

Title (10 words): Low-gain hearing aids for listening-in-noise difficulties in “normal hearing” individuals

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Abstract (500 words)

Objectives: Approximately one in ten adults who present to the clinic reporting difficulty understanding speech in noise have normal audiometric thresholds. National Acoustic Laboratories (NAL) research revealed that this creates a dilemma for the clinicians attending them as there is no standardised clinical approach available to address their hearing issues. Both the clients and clinicians often report feeling frustrated, confused and disempowered. This study aimed to evaluate the value of low-gain hearing aids as a potential intervention for the individuals with normal audiograms who present abnormal speech-in-noise hearing difficulties. We hypothesized that the directionality provided by low-gain hearing aids would provide an acoustic advantage, which would improve their hearing experience in both simulated and real-world noisy venues.

Design: This project followed a randomised controlled trial with (i) 14 control participants fitted with a Phonak Marvel Audeo M50 with an amplification gain close to 0 dB, and (ii) 13 experimental participants fitted with hearing aids of the same model but with an amplification gain close to +8 dB. Participants had clinically normal hearing thresholds and reported speech-in-noise hearing difficulties. Testing consisted of questionnaires, real-world assessment via *ecological momentary assessment* tools, and laboratory testing in an anechoic chamber including *ECO-SiN* (a speech-in-noise intelligibility test that uses ecologically valid speech stimuli and background noise) and *listening effort* (a behavioural dual-task based on reaction time and self-reported measures based on a questionnaire).

Results: At group level, results revealed that the acoustic advantage provided by hearing aids leads to a moderate improvement in the hearing experience of users. Results also showed a large inter-subject variability, with some participants experiencing a large benefit while others did not. For example, one participant reported “I used the hearing aids in a very noisy bar and it was absolutely brilliant! Do I really have to return them at the end of the study? Where can I buy one? It made the whole experience so much more pleasurable and my friends who were having similar issues all want one too!”. Results from a questionnaire showed that participants’ self-perceived hearing difficulties improved [on a scale from 0 (Extreme difficulties) to 10 (No difficulties)] from a mean score of 5.1 without hearing aids to 6.4 with hearing aids. Participants satisfaction with hearing aids was 3.9, on a scale from 0 (Not satisfied at all) to 6 (Fully satisfied).

Conclusions: Together, the results demonstrate that low-gain hearing aids lead to a moderate improvement in the hearing experience of users. This outcome will assist audiologists to provide more informed recommendations to clients with normal audiograms and speech-in-noise hearing difficulties, as well as manage the expectations of their patients. These results also open new research opportunities, including the evaluation of hearables as an alternative intervention for these individuals.

Submission category: Podium Presentation

Abstract focus: (1) Hearing loss / Rehabilitation, (2) Hearing Technology / Amplification

Presenting author: Author 7

Presenter biographical sketch (100 words): Brent Edwards, Ph.D., is the Director of the National Acoustic Laboratories (NAL), where he is currently leading new innovation initiatives that focus on transforming hearing healthcare. For over 22 years he headed research at major hearing aid companies and at Silicon Valley startups that have developed innovative technologies and clinical tools used worldwide. Dr. Edwards founded and ran the Starkey Hearing Research Center in Berkeley, California that was a leading site for research in hearing impairment and cognition. Dr. Edwards is a Fellow of the Acoustical Society of America and an Adjunct Professor at Macquarie University.

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All authors declare:

- Research support/Grants: This research was funded by the Australian Government Department of Health
- Consulting/Employment: I have no significant financial relationship to disclose.
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Learner outcomes.

After this presentation, participants will be able to evaluate the value of low-gain hearing aids as a possible intervention for individuals with normal audiometric thresholds and speech-in-noise hearing difficulties.