

# Using extended high frequency audiometry results to guide cases of borderline hearing aid candidacy.

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## Objectives

This study explores whether adding extended high frequency (EHF) audiometry to a standard diagnostic test battery influences counselling, treatment recommendations or hearing aid uptake.

## Rationale

There is a significant body of literature that indicates standard audiometric findings alone are a poor predictor of hearing aid candidacy (Beck & LeGoff, 2018; Roup, Whitelaw & Baxter, 2019). Studies have also illustrated there is especially poor consensus on how mild losses are managed (Serenda et al, 2015). With no clear audiometric criteria for hearing aid candidacy, there is significant variability in how clinicians will resolve borderline cases. It is hypothesized that EHF audiometry may be sensitive to hearing difficulties for a subset of individuals with otherwise clinically insignificant findings. Access to these results may better inform clinicians on how to manage cases and support hearing aid uptake where results confirm patient experiences.

## Methods

Audiometric data, case history, and outcomes were collected from **433 individuals with normal PTA thresholds** (500, 1000, 2000 & 4000Hz). Data regarding age of participant, presence of tinnitus, previous hearing assessment history, and standard and EHF audiometry was collected.

The participants were divided into two major categories: those who did or did not pursue hearing aids. The two groups were named Hearing Aid (HA) uptake (n=35) and non-HA uptake (n=398). EHF audiometry was performed on 8 participants from the HA group and 111 participants in the non-HA group, for a total of 119.

## Results

35 Participants with normal PTA decided to pursue HAs. Average age of participant at the time of assessment was **58 years old (15 SD)**. Of those 35 participants, EHF was performed on 8 participants (22.9%). **7 of 8 participants (87.5%) had elevated EHF thresholds**. At least 5 of 8 participants (62.5%) reported tinnitus. At least 5 of 8 participants (62.5%) had their hearing tested previously. **7 of 8 participants (87.5%) who were administered EHF audiometry also had a high frequency hearing loss (HFHL) present in the standard audiometry range**. Of those 35 participants, EHF was not performed on 27 participants. At least 13 of 27 (48.1%) participants reported tinnitus. At least 18 of 27 (66.7%) had their hearing tested previously. **20 of 27 participants (74.1%) who pursued HAs did have a HFHL in the standard audiometric range**.

There were 398 Participants with normal PTA who did not pursue HAs. Average age of participant was **47 years old (16 SD)**. Of those 398 participants, EHF was administered to 111 (28%). 82 of 111 participants (74%) had elevated EHF thresholds. Of the 398 participants, 177 participants still had elevated thresholds in the standard audiometric range. Of those 177 participants with elevated thresholds, 54 had EHF audiometry performed, and **51 of those 54 (94%) had elevated EHF thresholds**. **Of the 221 participants with normal PTA and no HFHL, 31 of 57 (54%) had elevated EHF thresholds**.

Of the sample of 433 individuals, 35 pursued hearing aids for an **uptake rate of 8.1%**. The uptake among those who were administered EHF was 8 of 119 for an uptake rate of 6.7%. A similar uptake rate was observed among the 27 of 314 not administered EHF for an uptake rate of 8.6%. The return rate 6 months post fitting was less than 3% (1 of 35.)

## Discussion

The purpose of the study was to determine if adding extended high-frequency audiometry to the standard test battery altered outcomes. In the non-HA uptake group, 94% of participants with elevated standard thresholds also had elevated EHF thresholds, but only 54% of participants with normal thresholds had elevated EHF thresholds. There was a significant age difference between these two groups. An argument can be made for only performing EHF on participants in the absence of elevated thresholds in the standard range, especially if the patient is reporting speech-in-noise or tinnitus concerns.

For the group already exhibiting some elevated thresholds, data would suggest that the presence of elevated EHF thresholds may be considered a redundant test; however, it may still allow clinicians to make stronger evidence-based recommendations when patients present with a wider frequency range of elevated thresholds. A qualitative study on clinician counselling with or without EHF would inform this point. Uptake did not appear to increase as a result of EHF testing; however, it was only used 27% of the time suggesting missed opportunities. HA uptake was higher among cases with HFHL which may also have skewed results slightly. Clear protocols and clinician buy-in are likely important additional factors.

## Conclusions

*54% of patients with normal hearing across the entire standard audiometric range had hearing loss in the EHF range as did 94% with a normal four frequency PTA.*



## Acknowledgement & References

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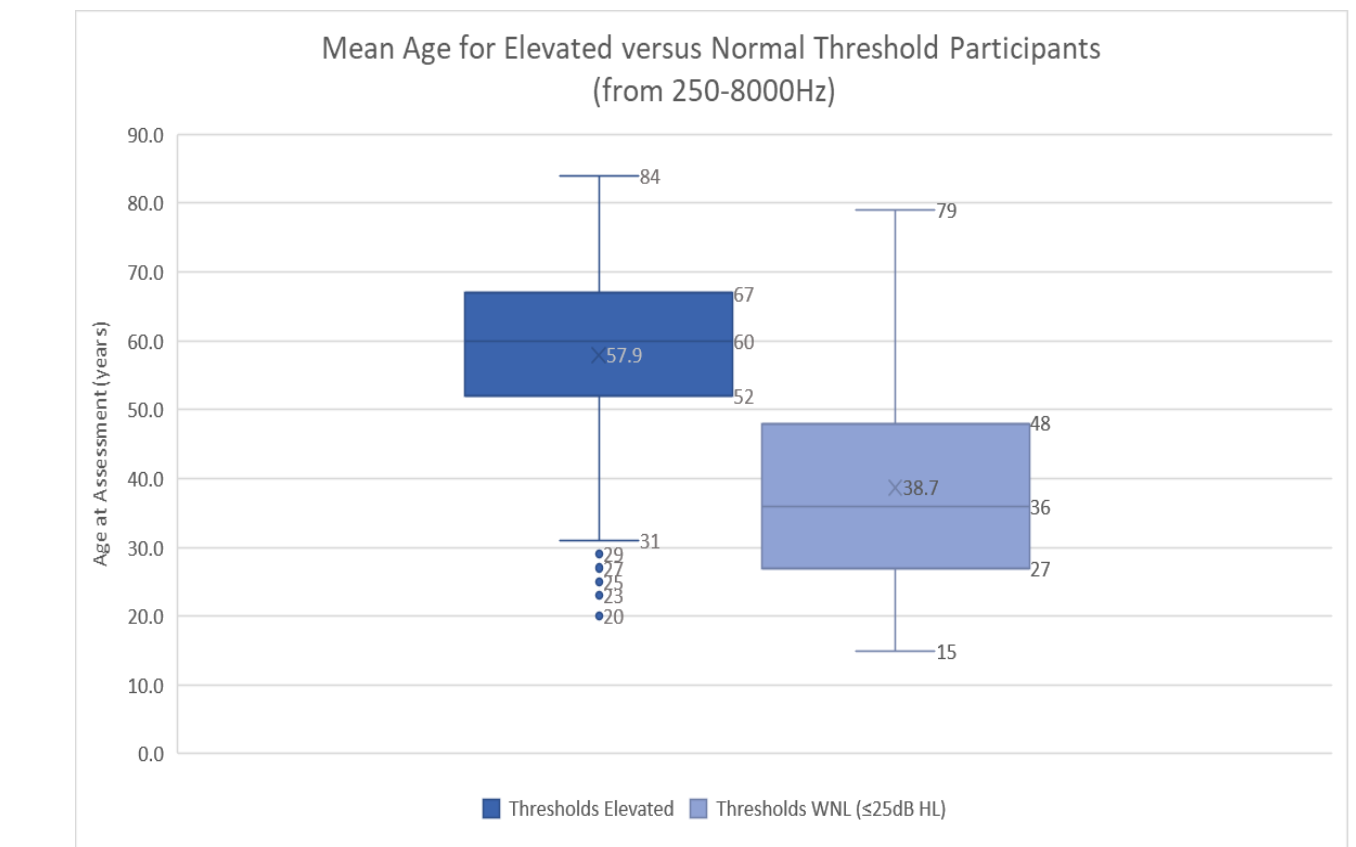


Figure 1. Shows the disparity in age between those with normal vs elevated thresholds in the standard range. This may help guide protocol development for when to use EHF testing.

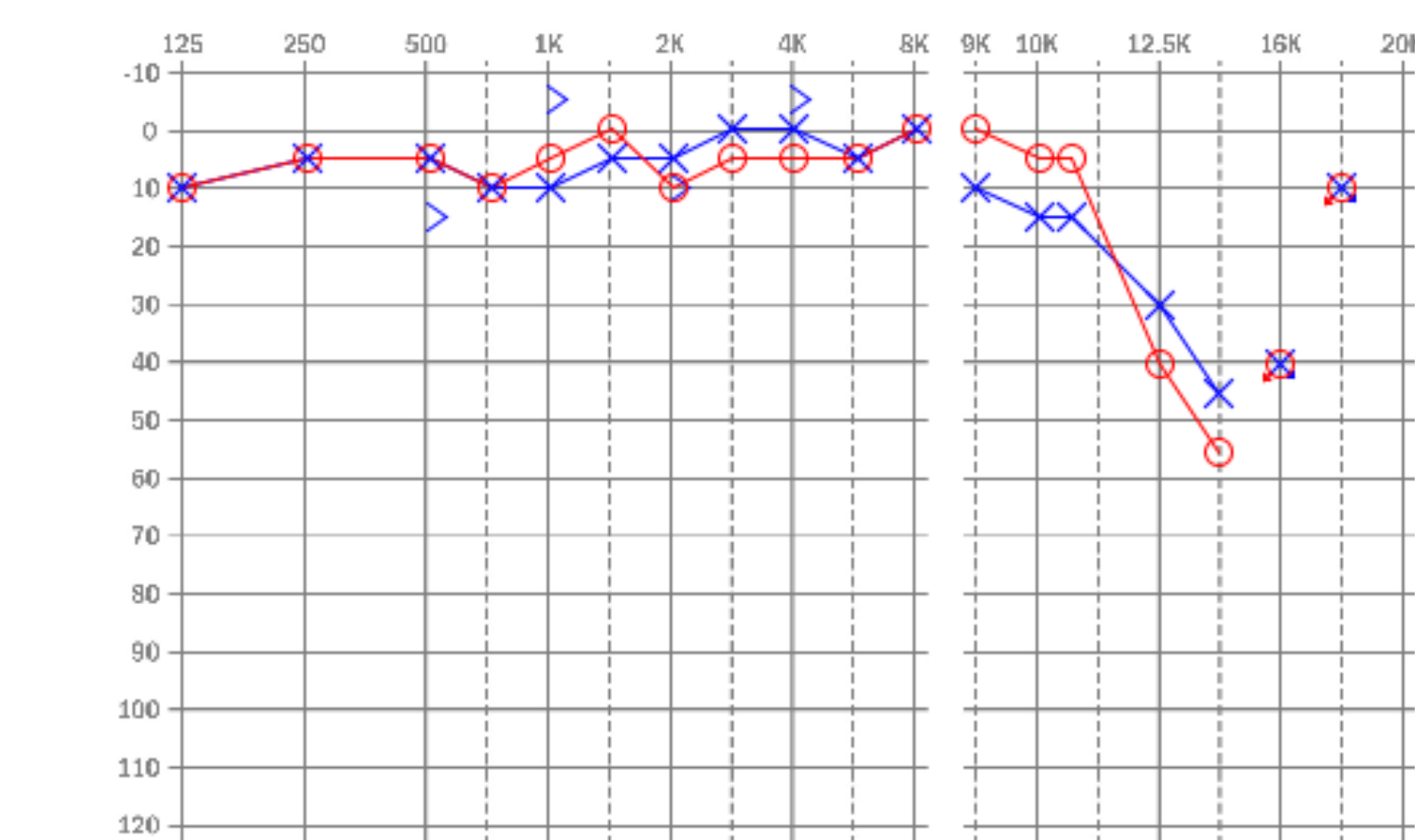
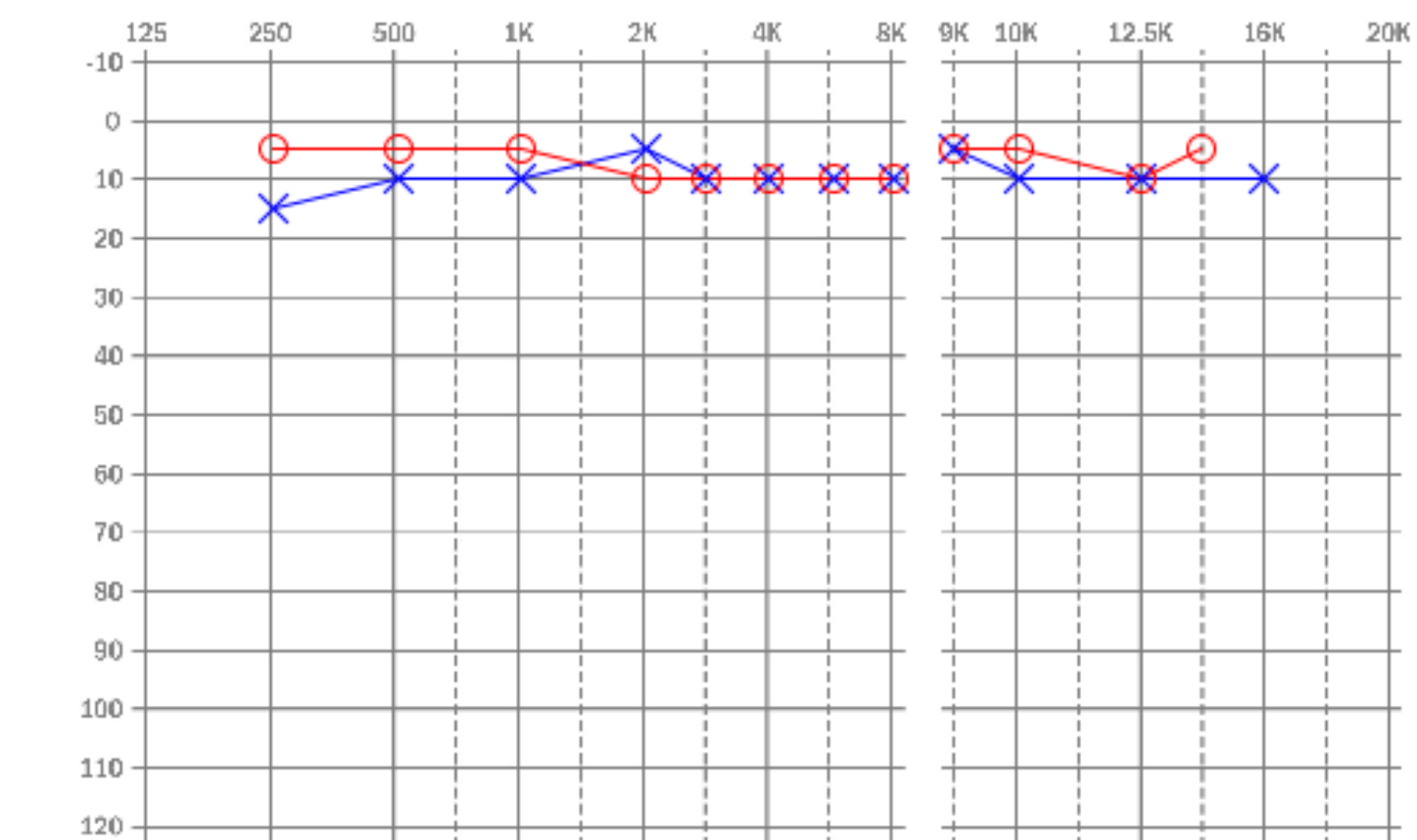


Figure 2-3. Contrasts the varied outcomes in the EHF range for two patients with normal hearing in the standard audiometric range. This variance was also observed in the aggregate data with roughly half approximating figure 2 and those other half figure 3.

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