Clinical Factors Affecting Directional Benefit
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Introduction

Efficacy of directional microphone technology is well established. Many studies have demonstrated better performance on speech-in-noise tests with directional microphones relative to omnidirectional microphones. Significant improvements in speech-in-noise performance observed in these studies are attributed to directional benefit. Clinical factors affecting directional benefit remain a topic of study and have been the subject of multiple research studies. The goal of the current investigation was to evaluate the predictive value of a number of clinical factors on benefit from directional microphone technology. Directional benefit is variable, and the results of this study seek to determine the relationship between directional benefit and various clinical factors.

Methods

Participants

70 adults with varying degrees of hearing impairment participated in three separate clinical studies. Participants ranged in age from 21.6 to 82.2 years with a mean age of 62.2 years. Both new and experienced users of hearing aids were included in the studies. All participants were fit bilaterally and were seen for a minimum of 3 laboratory sessions.

Hearing Aids

Six device styles were used in this investigation: the (ITC) with venting, the (ITE) with thin tubing in an open canal configuration, the (BTE) with thin tubing in an open canal configuration, the (IC) as a constricted-wenti, behind-the-ear (BTE) with thin tubing in an open canal configuration, the (RITE) with standard tubing in an occluded configuration with venting.

Real-world probe-microphone measurements were performed using the Audioscan Verifit hearing aid measurement system. Real-world measurements were obtained using the International Speech Test Signal (ISTS) at 50 dBA, 65 dBA, 80 dBA, and 95 dBA, and a pure-tone sweep at 75 dBA, to establish a maximum level.

The test devices were fixed in a needed based on patient reports of performance and comfort with the devices in real-world listening situations.

Real-world verification of directional benefit was performed using the Audioscan Verifit.

Results

The test devices were fine tuned as needed based on patient reports of performance and comfort with the devices in real-world listening situations.

Real-world verification of directional benefit was performed using the Audioscan Verifit.

Summary and Discussion

The goal of the current investigation was to evaluate the predictive value of a number of clinical factors on benefit from directional microphone technology. Directional benefit is variable, and the results of this study seek to determine the relationship between directional benefit and various clinical factors.

Summary of results from the current investigation:

- Directional benefit between the open and occluded groups was not significantly different; however, differences in degree of hearing loss between the two groups may have contributed to this finding. It should be noted that variability in directional benefit for the occluded group was greater than that for the open group.

- Group A: A significant correlation between directional benefit and omnidirectional HINT score was found. These results are consistent with the results of Ricketts and Mueller. Directional benefit was not significantly better than performance in the omnidirectional condition. These studies have included directional benefit as a function of hearing loss.

- Kuk, Keenan, and Ludvigsen found a significant correlation between directional benefit and omnidirectional HINT score.

- In contrast to Ricketts and Mueller, the current investigation did not find a significant correlation between directional benefit and degree of hearing loss, but the group fit in an occluded configuration only.

- For all participants, no significant correlations between directional benefit and 4000 Hz, tone, word threshold, word recognition score, or QuickSIN score were found. These results are consistent with those of Kuk et al.

Results suggest that directional benefit may be predicted by HINT performance in the omnidirectional condition regardless of fitting configuration. However, the availability of directional microphones in modern hearing aids and the likelihood of directional benefit, it seems reasonable to utilize directional technology for adult patients uncomplicated by conductive or mixed hearing loss.

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References