Predicting Hearing Aid Benefit from Speech Recognition Measures

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INTRODUCTION

A common reason cited in the literature for limited use and non-usage of hearing aids is inadequate improvement in speech understanding, particularly when listening in noise (e.g., Kochkin, 2000). Therefore, objective measures of unaided and aided speech recognition obtained in laboratory settings are generally poor predictors of subjective hearing difficulties and hearing aid outcomes in real-world settings. One reason for this disconnect may be that in some studies speech recognition is assessed in only a small number of test environments in a laboratory. These conditions may fail to capture the wide range of situations experienced in real-world settings. To address this limitation we measured unaided and aided word recognition at multiple levels and SNRs. Aided testing was completed using the participants’ own “as fit” hearing aids. Additionally, in an attempt to estimate understanding in the wide range of conditions experienced in real-world settings, we used the Speech Intelligibility Index (SII: ANSI S3.5, 1997) to predict unaided/aided sentence recognition in conditions not tested in the laboratory. A modified SII (mSII) procedure, incorporating individual proficiency factors derived from measured speech recognition ability obtained in the laboratory, was also used. The purpose of this study was to examine relationships between these various measures of unaided/aided speech recognition ability and subjective measures of unaided/aided hearing outcomes.

METHODS

Participants: Fifteen adults (52 to 85 years, 8 male, 7 female) with mild- moderate SNHL hearing loss. All were existing hearing aid users and had worn their current hearing aids for at least 10 months (median: 24 months, range: 10-42). The majority of participants used open fit digital BTE aids.

Hearing Aid Assessment: Hearing aid output was quantified using a computerized version of the Nu-6 monosyllables (Auditec, Boulder, CO). This measure was used to estimate hearing aid output for input levels of 55, 65, and 75 dB SPL. These measures were used to calculate real ear compression ratios for later use in SII calculations.

Subjective Assessments: Unaided and aided hearing outcomes were obtained using the Glasgow Hearing Aid Benefit Profile (GHABP; Gatehouse, 1999) and the Profile of Hearing Aid Benefit (PHAB; Cox and Gilmore, 1990). Unaided/aided Scores were based on individual measures of proficiency (mSII; both aided and unaided). The transfer function for “Unfamiliar Sentences” (Sherbecoe and Studebaker, 1990) was used to correct for predicted intelligibility at each SNR (See Figure 3).

Speech Recognition Testing: Unaided and aided word recognition was assessed using the Auditec version of the Nu-6 materials in 8 (4 unaided/4 aided) test conditions. Words were presented at 55 and 65 dBnHL in quiet, and in a 55 dBnHL steady-state background noise (0 and +10 dB SNR). Two hundred words were presented in each test condition.

RESULTS (con’t)

Speech Intelligibility Index (SII) Predictions

Figure 1. Scatter plots showing the relationship between mean unaided and aided SII predictions and mean unaided and aided GHABP scores in 483 conditions that are >90% correct. These SII estimates incorporate individual measures of proficiency and unaided and aided PHAB scores (See Table 1 and Figure 4).

Figure 2. Scatter plots showing the relationship between unaided and aided SII predictions and mean unaided and aided PHAB scores in 483 conditions that are >90% correct. These SII estimates incorporate individual measures of proficiency and unaided and aided PHAB scores (See Table 1 and Figure 4).

Figure 3. Scatter plots showing the relationship between unaided speech recognition based on the Speech Intelligibility Index and subjective measures of hearing outcomes (both aided and unaided). The listening situations chosen for SII predictions may not have been representative of important listening situations for this group.

Factors other than speech recognition ability are known to affect ratings of subjective outcomes.

REFERENCES


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