ORIGINAL ARTICLE

Effect of different test signals during the verification stage of digital multi-channel hearing aids on word recognition performance

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ABSTRACT

Aim

The aim of this study was to investigate the aided word recognition performance in adult patients with digital multi-channel hearing aids, by using different test signals during the verification stage of fitting.

Material and Methods

Ten adults with sloping sensorineural hearing loss, bilaterally, participated in this study. A real ear instrument - using three different test stimuli- was used for the verification stage of all subjects. Word recognition testing was performed monaurally at 65 dB SPL under two conditions: in quiet and in the presence of noise.

Results

Listeners performed significantly better in quiet than in noise. However, the percentage scores obtained in each condition did not fall outside the 95% critical range for significant differences. A higher score was obtained for the real speech stimulus under both conditions.

Conclusions

These results indicate that all three stimuli used in this experiment are appropriate for the verification of digital hearing aids with real speech being the stimulus of choice.

Key words: *Word recognition test, sensorineural hearing loss, hearing tests, hearing aids*

INTRODUCTION

The main need for an individual with hearing loss is to hear and understand speech, especially in noisy situations. The fitting of amplification for individuals with hearing loss is comprised of four stages involving assessment, selection, verification and validation. The verification stage of amplification is the most important part of the fitting process, since it defines the acceptance and therefore usefulness of the instrument to the patient. Acceptance also means that the patient will not return the instrument by the end of the trial period and that he/she will inform other patients for the provided services.

Currently, the methods used for evaluating amplification vary among professionals and facilities. Some clinicians do not use any systematic approach or modern technology in the verification stage. Others, will verify their fittings only if the patient returns the amplification system. However, professionals have always been interested in verifying their amplification fittings, and most of them are trained in the use of the soundfield assessment (functional gain), the 2cc coupler measurement and the Real-Ear Measurement (REM). These procedures are appropriate for use with analog hearing aids. They involve adjustment of the electroacoustic characteristics of the aid in order to match Real-Ear Insertion Gain (REIG). However, the incorporation of these tests in the verification process, although very useful, have had little impact on the acceptance and use of amplification by patients.[1,2,3,4,5]

DIGITAL TECHNOLOGY

A large number of parameters are incorporated in modern digital and especially multi-channel hearing aids in order to suit individual needs and preferences.[6] Verification of digital hearing aids is often done with REMs using a probe microphone, which is the only objective way for measuring the acoustic energy at the tympanic membrane. Other measures such as coupler and programming displays do not show the amplified sound pattern, actually occurring in the patient's ear canal. REM is done using signals such as swept pure tones or/and steady sounds that match the spectrum of speech. However, the signals used to make these measurements are irrelevant to everyday sounds that the hearing aid user experiences, for example speech and music. Therefore, the real gain from a complex signal like speech will differ from the gain measured with steady signals, such as tones or noise.[7,8,9,10] This difference in gain depends on a number of discrete factors. For example, a pure tone test signal can be reduced or cancelled, since it may be recognized as feedback of the hearing aid. The feedback reduction algorithm reduces or eliminates feedback detected in the input signal by lowering the gain of certain frequencies. Thus, the

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