Suboptimal hearing aid gain negatively impacts perceptual and cognitive processing of speech

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When fitting a hearing aid, it is important to ensure the real-ear insertion gain of the hearing aid matches to the prescriptive targets. However, hearing aid users do not always receive the amount of gain they need due to many different reasons, such as feedback management and individual differences in ear acoustic, leading to underfitting. Research studies have showed that underfitting of hearing aid could result in reduced sound quality and perceived intelligibility. The present study aimed to investigate the impact of hearing aid underfitting on speech intelligibility, listening effort and memory for speech heard in noise. The Hearing In Noise Test (HINT), pupillary responses during speech recognition and the Sentence final-Word Identification and Recall test (SWIR) were used to assess speech intelligibility, listening effort and memory recall respectively. Experienced hearing aid users (mean age = 67 years) with mild-to-moderate hearing loss were recruited. There were two conditions of gain prescription: 1) a target match condition where the gain is matched to the targets prescribed based on the NAL-NL2 rationale with a 2-dB deviation acceptance and 2) a simulated underfit condition where the prescribed gain was approximately 6 dB below the NAL-NL2 targets between 2 and 4 kHz. Real ear measurements were performed in both test conditions. Better HINT performance was found in the target match condition. The analyses of the pupillary responses showed an increased pupil dilation in the underfit condition when compared to the target matched condition, indicating more evoked listening effort when the hearing-aid gain was not optimal. For the SWIR test, the target match condition resulted in a better recall performance compared to the underfit condition for words that occurred in the early list position, suggesting less cognitive resources were devoted for speech identification and hence more remaining resources was available for recall from the long-term storage. The results of the present study demonstrated that underfitting of hearing aids can have negative impacts on perceptual and cognitive processing of speech. This study also sheds light on the importance of providing optimal gain that matches the prescriptive target in hearing aid fitting. (345 words)

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