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Clinical performance of nuance audio glasses on adults with perceived mild to moderate hearing difficulties

Abstract

This National Acoustic Laboratories (NAL) Clinical Investigation evaluated the performance of Nuance Audio Glasses and App in adults with perceived mild to moderate hearing difficulties. The study examined speech understanding in noise, laboratory and real-world listening preferences, short-term patient-reported outcomes, and safety.

In controlled laboratory conditions, aided speech reception thresholds in noise improved by an average of 3.5 dB SNR relative to unaided listening, demonstrating a clinically meaningful advantage. Participants showed a strong and consistent preference for aided listening across simulated acoustic environments and in real-world settings most relevant to their daily lives, particularly noisy social situations.

Patient-reported outcomes reinforced these findings. Most participants reported noticeable improvement in communication ability. Greater than 90% of participants top-priority goals on the modified COSI demonstrated benefit. No adverse events were observed.

Together, these results indicate that Nuance Audio Glasses and App provide measurable improvement in speech understanding in noise, strong user preference, and positive self-reported communication outcomes. The findings support their potential as a practical, accessible solution for adults seeking enhanced communication in challenging acoustic environments.

Keywords: nuance audio glasses, hearing glasses, speech in noise, patient reported outcome measures, ema (ecological momentary assessment)

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Introduction

Hearing difficulties, particularly in noisy environments, are among the most common and undertreated sensory challenges in adults.[1,2] Even individuals with mild or minimal hearing loss often experience substantial difficulty understanding speech in complex acoustic scenes such as restaurants, offices, or social gatherings.[3,4]

Hearing and listening difficulties are linked to social withdrawal, reduced quality of life, increased cognitive load,[5,6] social isolation and increased risk of depression.[7,8]

Although conventional prescription hearing aids can be effective in managing hearing and listening difficulties, barriers such as cost, stigma, and limited access to hearing healthcare professionals hinder adoption.[9,10] Over-the-counter (OTC) hearing devices have recently emerged as a promising alternative, expanding consumer-driven access to amplification under new U.S. FDA regulations[11] and supported by consumer trend data from MarkeTrak 2022.[12] Nuance Audio Glasses and App were designed to offer discreet sound amplification for adults with perceived mild to moderate hearing difficulties particularly in situations where speech understanding is most important. As a novel over the counter (OTC) solution, Nuance Audio Glasses integrate advanced hearing technology into a familiar eyewear form factor, providing an accessible and socially acceptable (i.e., stigma free) alternative to traditional hearing aids.

The device features four user-selectable amplification presets and supports both directional (frontal) and all-around (omni) listening modes. Users can control these settings through a dedicated mobile app or via intuitive tap gestures on the temple of the glasses. Targeted toward adults who may be reluctant to use conventional hearing aids for cosmetic or social reasons, Nuance Audio Glasses are designed to deliver tangible communication benefits in noisy environments while maintaining comfort and style (Figure 1).

Figure 1 Nuance audio glasses components.

This NAL Clinical Investigation of Nuance Audio Glasses was conducted to assess how the device improves speech understanding in noisy environments and to explore user listening preferences in both laboratory and real-world settings. The study evaluated speech-in-noise performance, listening behavior through Ecological Momentary Assessment (EMA), short-form patient-reported outcomes, and overall safety.

Methods

Study design and participants

A prospective, within-subject study was conducted at the National Acoustic Laboratories (Sydney, Australia). Adults aged 18 years and older with self-perceived mild to moderate hearing difficulties, who did not require prescription spectacles (contact lenses permitted), were recruited. Twenty participants (13 male, 7 female) completed all study procedures per protocol. Screening included otoscopy, tympanometry, and pure-tone audiometry, as well as administration of the Hearing Handicap Inventory for the Elderly Screening version[13,14] to confirm and document the presence of perceived communication difficulty.

Audiometric thresholds were consistent with perceived mild-to-moderate hearing difficulties. The four-frequency pure-tone average (PTA4; 0.5, 1, 2, and 4 kHz) was 28.25 dB HL (SD = 16.40; range = 70 dB) for the left ear and 27.94 dB HL (SD = 14.31; range = 65 dB) for the right ear. These values fall within the mild-to-moderate range defined under current OTC/FDA criteria.

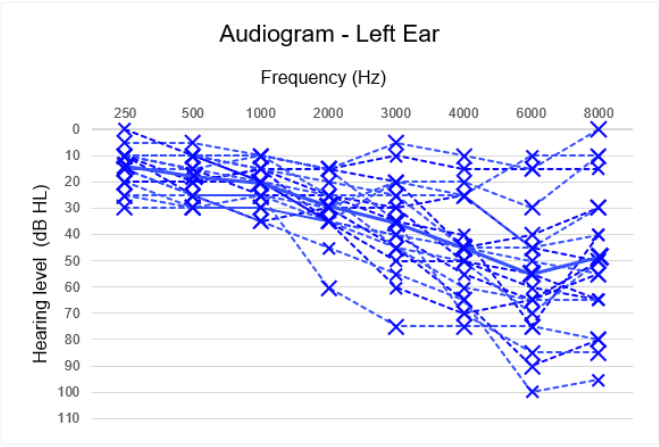
For the laboratory speech-in-noise testing, the device was configured in the Frontal (directional) mode.

Regarding the amplification presets (A, B, C, or D), there was no single standardized preset used for all participants. Instead, the test was conducted using the specific preset that each participant preferred and selected during the device set-up phase

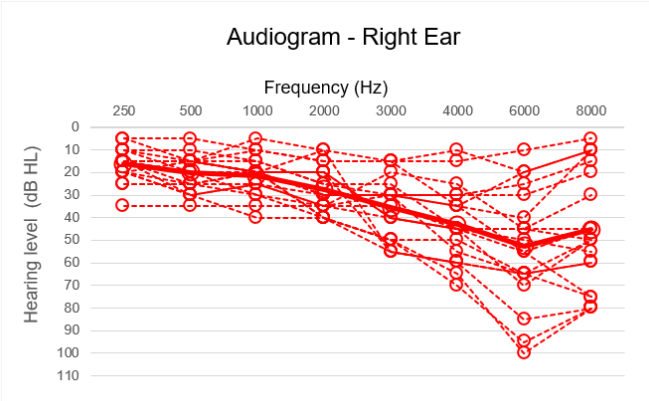
Device fitting and settings

For the laboratory speech-in-noise testing, the device was configured in the Frontal (directional) mode for all participants. With respect to amplification presets (A, B, C, or D), no single standardized preset was used across participants. Instead, testing was conducted using the specific preset that each participant preferred and selected during the initial device set-up phase.

Participants' own voice was natural and not monitored, however environmental noise levels were measured and are reported in the 'Real World Ecological Momentary Assessment (EMA)' section (Figure 2).



A) Pure tone thresholds left ear



B) Pure tone thresholds right ear

Figure 2 Pure tone air-conduction audiometric thresholds for A) left and B) right ears.

Results and measures

Speech in noise performance

Speech reception thresholds in noise (SNR-50) were measured using Australian-English BKB sentences[15] presented from the front (0° azimuth) against diffuse multi-talker babble delivered through four surrounding loudspeakers. An adaptive procedure determined the signal-to-noise ratio required for 50% correct word recall.

Each participant was tested in unaided and aided conditions with Nuance Audio Glasses set to Frontal (directional). List order and condition were randomized, and testing was repeated across two sessions, with consolidated data used for analysis.

Relative to unaided listening, aided thresholds improved by a mean of 3.48dB SNR (95 % CI 2.97–3.98; $p < 0.0001$), representing a large within-subject effect. All participants showed lower (better) aided scores, confirming a robust device-related advantage in diffuse babble (Figure 3).

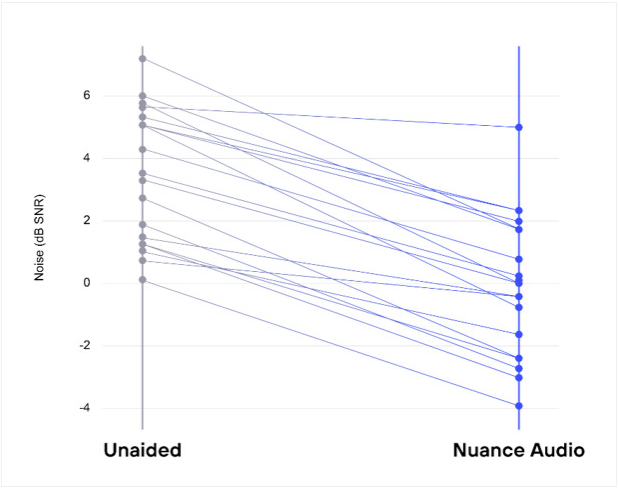


Figure 3 Individual benefit in speech-in-noise performance.

Laboratory listening preferences

In simulated environments representing everyday scenes library (~45 dB SPL), office (~55 dB SPL), restaurant (~65 dB SPL), and traffic (~75 dB SPL), participants compared aided and unaided listening while attending to frontal speech. They rated their preference on a five-point scale and identified factors which influenced their preference (e.g., speech clarity, listening effort, naturalness, localization).

Aided listening was preferred across all scenes. While preference in the quiet library was modest (55%), it strengthened with increasing background noise, reaching 75% in the restaurant, office, and traffic conditions. Participants most often cited enhanced speech clarity and reduced listening effort as reasons for their preference (Figure 4).

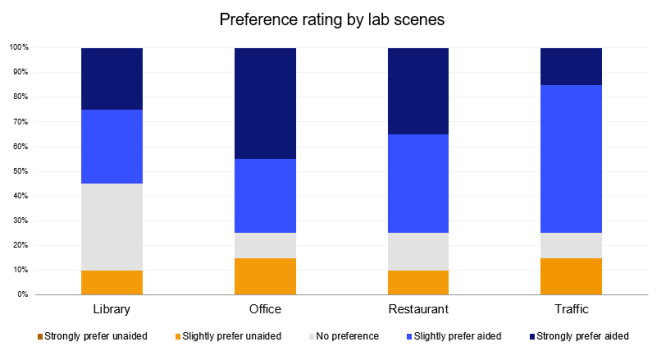


Figure 4 Preference ratings by laboratory scene.

Real world ecological momentary assessment (EMA)

During a guided outdoor walk, participants evaluated aided versus unaided listening while attending to a live talker across a range of realistic acoustic environments including corridors, meeting rooms, busy streets, parks, and café/food-court scenes. Ambient sound levels were logged to contextualize preferences. Environmental sound levels varied across the different real-world settings, ranging from ~39 dBSPL in the meeting room to ~70 dBSPL in the café.

Participants consistently preferred aided listening, with the most pronounced advantage observed in noisy social environments such as cafés and busy streets, where Nuance Audio Glasses provided its strongest real-world benefit during speech-focused interactions.

Patient-reported outcomes

Participants completed a modified Client-Oriented Scale of Improvement (COSI) before and after the trial. In the pre-trial phase, they identified their most important communication goals, most frequently citing difficulty following conversations in noisy social environments (Figure 5).

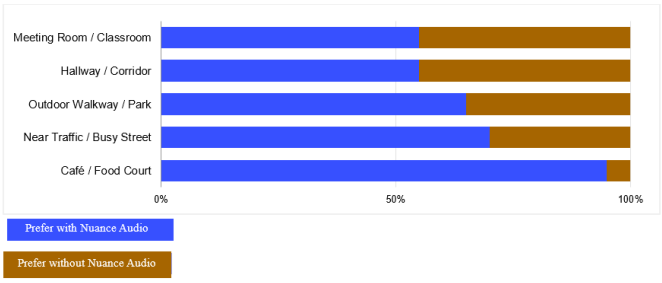


Figure 5 Preference ratings by real-world scene.

After the trial, they re-evaluated these same goals. The majority reported noticeable improvement in their prioritized listening situations. On the modified COSI, participants reported substantial improvement across nearly all communication goals, with more than 90% of their top priorities and approximately 84% of secondary goals showing clear benefit most notably for speech understanding in noise.

Following the trial, participants also completed a modified version of the International Outcome Inventory for Hearing Aids (IOI-HA) adapted for short-term use. Responses indicated overall improvement in hearing and communication ability, consistent with participants' laboratory and real-world listening preferences. Future studies with larger samples may wish to examine the relationship between individual objective benefit and subjective real-world outcomes.

Safety

Adverse events and device deficiencies were monitored throughout the study. No adverse events or safety concerns were reported, confirming the device's overall safety and tolerability during supervised use.

Limitations

This investigation involved a short, supervised exposure period and a modest sample size (n=20). Long-term acclimatization, independent use and configuration, daily wear patterns, and the durability of observed benefits were not evaluated and warrant further investigation in future studies. Another limitation is that participants were not blinded to the listening conditions due to the nature of the device, which should be considered when interpreting the results.

Conclusion

This NAL Clinical Investigation provides compelling evidence that Nuance Audio Glasses, when paired with the companion app, delivers clinically significant improvements in speech understanding in noisy environments for adults with perceived mild to moderate hearing difficulties. Across controlled laboratory simulations and real-world listening scenarios, participants consistently demonstrated a marked preference for aided listening with Nuance Audio Glasses, particularly in challenging social settings with background noise. Importantly, aided conditions yielded a significant improvement in SNR-50 scores, indicating that listeners required substantially less favorable signal-to-noise ratios to achieve 50% speech recognition compared to unaided listening. For a direct comparison of speech-in-noise performance between the Nuance Audio Glasses and two premium prescription hearing aids, see Harel-Arbeli & Beck.[16] Patient-reported outcomes reinforced these findings, highlighting meaningful gains in communication ability and overall listening confidence.

This study demonstrates that Nuance Audio Glasses can be used safely and provide measurable benefit for adults with perceived mild-to-moderate hearing difficulties. Participants showed clinically meaningful improvements in speech understanding in noise, strong user preference in both laboratory and real-world settings, and positive short-term patient-reported outcomes.

Collectively, these results position Nuance Audio Glasses and App as a practical, effective, and user-friendly OTC solution for individuals seeking to enhance everyday communication in acoustically challenging environments.

Future research involving extended, independent use will be essential to confirm the durability and long-term impact of these benefits.

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Acknowledgments

None

Conflicts of interest

The authors declare that there are no conflicts of interest.

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