Measuring speech-in-noise performance every week across a year

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Background

Hearing loss (HL) is known to increase with age. However, HL also varies greatly across individuals, yet longitudinal research investigating the rate-of-change is limited (e.g., Milne, 1977). We know that there is a steady decline of hearing during middle adulthood (e.g., 40-60 yrs), but can we spot this deterioration over a year? We will use an exponential fit as per our exploratory analyses (figure 1), the underlying constancy of HL change (dB) accelerates with age, and the *proportional* rate of change is constant.

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Research Aims & Procedure

To collect data on the day-by-day variability of an “at-home” digit-in-noise test. Additionally, we will determine the reliability of at-home testing, and the practical considerations (e.g., gaps in data collection, attrition rate & acceptability to participants)

Experimental Task

We will use the **triple-digit-noise (TDIN)** test as it a standard task, easy to implement and quick to complete. In this test, spoken digits in noise (e.g., “9-1-4”, “2-7-6”) are presented and the listener is tasked with identifying the digits by typing on a keyboard. The SNR varies adaptively with performance; the better the listener does, the lower the SNRs reached. “Threshold” is calculated from SNRs presented. We will use a 2-down, 1-up adaptive procedure in response to participant performance. The test should take approximately 15 mins to complete. We will run the TDIN via our “NOTE” (Nottingham online experimental engine) system.

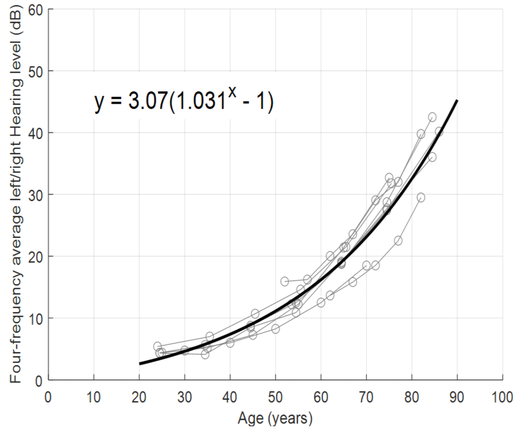
Participants & Procedure

- Adults aged 40-60ys with HL or normal hearing (NH)
- Weekly online TDIN & hearing questionnaires for approximately one year
- Standard pure-tone audiogram
- Focus group at the end of the study to gain participant feedback

Analysis

- We will apply multi-level regression models to get the variation around the best fit curve, and profiles of longitudinal change across the year.
- As each TDIN trial is a three conjoined one-interval nine-alternative forced choice tests, then calculating d’ and bias using signal-detection theory offers potential insight that would be missed by just looking at the percent correct.

Figure 1 – Exponential fit for audiometric hearing level in women



Conclusions

- Our exploratory exponential model suggests a steady deterioration of hearing during middle adulthood.
- By investigating the longitudinal rate-of-change across a period of a year, we aim to determine the underlying constancy.
- This may encourage individuals to seek earlier audiological assistance.
- Our pilot project will refine an at-home digit-in-noise test & help to identify people potentially at risk.