

## INTRODUCTION

- Hearing aids are typically programmed using validated audiogram-based prescription methods and verified using real-ear measures.
- Hearing aid software can estimate prescribed targets (initial fit).
- Manufacturers' initial fits are now more accurate than ever due to developments in technology and computation; thus, the benefit of routinely using real-ear measurements (REM) for new adult users is unclear (1,2).

### Aims:

- Determine whether new adult hearing aid users prefer REM or the initial fit using a preference diary on a daily basis.
- Question users about the reason for their preference

## METHODS

- This double-blind, randomised, mixed method study was pre-registered in the Open Science Framework platform (OSF; osf.io/d2bjm) and approved by the North-West Liverpool Central Research Ethics Committee (Ref: 20/NW/0283).

## Participants

- Direct referrals of adults with mild-to-moderate sensorineural hearing loss and who had no previous experience with hearing aids were asked to participate in this clinical trial.

## Procedures

- All participants were fitted (in accordance with the BSA guidelines) with one or two NHS Oticon Engage behind-the-ear hearing aids.
- Each hearing aid was fitted with two programmes—the REM and initial fitting approaches—with modifications based on the user's feedback, as per the clinics normal practice.
- Both fitting approaches were saved as two hearing aid programmes (A and B). The participants and their audiologists were blinded to the order of the programmes.
- Participants were told to compare the two fitting approaches in many listening environments on a daily basis for six weeks and record their preferences.

## Preference diary and follow-up questionnaire

- Each participant was provided with a diary with one page for each day of the 6-week trial. Each page contained the following:
  - Four 7-point Likert scales measuring the participant's preferences for the clarity and comfort of sounds in quiet and noisy environments; and
  - A question about the participant's overall preference.
- All participants were asked to complete the follow-up questionnaire, which contained a question about the reasons for the participant's preferences.

## RESULTS

### Participants

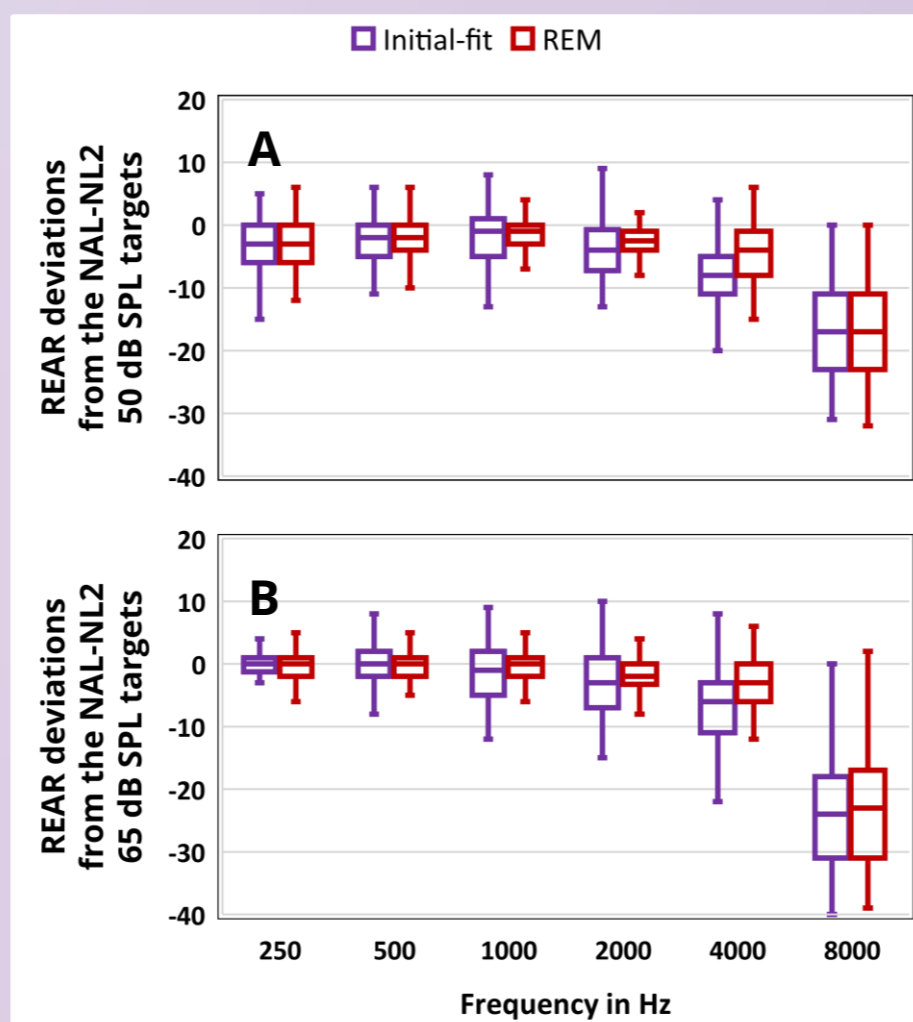
- 58 participants were deemed eligible for inclusion and were fitted with the two fitting approaches. Of these, 45 participants (aged between 27 and 89 years) completed this clinical trial.
- The pure-tone average for those who completed the study (averaged across 0.25, 0.5, 1, 2 and 4 kHz) was 34 dB HL (SD = 12). The configuration was typical of age-related hearing loss.

### Adjustments to the initial settings

- 13 participants (22%) requested modifications to their initial REM and initial fit programmes.
- All adjustments were relatively small (the mean absolute difference in gain before and after adjustment was 1.7dB).

### Deviation from prescription targets

- The median mismatches from NAL-NL2 targets for the initial fit and REM programmes were generally close (see Fig. 1).
- Both fitting approaches resulted in less gain at high frequencies compared to the NAL-NL2 target, especially the initial fit.
- The difference in the root-mean-square errors (of deviations from 0.5–4 kHz) between the fitting approaches at average input levels was statistically significant ( $p < 0.05$ ), with the REM values being closer to targets (3.2 vs 5.3 dB).



**Fig. 1.** Box plots of the mismatches between the measured real ear aided responses and NAL-NL2 targets for REM and initial fittings at 50 dB SPL (top panel) and 65 dB SPL (bottom panel) input levels. Medians and interquartile ranges are represented by the middle lines and the upper and lower ends of each box. The minimum and maximum values are represented by the whiskers.

### Aim 1: Listening preferences

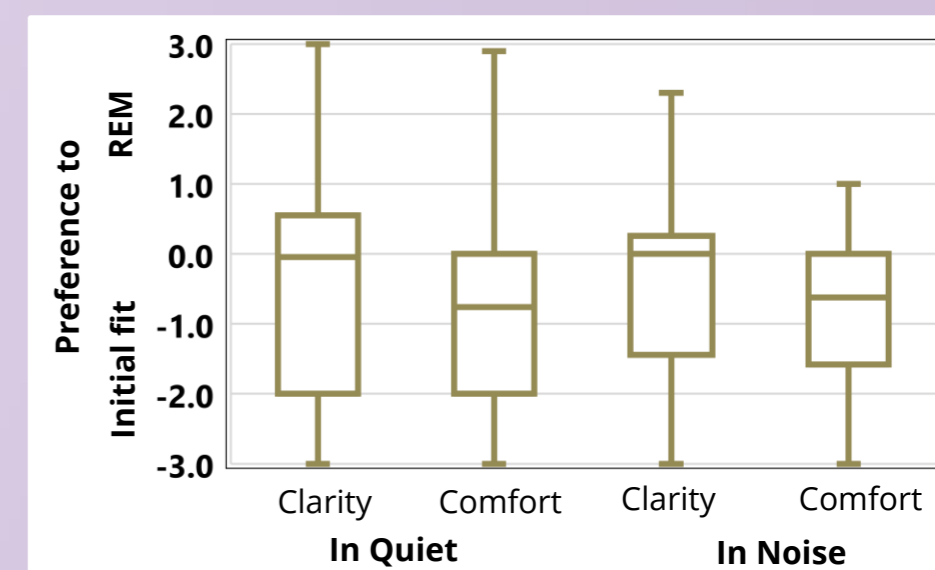
- Regarding the clarity and comfort of sounds in quiet and noisy environments, participants' ratings were averaged from weeks 3 to 6. Fig. 2 shows the medians and interquartile ranges for all listening conditions. Positive ratings indicated preferences for the REM programme.

- The median clarity ratings in quiet and noisy environments were around zero, whereas the ratings for comfort were in favour of initial fit (see Fig. 2). As indicated by the sign test, only comfort in quiet and noisy conditions significantly favoured initial fit ( $p < 0.05$ )
- In terms of the participants' final preference, more preferred the initial fit than REM (60% vs. 22%), and the difference was statistically significant ( $p < 0.05$ ).

### Aim 2: reason for preference

Thematically analysing participants' responses revealed that:

- The main reason for initial fit was that 'is mellow and sounds are less annoying'.
- The main reason for REM was that 'is clearer and provides access to treble sounds'.



**Fig. 2.** Medians and interquartile ranges for the participants' preferences.

## TAKE HOME MESSAGES

- The findings suggest that manufacturers' estimations of perceptions have become more accurate than before.
- At least for the model of hearing aid used in the present study, initial fit is sufficient for new adult fittings with instead of REM, time could be spent to provide, for example, more patient-focused support that addresses unique hearing difficulties.

## POTENTIAL LIMITATIONS

- We do not know if initial dislike for one setting means the participants did not give due time to both programmes and prevented possible acclimatisation; and
- It may have been possible to manipulate user preference if, for example, we were able to demonstrate that persevering with a particular programme would result in better performance.

## REFERENCES

- [1] Folkeard et al. JAAA 2019 <https://doi.org/10.3766/jaaa.19057>  
[2] Narayanan et al. IJA 2022 <https://doi.org/10.1080/14992027.2022.2053594>

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