Communicative Benefits via Directional Microphones/FM Systems

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Introduction

The major complaint of individuals with sensorineural hearing loss (SNHL) is communicative difficulty, especially in adverse listening environments (Hawkins & Yacullo, 1984; Crandell, 1991; Needleman & Crandell, 1995). Fortunately, numerous investigations have reported a subjective improvement in communication with the utilization of hearing aids (Valente, Fabry, & Potts, 1995; Haskell, Noffsinger, Larson, Williams, Dobie, & Rogers, 2002).

Although the communicative benefits of hearing aids have been well established, little information is available regarding the communicative benefits of FM technology. With these thoughts in mind, the purpose of the present investigation was to examine the communicative benefits of FM technology and to compare them to the benefits obtained with using hearing aids alone. Specifically, the Abbreviated Profile of Hearing Aid Benefit (APHAB; Cox & Alexander, 1995) was administered at pre-fitting and one time per month in each experimental condition: (1) hearing aids alone and (2) hearing aids plus FM system. The subjects used the devices for three months in each experimental condition.

Methodology

Subjects

Subjects were recruited from the audiology clinics at the University of Florida (UF) in Gainesville, Florida and at Washington University School of Medicine (WU) in St. Louis, Missouri. These subjects ranged in age from 24 to 84 years with a median age of 73 years. Pure-tone test results revealed mean thresholds consistent with a mild sloping to severe SNHL bilaterally and a moderate sloping to severe SNHL bilaterally at UF and WU respectively (see Figures 1 and 2). Mean word recognition scores (± 1 SD) of 78% (± 16%) and 77% (± 15%) were obtained for the right and left ears respectively at UF and 73% (± 11%) and 77% (± 7%) were obtained for the right and left ears respectively at WU.

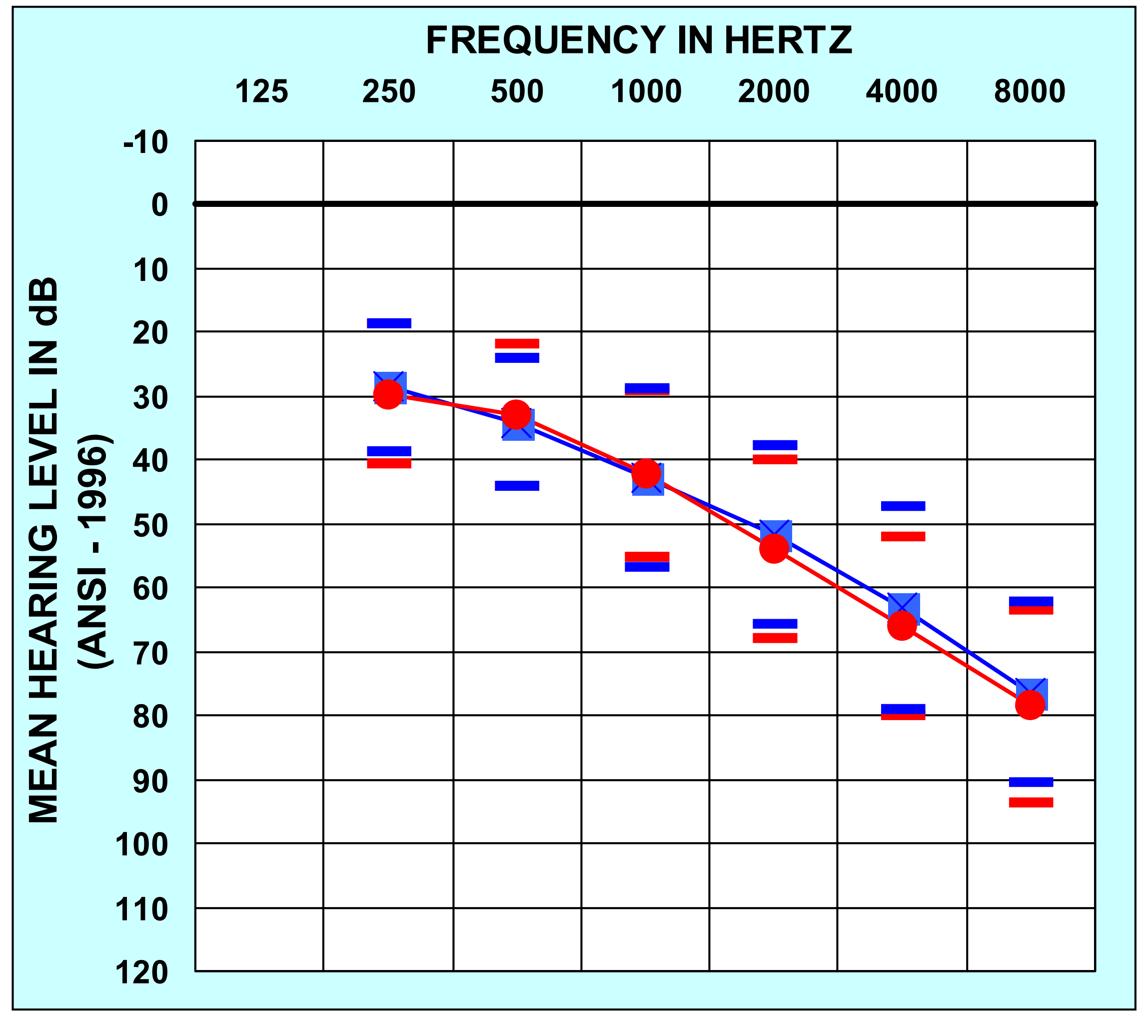

Figure 1. Mean pure-tone air-conduction thresholds for the right and left ears (± 1 SD) at UF.

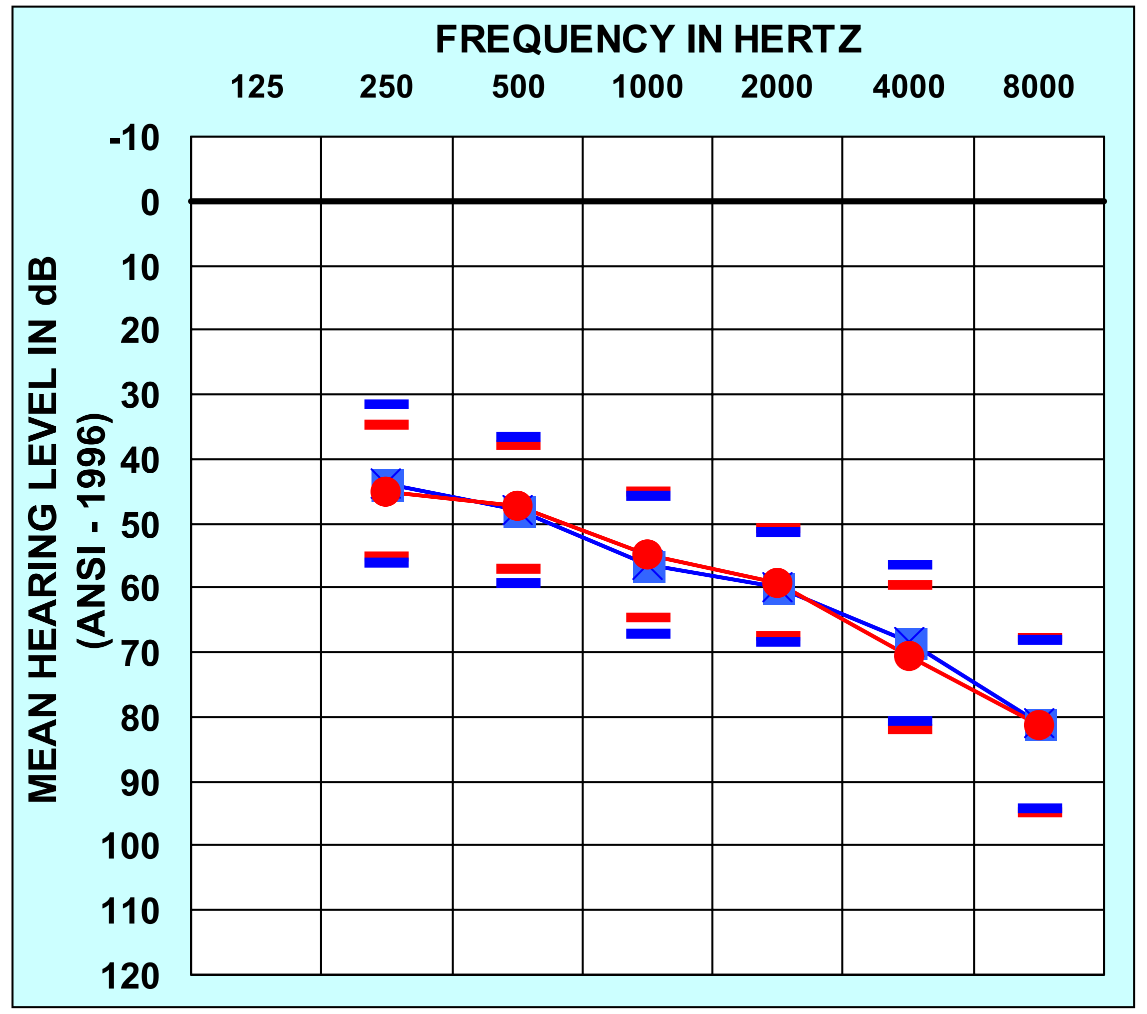

Figure 2. Mean pure-tone air-conduction thresholds for the right and left ears (± 1 SD) at WU.

Amplification Systems

All subjects were fit with digital Phonak Claro 311 dAZ BTE hearing aids and Phonak Microlink ML8 FM receivers bilaterally. The Phonak TX3 HandyMic FM transmitter served as the FM transmitter.

Figure 3. Phonak Claro 311 dAZ BTE hearing aid and Phonak Microlink ML8 FM receiver.

APHAB

Communicative benefit was assessed by the APHAB (Cox & Alexander, 1995). The APHAB consists of 24 questions that are divided into four subscales: (1) ease of communication (EC); (2) speech in background noise (BN); (3) speech in reverberation (RT) and (4) aversiveness to sound (AV). Responses range from always (99%) to never (1%). Communicative benefit was determined by examining the difference between unaided and aided responses.

Procedures

All subjects were randomly fit with the Phonak amplification systems in one of the following conditions: (1) Phonak 311 dAZ BTE hearing aids only or (2) Phonak 311 dAZ BTE hearing aids used in conjunction with the Phonak Microlink FM system. This investigation had a crossover design, in which at the end of three months the subjects switched experimental conditions. Each subject was evaluated with the APHAB one time prior to receiving amplification and three times (one time per month) in each experimental condition.

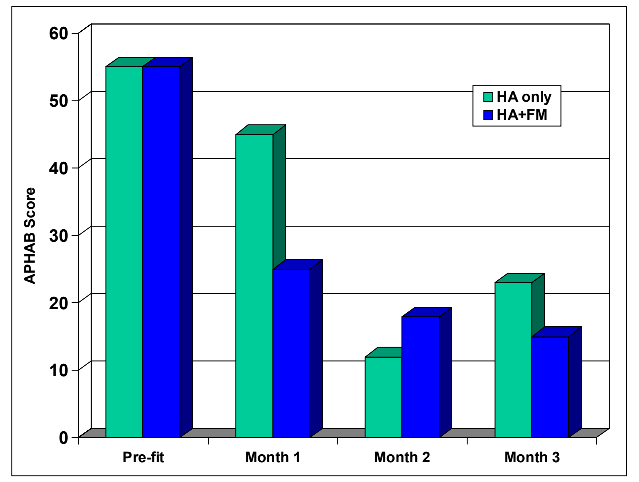

Figure 4. Ease of Communication (EC) subscale scores for each month in each condition at UF.

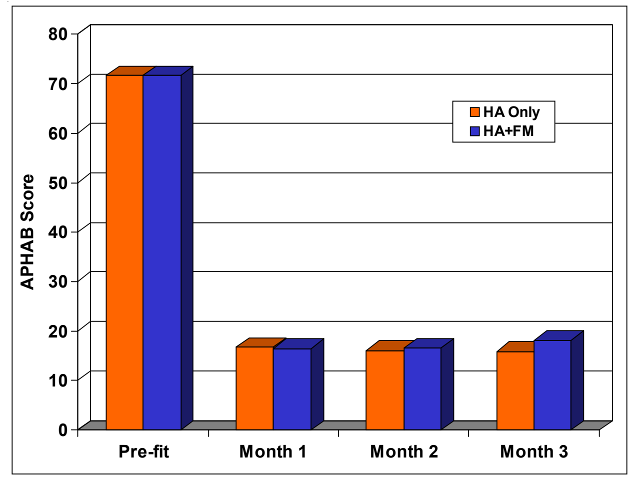

Figure 5. Ease of Communication (EC) subscale scores for each month in each condition at WU.

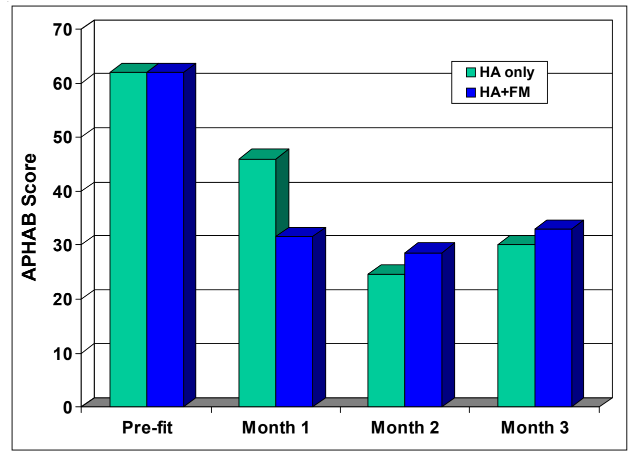

Figure 6. Background Noise (BN) subscale scores for each month in each condition at UF.

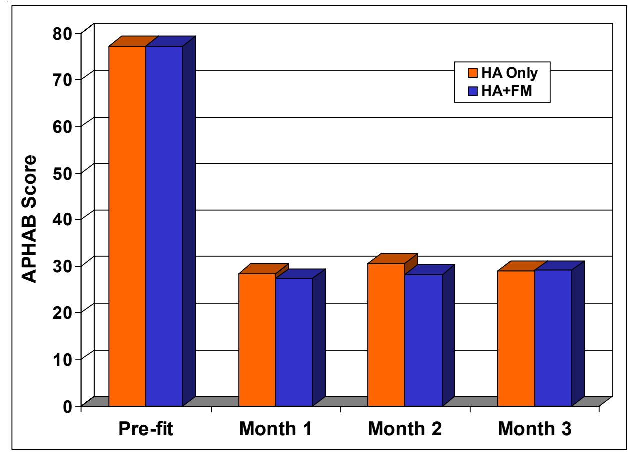

Figure 7. Background Noise (BN) subscale scores for each month in each condition at WU.

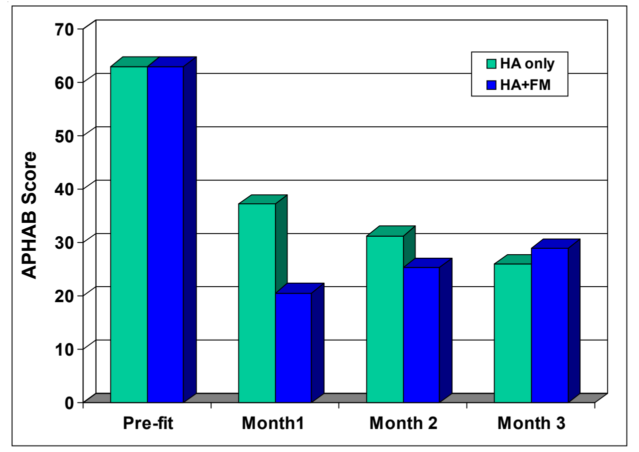

Figure 8. Reverberation (RV) subscale scores for each month in each condition at UF.

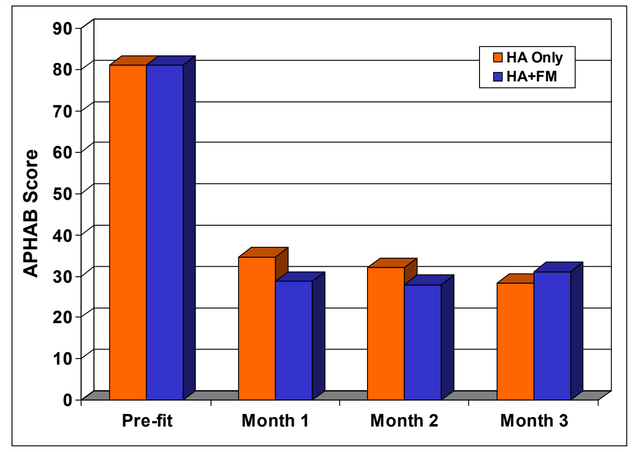

Figure 9. Reverberation (RV) subscale scores for each month in each condition at WU.

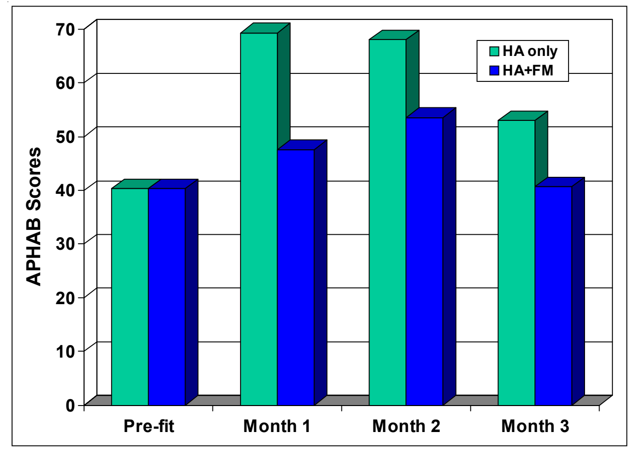

Figure 10. Aversiveness to sound (AV) subscale scores for each month in each condition at UF.

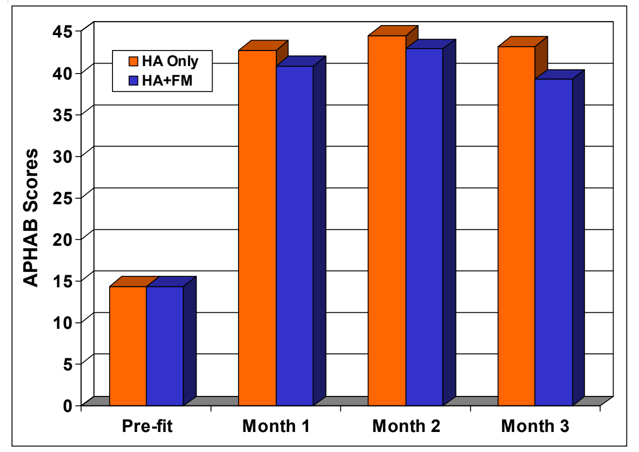

Figure 11. Aversiveness to sound (AV) subscale scores for each month in each condition at WU.

Results

The mean scores for the subscales EC, BN, RV, and AV at each month for each condition at both sites are presented in Figures 4-11. From these figures, it is apparent that the APHAB scores at pre-fitting, in general, are significantly different from the aided APHAB scores for all four subscales in both aided conditions. In general, there are no significant differences between the two aided conditions, (1) hearing aids alone and (2) hearing aids plus FM system, on any of the four APHAB subscales.

Conclusions

Results indicated that while both amplification strategies provided significant communicative benefit, no significant differences were noted between the HA only and HA + FM conditions. The explanation for these findings remains unclear at this time. It is reasonable to speculate however, that no differences were found between amplification strategies for several reasons. First, it is possible that the directional microphone on the hearing aids provided enough communicative benefit in noisy environments that the FM system did not significantly increase communicative efficiency. In some contrast to this hypothesis however, a previous investigation by these authors indicated that FM technology improved significantly speech perception in noise over directional microphone technology. A second hypothesis for these findings is that subjects did not engage consistently in communicative activities where the FM system would be most advantageous, such as conventions, lectures, and group functions. The self- perceived inconvenience of requesting microphone use by the speaker might have also contributed to these findings. We are currently examining these hypotheses and are in the process of developing a counseling program for increasing FM utilization.

References

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