

## Evaluation of Replacement Hearing Aids with Hearing in Noise Test (HINT) in Cochlear Implant Candidates Prior Decision of CI Surgery

Jakobsen, Yeliz; Schmidt, Jesper Hvass

*Publication date:*  
2023

*Document version:*  
Final published version

*Citation for pulished version (APA):*  
Jakobsen, Y., & Schmidt, J. H. (2023). *Evaluation of Replacement Hearing Aids with Hearing in Noise Test (HINT) in Cochlear Implant Candidates Prior Decision of CI Surgery*. Poster session presented at International Symposium on Auditory and Audiological Research, Nyborg, Denmark.

Go to publication entry in University of Southern Denmark's Research Portal

### **Terms of use**

This work is brought to you by the University of Southern Denmark.  
Unless otherwise specified it has been shared according to the terms for self-archiving.  
If no other license is stated, these terms apply:

- You may download this work for personal use only.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying this open access version

If you believe that this document breaches copyright please contact us providing details and we will investigate your claim.  
Please direct all enquiries to [puresupport@bib.sdu.dk](mailto:puresupport@bib.sdu.dk)

# Evaluation of Replacement Hearing Aids (HAs) with Hearing in Noise Test (HINT) in Cochlear Implant (CI) Candidates Prior to CI Surgery

Yeliz Jakobsen, Jesper Hvass Schmidt

Research Unit for ORL – Head & Neck Surgery and Audiology, Odense University Hospital, Odense, Denmark; University of Southern Denmark, Odense, Denmark

**Background:** Pupils react to changes in sympathetic nervous system – this is an autonomous (involuntary) reaction in the brain during stressful conditions.

40 years ago in 1973, Kahneman documented a correlation between pupil size and complexity of a given task. Recently, Kramer documented that pupillometry can be used to quantify listening effort when listening to speech in background noise.

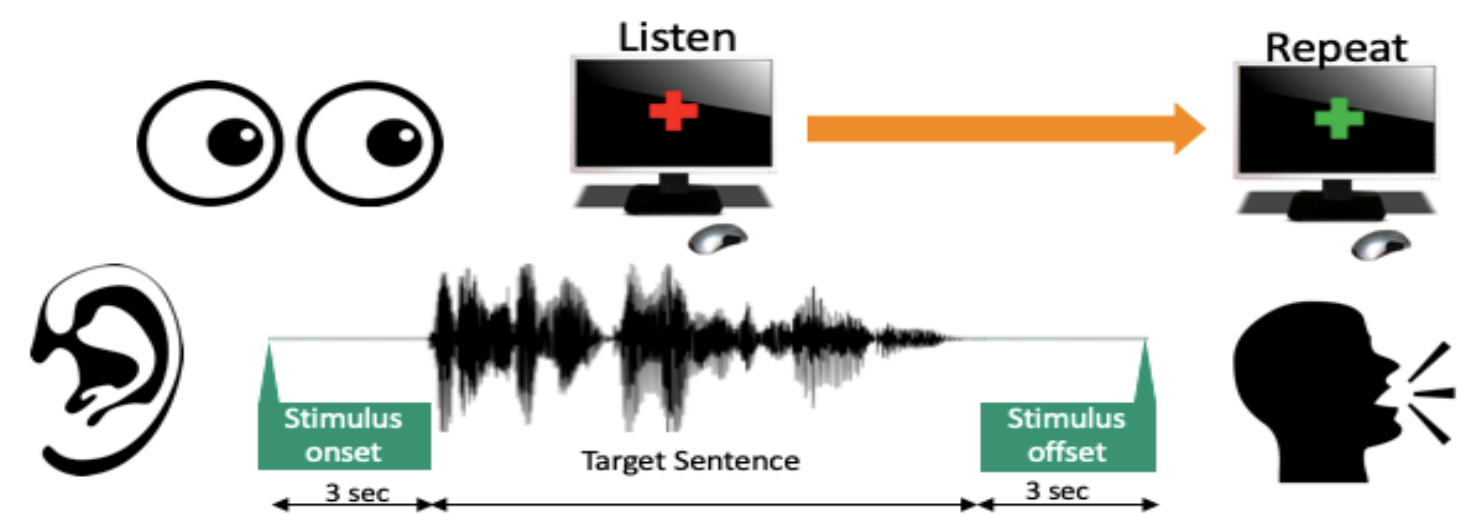
## Introduction

We studied if new replacement HAs compared to existing HAs improve speech intelligibility with constant task engagement by examining the pupillary response in relation to signal to noise ratio (SNR) during a Danish HINT.

## Method

21 bilateral HA users referred for CI, aged 23-82 (mean=65) were tested with existing HAs(A) and one month(B) and four months(C) post fitting with new HAs (Phonak Link M or GN (ReSound LiNXQ, ENZOQ) according to NAL-NL2 prescription and verified with Real Ear Measurement (REM).

The test consisted of two sessions: first a SNR was determined of 70% correct word recognition score at 65 dB SPL in HINT, thus finding the constant task engagement. This individual SNR was then used in another HINT while recording the pupil reaction and studying the peak pupil dilation (PPD).

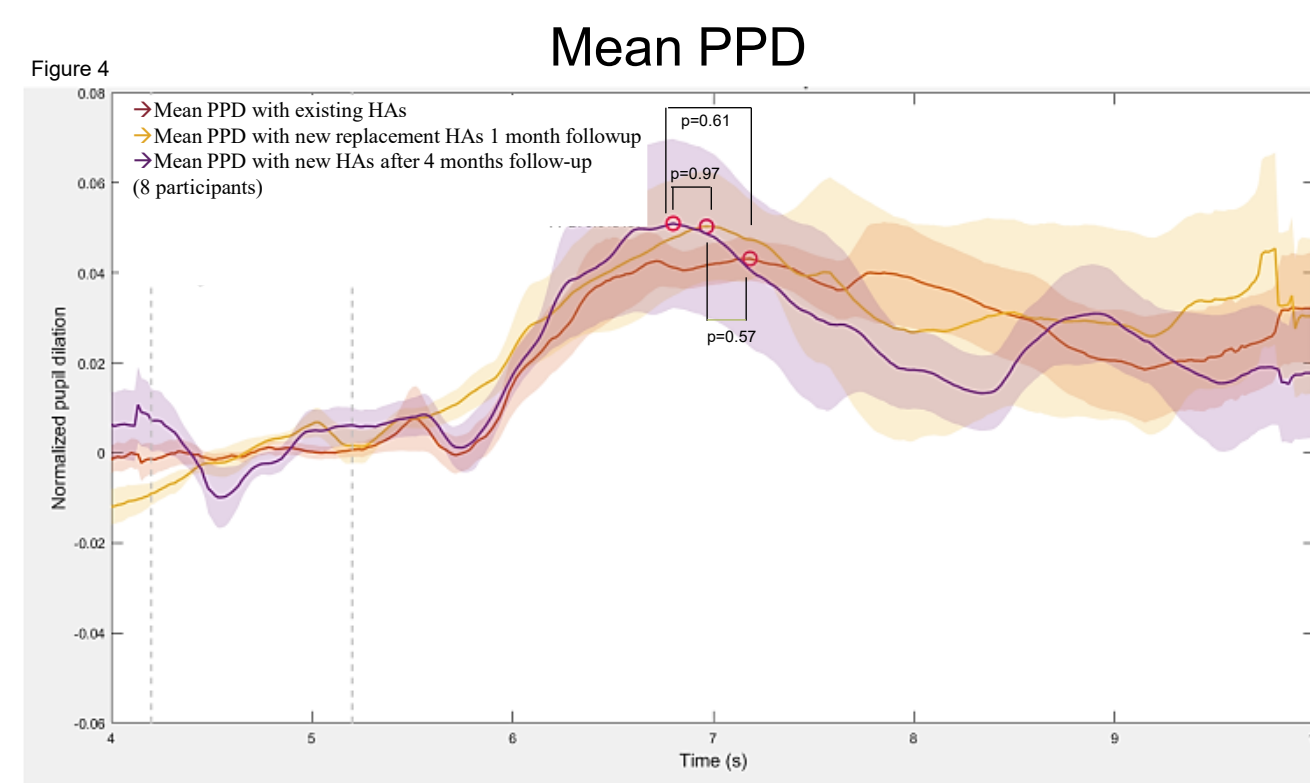
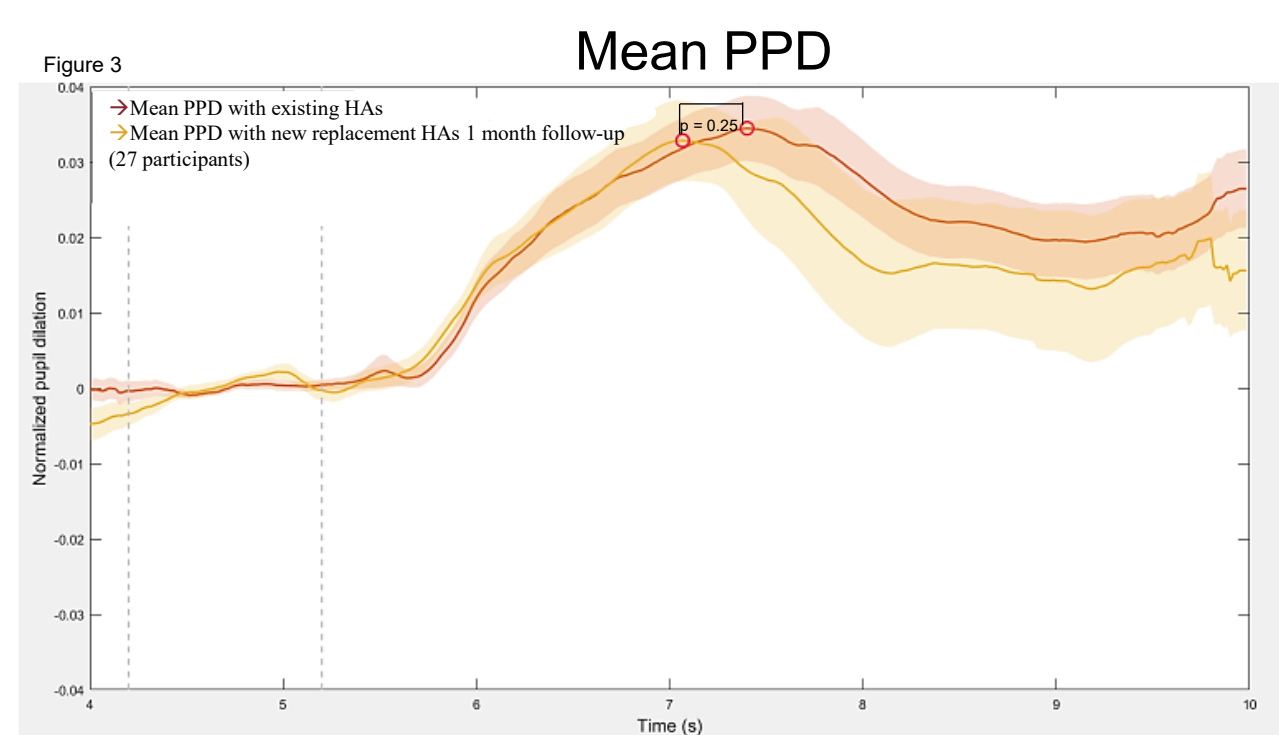
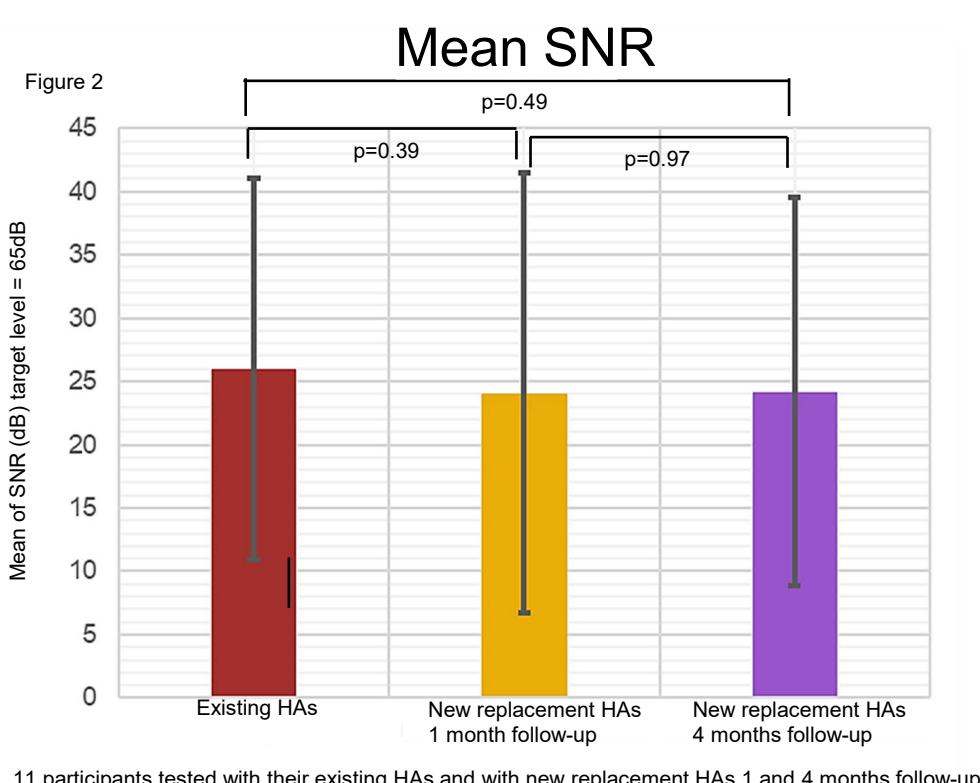
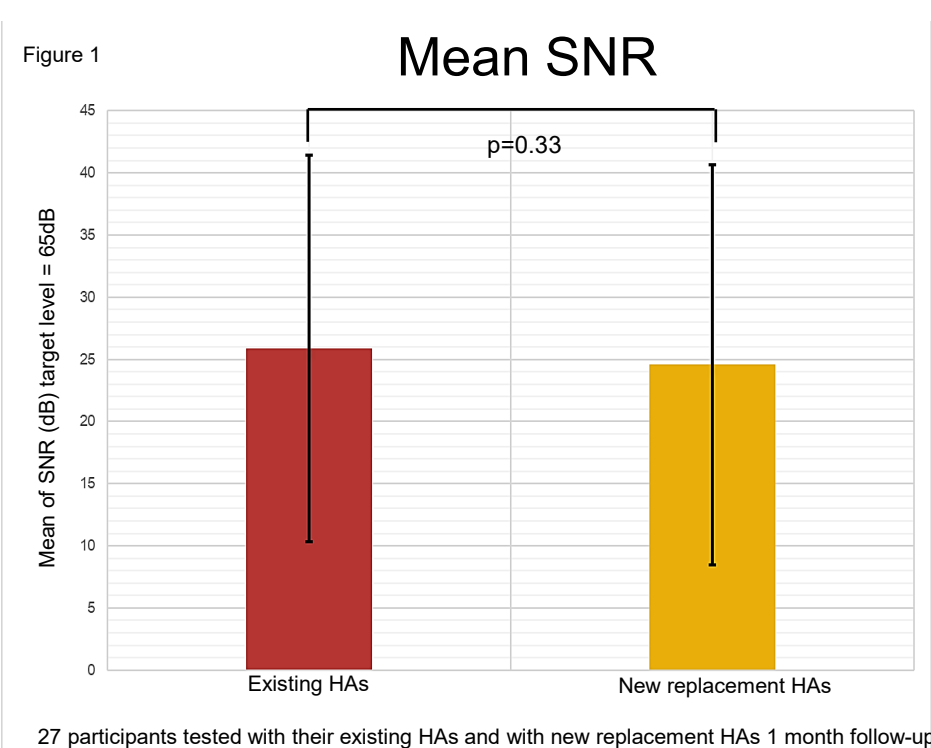


## Results

5 out of 27 patients tested with HINT and monitored with showed a clear improvement in SNR with a mean difference of -12 dB in SNR (SD = 5.9 dB,  $p=0.01$ ) but no significant difference in PPD = -0.0064 (-0.64%) (SD=0,027,  $p=0.62$ ) whereas 2 out of 27 showed a clear worsening with a mean difference of 7dB in SNR (SD=0).

Patients with existing HAs (baseline) compared with new replacement HAs after 1 month, showed a non-significant improvement of -0.39 dB in SNR (95% CI -3.16– 2.38  $p = 0.33$ ) and with a mean change in PPD of 0.0082 (0.82%) (95% CI -0.022 - 0.0058,  $p = 0.25$ ) (Fig. 1 and 3).

A t-test was also performed on the differences between baseline and 4 months follow-up after new HAs with a mean change in SNR of 1.82 dB (95% CI -3.84-7.48,  $p=0.49$ ) and a change in mean PPD of -0.0090 (0.90%) (95% CI -0.045 - 0.049,  $p = 0.61$ ) as well as between 1 month follow-up after new replacement HAs and 4 months follow-up after new replacement HAs with a mean change in SNR of -0.09 dB (95% CI -6.35-6.17,  $p=0.97$ ) and a mean change in PPD of 0.00058 (0.058%) (95% CI -0.035 - 0.0367,  $p = 0.97$ ) (Fig. 2 and 4).



## Conclusion

SNR and PPD during HINT with constant task engagement was not improved significantly when comparing new replacement HAs with existing HAs, however we found a trend of improvement in SNR with a mean difference of 12 dB (SD = 5.9 dB,  $p=0.01$ )

## Perspective

The study is still collecting data and if we show no improvement when replacing hearing aids prior to CI surgery, we might change clinical practice to replace hearing aids parallel with cochlear implant rehabilitation.

When speech intelligibility increases after CI surgery we expect decrease of task engagement, ultimately leading to the conclusion that pupillometry is a sensitive and valid measure of cognitive load.