Listening Effort at Different Signal-to-Noise Ratios for Bone-Anchored Users

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Methods

- This is a prospective study, where listeners serve as their own control.
- Listeners with a bilateral conductive or mixed hearing loss and with bone-conduction pure tone thresholds lower than 40 dB HL are included in the study.
- Subjects should have previous consistent use of a Ponto Pro, Ponto Plus or Ponto 3 processor for at least 6 months.
- Patients are fitted with Oticon Medical Ponto 4 (fig1).

- Self-reported performance with Ponto 4 is also evaluated via questionnaires including the impact on work related fatigue.

Listening task

- For each trial, noise started 3 s before sentence onset and ended 3 s after sentence offset.
- Subjects’ task: Listen to the sentence in noise, retain the sentence for 3 s, repeat the sentence after noise offset.
- There are varying test conditions at each visit account for differing SNRs.
- The test conditions will be performed with the new Ponto 4 Open Sound Navigator (OSN) and off to identify to evaluate its impact on listening effort.
- An eye-tracking camera monitors pupil dilation, as a measure of listening effort.

Factors affecting listening effort

- Listening effort depends on subject’s motivation and on the task demands.
- As motivation to listen increases, listening effort increases.
- As demands increase, listening effort increases.
- At point demands become too high, motivation reduces and listening effort decreases.
- At this stage disengagement occurs leading to further reduction in listening effort.

Pupil dilations are linked to a parasympathetic nervous system (PNS) mechanism.

- The Sympathetic and Parasympathetic Nervous System (SNS) activates the dilator muscle and inhibition of the Parasympathetic Nervous System (PNS) relaxing the sphincter muscle.

Results

- Listening effort assessed by measuring pupil dilation with an eye-tracking camera (fig 3) during a speech-in-noise task.
- The headwear supporting the cameras is lightweight and comfortable for wear and can be worn with PPE without difficulties.
- The environment is controlled using a specific dimmable light source and the subject is asked to maintain focus on a specific point.
- Subjects are not required to ingest caffeine within 6 hours of testing due to the influence on the pupil responses.

Study Progress

The impact of COVID19 has been felt worldwide. Alongside the impact on NHS clinical services, the pandemic has also had a major impact on Research and Development. Between March 2020 and August 2020 all Non-COVID studies at UHB were suspended. In August 2020 this study was reopened. Currently 6 of a target of 30 patients have been recruited to this trial. Data collection remains ongoing, to date no results are available for publication.

References


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