'medium satisfied' to 'considerably satisfied'

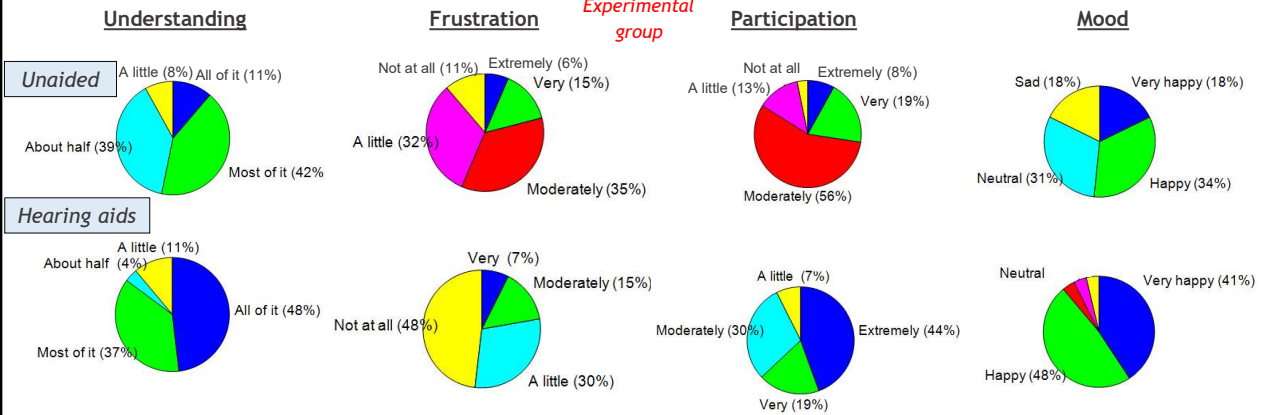
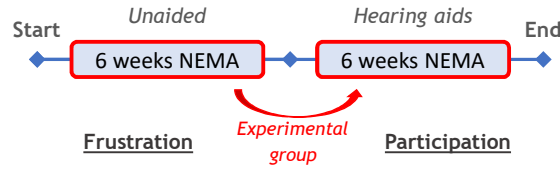
- The Satisfaction with Amplification in Daily Life or SADL questionnaire aims to quantify hearing aids satisfaction in a scale 1 (very low satisfaction) to 7 (very high satisfaction).
- Normative data obtained from a cohort of 257 hearing aid users show that expected scores of global satisfaction are in the range of 4.9 ± 1.0
- Our data showed that control participants reported a global satisfaction score of 3.7 – which is below the expected satisfaction of hearing aid users
- But interestingly, the satisfaction of those who were fitted with low-gain hearing aids increased to 4.8, which is consistent with the satisfaction scores reported by hearing aid users.
- From this outcome, we learnt that a mild gain increases global satisfaction from medium satisfied to considerably satisfied.



The Experimental group reported some degree of benefit from the hearing aids and to feel moderately satisfied with the technology

- When we compared the overall benefit and satisfaction with the hearing aids reported by the control and the experimental participants in real life situations via NEMA, we found that participants fitted with 8 dB gain reported higher levels of perceived benefit and satisfaction.
- On average, the experimental participants reported to perceive some degree of benefit from the hearing aids and to feel moderately satisfied with the technology.

NEMA



Low-gain hearing aids helped our participants to understand more, participate more in conversations, reduce their frustration, and improve their mood in real-life noisy conversations

- Interestingly, when we compared the hearing experience of the experimental group with and without hearing aids, we observed that they reported that the hearing aids helped them to
- Understand more – here we see that the proportion of participants reporting they could understand all of it or most of it increased from around 50% without the hearing aids, to around 85% when they wore the hearing aids.
- Reduce their frustration levels – participants reporting no or little frustration increased from around 40% to 80%
- Participate more in conversations – participants reporting higher levels of participation (Extreme and very) increased from 27% to 63%
- And participants feeling happy or very happy increased from around 50% to 90%.
- This data demonstrates that low-gain hearing aids...

Would you continue using the hearing aids?



Control: 9/14 NO
Experimental: 8/11 YES

No. Unnoticeable benefit, for the slight administrative burden (batteries management, fitting comfort, etc.)

I would consider it **if my hearing loss gets a lot worse**, but at this stage the cons outweigh pros

No. They don't really help

No

No, I don't feel it has been a distinctive change enough for me



Control

I would only want to wear them **in particular environments** requiring a lot of listening - this would help reduce fatigue and frustration

Yes, the benefit that I gain from them is too great to not use them

Yes but they do appear to have improved my condition

Yes, would be a useful option to have when going into noisy social/talking environments



Experimental

Yes I would in social situations. It makes engaging in conversations easier

No because **I don't think I need them at this stage** and they're a bit awkward (slightly itchy, tickly and make it harder to change glasses especially if also wearing a mask and earrings). I don't like hearing myself eat

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- We asked our participants whether they would continue using the hearing aids in similar situations in the future.
- The majority of the control participants reported they were not finding much value in the devices, and that they would not continue using them. Some testimonies that were told to us were “No, I don't feel...”
- By contrast, most of the experimental participants reported they would continue using the hearing aids in challenging situations.

Would you purchase the hearing aids (cost \$5000)?



Control: 14/14 NO
Experimental: 11/11 NO

Not at this stage as it is too expensive, but I would if my hearing impacts my ability to work

No



Control

No. I don't feel any improvement in my hearing ability

At a cost of \$5000 I would personally **not be investing** in hearing aids as I find my unaided hearing to work well, even if I sometimes struggle in a noisy environment to understand speech clearly

No. Too much money!



Experimental

Not for that price



NAL Project 1. Apple AirPods Pro



NAL Project 2. Nuheara IQbuds² Max

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- However, when participants were asked if they would buy the hearing aids to ameliorate their hearing difficulties, none of the participants would spend around \$5000 in technology addressing their hearing difficulties.
- Some testimonies from control participants were “No. I don’t feel...”
- And similarly, experimental participants also reported that they would not spend that amount of money... For example some people reported...
- Considering the learnings from this study, we are now conducting new research at NAL investigating the value of other more inexpensive technologies such as hearables as a possible intervention for people with speech in noise hearing difficulties and normal audiograms. Stay tuned to these results.

Take-home message & Acknowledgements



- Low-gain hearing aids improve the hearing experience of individuals with normal audiograms but with speech-in-noise hearing difficulties
- Participants fitted with 8 dB gain hearing aids could understand more in noisy venues, participate more in conversations, and reduce their frustration
- The elevated cost is a barrier for the adoption of hearing aids for this population



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- In summary, this study shows that... (read take-home messages)
- I would like to acknowledge the contribution of the rest of the research team, and thank the sponsorship of this research by the Australian Government Department of Health.
- Thank you all for your attention.
- Happy to take any question.