Expectations, Prefitting Counseling, and Hearing Aid Outcome

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Abstract

Background: Data suggest that having high expectations about hearing aids results in better overall outcome. However, some have postulated that excessively high expectations will result in disappointment and thus poor outcome. It has been suggested that counseling patients with unrealistic expectations about hearing aids prior to fitting may be beneficial. Data, however, are mixed as to the effectiveness of such counseling, in terms of both changes in expectations and final outcome.

Purpose: The primary purpose of this study was to determine whether supplementing prefitting counseling with demonstration of real-world listening can (1) alter expectations of new hearing aid users and (2) increase satisfaction over verbal-only counseling. Secondary goals of the study were to examine (1) the relationship between prefitting expectations and postfitting outcome, and (2) the effect of hearing aid fine-tuning on hearing aid outcome.

Research Design: Sixty new hearing aid users were fitted binaurally with Beltone Oria behind-the-ear digital hearing aids. Forty participants received prefitting counseling and demonstration of listening situations with the Beltone AVE™ (Audio Verification Environment) system; 20 received prefitting counseling without a demonstration of listening situations. Hearing aid expectations were measured at initial contact and following prefitting counseling. Reported hearing aid outcome was measured after eight to ten weeks of hearing aid use.

Study Sample: Sixty new hearing aid users aged between 55 and 81 years with symmetrical sensorineural hearing loss.

Intervention: Participants were randomly assigned to one of three experimental groups, between which the prefitting counseling and follow-up differed: Group 1 received prefitting counseling in combination with demonstration of listening situations. Additionally, if the participant had complaints about sound quality at the follow-up visit, the hearing aids were fine-tuned using the Beltone AVE system. Group 2 received prefitting counseling in combination with demonstration of listening situations with the Beltone AVE system, but no fine-tuning was provided at follow-up. Group 3 received prefitting hearing aid counseling that did not include demonstration of listening, and the hearing aids were not fine-tuned at the follow-up appointment.

Results: The results showed that prefitting hearing aid counseling had small but significant effects on expectations. The two forms of counseling did not differ in their effectiveness at changing expectations; however, anecdotally, we learned from many participants that they enjoyed listening to the auditory demonstrations and that they found them to be an interesting listening exercise. The data also show that positive expectations result in more positive outcome and that hearing aid fine-tuning is beneficial to the user.

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Conclusions: We conclude that prefitting counseling can be advantageous to hearing aid outcome and recommend the addition of prefitting counseling to address expectations associated with quality of life and self-image. The data emphasize the need to address unrealistic expectations prior to fitting hearing aids cautiously, so as not to decrease expectations to the extent of discouraging and demotivating the patient. Data also show that positive expectations regarding the impact hearing aids will have on psychosocial well-being are important for successful hearing aid outcome.

Key Words: Counseling, expectations, hearing aids, outcome

Abbreviations: 4F-PTA = four-frequency pure-tone average (the mean of the air-conduction thresholds obtained at 500, 1000, 2000, and 4000 Hz); AF = active fitting; APHAB = Abbreviated Profile of Hearing Aid Benefit; AV = Aversiveness subscale of the APHAB; AVE = Audio Verification Environment; BN = Background Noise subscale of the APHAB; BTE = behind the ear; CD = critical difference; COSI = Client Oriented Scale of Improvement; EC = Ease of Communication subscale of the APHAB; ECHO = Expected Consequences of Hearing Aid Ownership; HANA = Hearing Aid Needs Assessment; HAPI = Hearing Aid Performance Inventory; HARQ = Hearing Attitudes in Rehabilitation Questionnaire; HHIA = Hearing Handicap Inventory for Adults; HHIE = Hearing Handicap Inventory for the Elderly; NF = Negative Features subscale of the ECHO and SADL; PE = Positive Effects subscale of the ECHO and SADL; PI = Personal Image subscale of the ECHO and SADL; PIADS = Psychosocial Impact of Assistive Devices Scale; RV = Reverberation subscale of the APHAB; SADL = Satisfaction with Amplification in Daily Life; SC = Service and Cost subscale of the ECHO and SADL

On average, people wait several years between learning they have a hearing loss and acquiring a hearing aid (Kochkin, 2008). One would speculate that during this time, users formulate expectations about what hearing aids will do for them and what wearing hearing aids will be like. Research has shown that these preconceived notions (expectations) affect reported outcome, hearing aid satisfaction, and the frequency with which the hearing aids are worn, although other factors such as self-perceived handicap also may play a role (Weinstein, 1990; Humes et al, 2003; Helvik et al, 2006). Cox et al (2007) showed that scores on the Expected Consequences of Hearing Aid Ownership (ECHO; Cox and Alexander, 2000), a measure of expectations about hearing aid use, explained 15% of the variance in outcomes associated with the hearing aid function, such that higher expectations were associated with better outcome. Jerram and Purdy (2001) reported that higher expectations, as measured by a 12-item prefitting hearing aid expectations questionnaire (Seyfried, 1990), were associated with more hours of hearing aid use per day, greater overall reported benefit, and greater reported benefit in difficult listening situations. Gatehouse (1994) similarly reported that expectations were significantly correlated with responses to hearing aid benefit. Not all studies, however, have shown prefitting expectations to relate to postfitting outcome. For instance, Brooks and Hallam (1998) used the Hearing Attitudes in Rehabilitation Questionnaire (HARQ; Hallam and Brooks, 1996) to assess attitudes toward hearing loss and the provision of hearing aids. They found that inclusion of the three-item “overpositive expectation scale” of the HARQ did not improve classification of, or help predict, frequent versus nonfrequent hearing aid users, satisfied versus unsatisfied users, or those reporting benefit versus those who did not. Similarly, Norman et al (1993) did not show a relationship between reported satisfaction, usage, benefit, or improvement with responses to questions concerning how well people expect to hear with a hearing aid and how long it would take to get used to a hearing aid.

Both Schum (1999) and Cox and Alexander (2000) examined directly the extent to which expectations about hearing aids and satisfaction with amplification are met by comparing pre- and postfitting responses on companion questionnaires. Schum compared expectations scores on the Hearing Aid Needs Assessment (HANA) scale with outcomes on the companion Hearing Aid Performance Inventory (HAPI; Walden et al, 1984) or the shortened HAPI (Schum, 1999). These companion questionnaires evaluate listening in four scenarios: (1) speech in noise, (2) speech in quiet, (3) speech without visual cues, and (4) nonspeech signals. He found that expectations were generally higher than the outcome reported but that this relationship differed by listening situation. Expectations were closest to outcome for nonspeech stimuli, and most divergent from outcome for listening to speech in nonvisual situations and in noise. There was a significant positive correlation between expectations in noise and outcome in noise. No other HANA/HAPI scores were correlated significantly. In addition, he reported that previous hearing aid users had higher expectations than new users about outcomes for listening in quiet, listening without visual cues, and listening to nonspeech stimuli. Expectations were the same for both previous hearing aid users and new users for listening to speech in noise. Importantly, however, when comparing expectations for listening in quiet versus in noise, previous users had lower expectations for listening in noise than in quiet, while...
for new users expectations were the same. Cox and Alexander (2000) compared scores on the ECHO questionnaire and the Satisfaction with Amplification in Daily Life questionnaire (SADL; Cox and Alexander, 1999). These 15-item questionnaires are comprised of four subscales: Positive Effects (PE), Negative Features (NF), Service and Cost (SC), and Personal Image (PI). They found a significant correlation between expectations and outcomes on the positive effect subscale but not on the other scales. Unlike Schum (1999), they reported that new users had higher prefitting expectations than experienced users and that individuals with higher prefitting expectations had higher, more positive postfitting satisfaction.

Many authors have suggested that expectations about hearing aids should be addressed prior to fitting a hearing aid as a part of auditory rehabilitation (e.g., Goldstein and Stephens, 1981; Garstecki, 1982; Stephens, 1996; Ross, 2001; Schow, 2001; Borg et al, 2002; Saunders et al, 2005); however, there are only a few studies that document the value of doing this. Van Campen and Goldstein (1987) present the case of an individual who had constant complaints about the inadequacy of her hearing aids. After receiving counseling using strategies recommended in Goldstein’s Audiological Rehabilitation Management Model (Goldstein and Stephens, 1981), she became a fully successful hearing aid user. The counseling addressed what a hearing aid does and what it cannot do; it probed attitudes about hearing loss and taught communication strategies and auditory training. Brooks (1979) reported that subjects who received prefitting counseling wore their hearing aids significantly more than did patients who had not received counseling. This counseling included making individuals aware of the problems of background noise in the environment when wearing hearing aids, counseling about the psychosocial impacts of hearing loss, family relationships and communication, attitudes, communication difficulties, and more (Brooks and Johnson, 1981), so it is not possible to determine which particular aspect of the prefitting counseling affected the frequency of hearing aid use. Borg et al (2002) conducted a small study with 13 individuals to assess the effectiveness of an active communication approach to auditory rehabilitation. It incorporated teaching insight into hearing loss and communication behaviors, learning how to become a counselor to significant others and learning improved communication skills. They report the program was successful in terms of seeing positive emotional and cognitive effects for some participants and suggest the program was successful in part because “previously high expectations of everything being as before may have been modified in a more realistic direction” (p. 320). Using an “active fitting (AF) programme” for hearing aids, Eriksson-Mangold et al (1990) had patients complete a task-oriented diary with the expectation that this would increase hearing aid use and change unrealistic expectations and negative attitudes using the philosophy that changes in attitude occur following changes in behavior (Eiser, 1986). They found that significantly more of their subjects in the AF program obtained a realistic view of wearing hearing aids than did the control group who did not participate in the AF program. Once again, however, the AF program consisted of more than simply counseling regarding realistic expectations. Norman et al (1993) conducted a study in which the effect of prefitting hearing aid counseling was compared to no counseling. The counseling addressed attitudes, expectations, severity of hearing loss, disability, handicap, and pressure to do something. They reported no differences between the experimental group and the control group in terms of satisfaction, benefit, usage, or reported improvement with hearing aids. In summary, the majority of studies showed that prefitting hearing aid counseling resulted in positive outcome, but none of them used counseling that focused on addressing expectations alone; thus, definitive conclusions about the impact of counseling to address expectations cannot be drawn.

With these thoughts in mind, the primary purpose of this investigation was to evaluate the effect of prefitting counseling on expectations and hearing aid satisfaction. It seems possible that expectations counseling would be more effective if it were accompanied by demonstration of real-world listening situations. Beltone Electronics has developed a system, known as the Audio Verification Environment (AVE™), to do precisely this. This program, which is part of the Beltone SelectaFit fitting software, offers many assorted sound stimuli ranging from simple individual sounds (like a baby crying) to complex sound scenarios (like a child telling a story in the presence of competing acoustic information). These sounds are presented to the patient while he or she is seated in the center of a calibrated sound field surrounded by five carefully placed loudspeakers (four broadband and one subwoofer). The stimuli presented from the loudspeakers are selected by the audiologist; the output levels and conditions are controlled by the Beltone AVE software. Signals can be presented from one loudspeaker at a time or from multiple loudspeakers simultaneously (see Meskan and Robinson, 2000, for additional details about the Beltone AVE system and the creation of the sound stimuli used on this system).

The primary purpose of this investigation was to determine whether supplementing prefitting counseling with demonstration of real-world listening using the Beltone AVE system can: (1) alter expectations of new hearing aid users and (2) increase satisfaction over non-AVE based counseling. Based on prior
research, we hypothesized that the use of this system would have a significant impact on pre-use expectations and that this change in expectations would result in better hearing aid satisfaction than traditional clinical counseling methods based because expectations about the benefits and limitations of hearing aids would be more realistic after listening to real-world sounds via the Beltone AVE system. Secondary goals of the study were to examine (1) the relationship between prefitting expectations and postfitting outcome, and (2) the effect of hearing aid fine-tuning using the Beltone AVE system on hearing aid outcome. We hypothesized that there would be a significant and positive correlation between prefitting expectations and hearing aid satisfaction but that provision of hearing aid fine-tuning would not result in better outcome. This latter hypothesis is based on the work by Cunningham et al (2001), who report no measurable advantages in outcome following hearing aid fine-tuning, and Robinson et al (2002), who reported that patient adjustments to hearing aids using the Beltone AVE system resulted in fittings that were close in approximation to the original prescriptive fitting targets.

**METHODS**

Overview

Sixty new hearing aid users were fitted binaurally with Beltone Oria behind-the-ear (BTE) digital hearing aids to use for a period of 10 weeks. Forty participants received prefitting counseling and demonstration of listening situations with the Beltone AVE system; 20 received prefitting counseling without a demonstration of listening situations. Hearing aid expectations were measured at initial contact and following prefitting counseling; reported hearing aid outcome was measured after eight to ten weeks of hearing aid use.

Participants

Sixty individuals aged between 55 and 81 years participated; 18 were female and 42 were male. All had symmetrical sensorineural hearing loss. Symmetrical hearing was defined as a difference between the left and right ear four-frequency pure-tone average (4F-PTA; mean of thresholds at 0.5, 1, 2, and 4 kHz) of 15 dB or less. In fact, all but two subjects had left and right 4F-PTAs that were within 9 dB of each other. At the start of the study, none of the participants had ever worn hearing aids. Participants were randomly assigned to one of three test groups, between which the prefitting counseling and follow-up differed, as follows:

- **Group 1** received prefitting counseling in combination with demonstration of listening situations with the AVE system. Additionally, if the participant had complaints about sound quality at his or her follow-up visit, the hearing aids were fine-tuned using the Beltone AVE Sound Matrix system. The system permits presentation of a variety of environmental sounds categorized by frequency and level in the real world. Adjustments are made to the hearing aid output following patient input regarding loudness and sound quality.
- **Group 2** received prefitting counseling in combination with demonstration of listening situations with the AVE system, but no fine-tuning was provided at follow-up.
- **Group 3** received pre-hearing aid counseling that did not include demonstration of listening with the AVE system, and the hearing aids were not fine-tuned at follow-up.

The inclusion of a group who received fine-tuning was motivated by an interest in evaluating the Beltone AVE fine-tuning algorithm. Ideally an additional group would have been included, one in which participants received routine counseling and hearing aid fine-tuning. However, due to funding and time limitations, this group was not included in the design. Participants in Groups 2 and 3 were informed at the start of the study that their hearing aids were to be fitted using a specific algorithm and that changes would not be permitted. All knew that the study was to last for a 10-week period only and that following study completion they would return their hearing aids to the experimenters; they were, however, permitted to keep their custom-made ear molds.

Test Measures

Otoscopy and tympanometry were conducted to check for cerumen and conductive pathology respectively.

Air-conduction and bone-conduction thresholds were obtained using the American Speech-Language-Hearing Association (1978) recommended procedure, a clinical audiometer (Grason Stadler Instrument-61), and insert earphones (Etymotic Research, ER-3A).

The Client-Oriented Scale of Improvement (COSI; Dillon et al, 1997) was completed to establish three to five listening situations that the participant most wanted improved by the hearing aid, as the basis for the prefitting counseling (see below).

The Hearing Handicap Inventory for the Elderly (HHIE; Ventry and Weinstein, 1982) or the Hearing Handicap Inventory for Adults (HHIA; Newman et al, 1990) was completed, as appropriate, to measure unaided and aided hearing handicap. It has an emotional subscale and a social subscale.
The Abbreviated Profile of Hearing Aid Benefit (APHAB; Cox and Alexander, 1995) was completed to measure unaided (APHAB-U) and aided (APHAB-A) hearing disability. A rephrased version of the questionnaire (APHAB-E) was also completed to assess expected disability pre- and postcounseling. For example, the APHAB question “I miss a lot of information when I am listening to a lecture” was rephrased to read, “I think that I will miss a lot of information when I am listening to a lecture.” The APHAB consists of four subscales: Ease of Communication (EC), Reverberation (RV), Background Noise (BN), and Aversiveness (AV).

The Expected Consequences of Hearing Aid Outcome (ECHO; Cox and Alexander, 2000) was used to assess pre- and postcounseling expected hearing aid outcome. The companion questionnaire, SADL (Cox and Alexander, 1999), was used to assess post-use satisfaction. They each comprise the same four scales: Positive Effects (PE), Negative Features (NF), Service and Cost (SC), and Personal Image (PI). Since participants in this study did not purchase their hearing aids, the items from the SC subscale of the ECHO and SADL were not analyzed.

The Psychosocial Impact of Assistive Devices Scale (PIADS; Day et al, 2002), as its name implies, measures the psychosocial impact of assistive devices, in this case, hearing aids. It incorporates three scales: Competence, Self-esteem, and Adaptability. It was completed pre- and postcounseling to assess expected psychosocial impacts (PIADS-E), and following hearing aid use to assess aided impacts (PIADS-A).

**Procedures**

Subjects attended four study visits. Table 1 summarizes the testing completed at each visit.

### Visit 1

At the start of the initial visit, prior to any testing, participants signed a Portland VA Medical Center Institutional Review Board (IRB)-approved consent form to ensure that they understood the study procedures. Following this, a case-history-questionnaire interview was completed, and otoscopy, tympanometry and pure-tone testing were conducted. If the participant met the study criteria, the COSI was completed in interview format, an earmold impression was taken, and the HHIE/A unaided, APHAB-U, APHAB-E, PIADS-E, and ECHO were completed in pencil-and-paper format. For the COSI, subjects identified and ranked between three and five listening situations that they most wanted improved. Following testing, subjects were randomly assigned to an experimental group.

### Visit 2

All participants were fitted with bilateral Beltone Oria BTE digital hearing aids using Beltone’s Adaptive Fitting Algorithm (BAFA; Russ and Robinson, 2001). Microphones were set to omnidirectional, and noise reduction was disabled. The output of the hearing aids was verified with real-ear testing using a Fonix 6500 hearing aid test system. Adjustments to the hearing aid settings were made until the real-ear aided response (REAR) from 500 through 2 kHz for speech-weighted inputs of noise at 50, 70, and 90 dB SPL were ±10 dB from target. This was achieved for all but eight ears. Each of those eight ears had values ±13 dB from target. Following the hearing aid fitting, participants received the appropriate hearing aid counseling for their experimental group. The adjusted hearing output was measured in a 2 cc coupler using the Fonix 6500 hearing aid test system.

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**Table 1. Testing Completed at Each Study Visit**

<table>
<thead>
<tr>
<th>Visit 1</th>
<th>Visit 2</th>
<th>Visit 3</th>
<th>Visit 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Review Board (IRB)-approved informed consent process</td>
<td>Hearing-aid fitting using Beltone’s Adaptive Fitting Algorithm (BAFA) and real-ear verification and adjustments (when appropriate)</td>
<td>Hearing-aid check. Group I also received fine-tuning adjustments using the Beltone AVE™ system</td>
<td>Hearing-aid check using 2 cc coupler measure</td>
</tr>
<tr>
<td>Audiology, otoscopy, tympanometry, case-history questionnaire, interview</td>
<td>HHS/A unaided</td>
<td>APHAB-E</td>
<td>APHAB-A</td>
</tr>
<tr>
<td>Ear impressions made</td>
<td>APHAB-E</td>
<td>PIADS-E</td>
<td>PIADS-A</td>
</tr>
<tr>
<td>COSI initial section</td>
<td>Hearing-aid counseling</td>
<td>HHIE aided</td>
<td>SADL</td>
</tr>
<tr>
<td>HHIE/A unaided</td>
<td>APHAB-E</td>
<td>PIADS-E</td>
<td>ECHO</td>
</tr>
<tr>
<td>APHAB-U, APHAB-E</td>
<td>PIADS-E</td>
<td>ECHO</td>
<td>ECHO</td>
</tr>
</tbody>
</table>
### Hearing Aid Counseling

The content of the hearing aid counseling received was dependent on the test group to which the participant was assigned. To ensure uniformity within and across subjects, rigid counseling protocols were developed and followed. For all groups, the situations identified on the COSI as those the participants most want improved were used as the basis for the counseling.

- Subjects in Groups 1 and 2 received counseling supplemented with Beltone AVE demonstration. Specifically, while seated in the sound booth wearing their hearing aids, subjects listened to the AVE simulations most closely resembling each listening situation they specified on the COSI. Following each simulation, subjects were prompted to talk about their impressions of the demonstration, answering questions such as “Do things sound like you expected they would through a hearing aid and if not, how do they differ?”; “How do things sounds relative to listening without hearing aids?”; “Do the hearing aids help, and if not what was the problem?” The experimenter then discussed the benefits that hearing aids would likely provide, and the difficulties that might be encountered in each of the selected listening situations. The experimenter also suggested appropriate listening strategies to augment the benefits obtained with a hearing aid for each listening situation, such as turning off background music or making sure the speaker’s face is visible. This counseling took approximately 20 to 30 minutes.

- Subjects in Group 3 received the same counseling content as above but did not receive auditory demonstrations of the listening situations. Instead, the experimenter prompted the user to discuss his or her expectations about the hearing aids, described the potential benefits and difficulties of wearing the hearing aids in each situation, and suggested appropriate listening strategies. The counseling of participants in Group 3 lasted approximately 20 minutes.

Following hearing aid counseling, patients received a hearing aid orientation to explain use and upkeep of the hearing aids. They then completed the APHAB-E, PIADS-E, and ECHO for a second time. A follow-up appointment (Visit 3) was scheduled for about a week later.

### Visit 3

At Visit 3, the audiologist did a listening check to confirm the hearing aids were functioning properly, and to make sure the participant understood how to insert, maintain, and use the hearing aids correctly. Participants in Group 1 were given an opportunity to have the hearing aids fine-tuned if they had complaints about the sound quality. Of the 20 patients in Group 1, 16 elected to have the hearing aids adjusted. Adjustments were made using the Beltone AVE software. The participant listened to low-, mid-, and high-frequency signals at low, mid-, and high intensities presented via the AVE software. Hearing aid output level adjustments were made until the participant reported that the output levels were improved. The changes requested primarily resulted in a decrease of gain in the low frequencies for low-level signals.

### Visit 4

The final study visit took place eight to ten weeks after the hearing aid fitting. The hearing output was measured in a 2 cc coupler using the Fonix 6500 hearing aid test system to confirm that the hearing aids were functioning properly, and the HHIE/A, APHAB, PIADS, and SADL were completed in pen-and-paper format for aided listening.

### RESULTS

One male participant in Group 1 had incomplete questionnaire data, and one female participant in Group 2 decided to end her study participation after Visit 3; thus, data from only 58 participants were analyzed.

### Audiometric Data

A repeated-measures analysis of variance (ANOVA) confirmed that participants had symmetrical hearing (F(1,57) = 0.1, p = 0.872). Figure 1 shows the mean air-conduction thresholds for the three groups. The left and right ear thresholds have been combined since participants had symmetrical hearing. A repeated-measures ANOVA revealed that the thresholds did not differ significantly across groups (F(2,55) = 0.63, p = 0.537).

### Age

The mean age of the subjects in Group 1 through 3 were 70.6 years (±7.1 years), 69.9 years (±8.0 years), and 70.1 years (±7.9 years) respectively. A one-way ANOVA showed that the age of participants in the three groups did not differ significantly across groups (F(2,55) = 0.04, p = 0.960).

### Unaided Questionnaire Data

Repeated-measures ANOVAs comparing the unaided APHAB and HHIE/A scores of participants in each
group showed that baseline reported activity limitations (APHAB; F(1,52) = 0.09, p = 0.915) and participation restrictions (HHIE/A; F(1,55) = 1.6; p = 0.212) did not differ between the three groups. In the ANOVA for the HHIE/A, data were analyzed using both group and version of the Hearing Handicap Inventory (Elderly versus Adults) as between-subjects factors.

Hearing Aid Benefit

Repeated-measures ANOVAs comparing unaided and aided HHIE/A and APHAB scores were conducted to assess hearing aid benefit. The ANOVAs showed significant changes in score on both the HHIE/A (F(1,52) = 38.1, p < 0.001) and the APHAB (F(1,55) = 21.8, p < 0.001) such that reported social and emotional handicap decreased with hearing aid use, as did problems reported on the EC, RV, and BN scales of the APHAB. As is typical, scores on the AV scale increased, that is, more problems with loud sounds were reported for aided listening than for unaided listening. There were no significant group differences in hearing aid benefit on either questionnaire: HHIE/A (F(2,52) = 1.1, p = 0.353), APHAB (F(2,165) = 0.1, p = 0.880). Clinically, it is interesting to examine the proportion of participants whose APHAB and HHIE/A scores improved by more than the 95% critical difference (CD). The 95% CD is the change required to determine with 95% certainty that a true change has occurred. It accounts for the test-retest reliability of the measure. The 95% CD values and percentage of participants whose score on the HHIE/A and APHAB changed by at least that amount are shown in Table 2.

Table 2. Percentage of Participants Whose HHIE/A and APHAB Subscale Scores Improved by More Than the 95% Critical Difference (CD) Following Hearing-Aid Use

<table>
<thead>
<tr>
<th>Subscale</th>
<th>95% CD Value</th>
<th>% Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHIE</td>
<td>19</td>
<td>48%</td>
</tr>
<tr>
<td>HHIA</td>
<td>12</td>
<td>56%</td>
</tr>
<tr>
<td>EC</td>
<td>31</td>
<td>35%</td>
</tr>
<tr>
<td>RV</td>
<td>33</td>
<td>38%</td>
</tr>
<tr>
<td>BN</td>
<td>33</td>
<td>28%</td>
</tr>
<tr>
<td>AV</td>
<td>37</td>
<td>2%</td>
</tr>
</tbody>
</table>

Table Note: AV = Aversiveness subscale of the APHAB; BN = Background Noise subscale of the APHAB; EC = Ease of Communication subscale of the APHAB; RV = Reverberation subscale of the APHAB; HHIA = Hearing Handicap Inventory for Adults; HHIE = Hearing Handicap Inventory for the Elderly.

Effect of Counseling on Expectations and Outcome

Figures 2, 3, and 4 show the precounseling (dark gray bars) and postcounseling (light gray bars) APHAB, ECHO, and PIADS-E data respectively for each group combined, along with the aided (dotted bars) APHAB, SADL, and PIADS scores (±1 SE) for each group combined. Lower scores on the APHAB indicate fewer reported difficulties; higher scores on the SADL and ECHO indicate greater satisfaction; and higher scores on the PIADS indicate better psychosocial outcome. Changes in expectations scores following counseling can be seen by comparing the pre- and postcounseling scores (dark gray bars and light gray bars). Hearing aid benefit can be seen by comparing the postcounseling expectations scores and the aided scores (light gray bars and dotted bars).

A repeated-measures ANOVA, using questionnaire subscale and administration as the within-subjects variables and group as the between-subjects variable was conducted for each questionnaire separately to examine changes in scores across the three administrations. Results showed significant main effects of retest on each questionnaire: APHAB: F(2,110) = 32.0, p < 0.001; ECHO/SADL: F(2,110) = 4.9, p = 0.01; PIADS: F(2,110) = 11.0, p < 0.001. There were no significant effects of group, nor any significant interactions involving group, on any of the questionnaires. In other words, changes in scores were seen across questionnaire administrations, but the form of counseling did not differentially impact expectations or reported aided outcome. Post-hoc testing using paired-samples t-tests to examine changes across questionnaire administrations was conducted. Results are shown on Figures 2–4 by a horizontal bar between significantly differing scores. Comparison of precounseling and postcounseling scores shows a significant decrease in expectations for listening in background noise (Figure 2), and a significant increase in expectations about negative features (Figure 3). Counseling did not impact any of the PIADS...
scores. Comparison of postcounseling scores with aided scores shows that participants reported more listening problems on all subscales of the APHAB than they had expected, with the differences being significant on the RV, BN, and AV scales. Similarly, significantly less satisfaction was reported for the PE and NF scales of the SADL than was expected based on ECHO scores, and changes in psychosocial outcome were significantly less than expected on all three PIADS scales.

As mentioned above, there were no significant differences between the groups on any pre- versus postcounseling questionnaire scores or on postcounseling versus aided scores. From this we conclude that expectations and aided outcome were not impacted by

Figure 2. Precounseling, postcounseling, and aided APHAB scores for all data combined along with error bars showing ±1 standard error of the mean. Precounseling scores are shown by dark gray bars, postcounseling scores are shown by light gray bars, and aided scores are shown by dotted bars.

Figure 3. Pre- and postcounseling ECHO scores, and SADL scores for all data combined along with error bars showing ±1 standard error of the mean. Precounseling scores are shown by dark gray bars, postcounseling scores are shown by light gray bars, and aided scores are shown by dotted bars.
the form of prefitting counseling provided. The data will therefore be combined across groups for the analyses that follow.

**Relationship between Expectations and Outcome**

The relationship between postcounseling expectations and aided outcome was examined using Pearson correlations. Table 3 shows the results of Pearson correlations between postcounseling expectations scores and aided scores for each questionnaire subscale.

There were significant positive correlations between expectations and outcome on two of the APHAB subscales, two of the ECHO/SADL subscales, and all three of the PIADS scales. Positive correlations indicate that higher expectations resulted in better aided outcome, and vice versa. The r-value of the PIADS scores indicates that between 18 and 28% of the variance in aided scores can be accounted for by the prefitting expectations, which, bearing in mind the many potential variables that can impact reported outcome, is considerable.

The results of multivariate ANOVAs, comparing the mean expectations scores of individuals whose aided outcome improved by more than the 95% critical difference (CD) on the HHIE/A (high benefit) with the scores of those who did not improve by the 95% CD on the HHIE/A (low benefit), further supports this finding. Those in the high benefit group had significantly higher expectations scores than those in the low benefit group on each questionnaire (APHAB: F = 5.6, p = 0.001; ECHO/SADL: F = 8.4, p < 0.001; PIADS: F = 7.2, p < 0.001). Post-hoc paired comparisons showed that there were significant group differences on the RV scale and AV scales of the APHAB, the PE scale of the ECHO, and

![Figure 4](image)

**Figure 4.** Precounseling, postcounseling, and aided PIADS scores for all data combined along with error bars showing ±1 standard error of the mean. Precounseling scores are shown by dark gray bars, postcounseling scores are shown by light gray bars, and aided scores are shown by dotted bars.

**Table 3. Results of Pearson Correlations between Postcounseling Expectations and Aided Scores for Each Questionnaire and Subscale**

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Subscale</th>
<th>Prefit</th>
<th>Postfit</th>
<th>Aided</th>
<th>r-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>APHAB</td>
<td>EC</td>
<td>r = 0.151</td>
<td>r = 0.339**</td>
<td>r = 0.203</td>
<td>r = 0.422**</td>
</tr>
<tr>
<td></td>
<td>RV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECHO/SADL</td>
<td>PE</td>
<td>r = 0.373**</td>
<td>r = 0.123</td>
<td>r = 0.381**</td>
<td>PI</td>
</tr>
<tr>
<td></td>
<td>NF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIADS</td>
<td>Competence</td>
<td>r = 0.427**</td>
<td>r = 0.533**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adaptability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Esteem</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: APHAB = Abbreviated Profile of Hearing Aid Benefit; AV = Aversiveness subscale of the APHAB; BN = Background Noise subscale of the APHAB; EC = Ease of Communication subscale of the APHAB; ECHO = Expected Consequences of Hearing Aid Ownership; NF = Negative Features subscale of the ECHO and SADL; PE = Positive Expectations subscale of the ECHO and SADL; PI = Personal Image subscale of the ECHO and SADL; PIADS = Psychosocial Impact of Assistive Devices Scale; RV = Reverberation subscale of the APHAB; SADL = Satisfaction with Amplification in Daily Living.*

*p < 0.05; **p < 0.01
on all three PIADS scores. Note that participants reporting high benefit had significantly lower expectations on the AV scale than the participants reporting low benefit. Figures 5a, b, and c illustrate these findings. Once again, significant group differences are shown on the figures with horizontal bars.

**Daily Hearing Aid Use and Expectations**

The difference between reported daily hearing aid use at eight to ten weeks post-hearing aid fitting and expectations scores was examined as follows. First, daily hearing aid use was classified into five categories: none, <1 hour/day, 1–4 hours/day, 4–8 hours/day, and 8–16 hours/day. Second, a one-way ANOVA was conducted to determine whether daily hearing aid use (DHAU) was associated with degree of hearing impairment. To this end, 4F-PTA was used as the dependent variable and DHAU was used as the between-subjects factor. The ANOVA showed no differences in 4F-PTA across DHAU groups (F(3,54) = 1.0, p = 0.403). Multivariate ANOVAs were then used to compare expectations scores from each questionnaire across daily hearing aid use groups. No significant differences were observed.

**Daily Hearing Aid Use and Form of Counseling**

The final analysis examined whether daily hearing aid use differed across the three experimental groups. The data are shown in Figure 6. It is seen that eight participants in Group 1 wore their hearing aids for eight hours or more per day, as compared to four participants in Group 2 and one in Group 3. At the other extreme, there were five participants in Group 1 who wore their hearing aids for four hours or less, as compared to twelve in Group 2 and nine in Group 3. A chi-square analysis shows this distribution differs significantly from the expected distribution ($\chi^2 = 15.3$, p = 0.018).

**DISCUSSION**

In this study, we examined whether prefitting counseling altered expectations and improved hearing aid outcome. We also examined the relationship between postcounseling expectations and outcome and the effect of hearing aid fine-tuning and outcome. We provided two different types of counseling: one form relied on verbal discussion only, and the other form combined verbal discussion with auditory demonstrations of “real-world” listening situations. Baseline reported hearing difficulties were assessed, as were pre- and postcounseling expectations, and hearing aid outcome following eight to ten weeks of hearing aid use.

**Unaided Questionnaire Data**

In order to assess whether the population of participants seen in the present study reported auditory disability and handicap similar to those of other study populations, the unaided HHIE/A and APHAB scores of our study participants at the outset of the study were compared with data collected from the studies of Cox and Alexander (1995), Newman et al (1990), and Ventry and Weinstein (1982). Cox and Alexander (1995) reported normative APHAB data from 128 hearing aid users aged between 30 and 87 years; Ventry and Weinstein (1982) reported normative data for the HHIE from 100 adults aged between 65 and 92 years; and Newman et al (1990) reported data for the HHIA from a group of 67 hearing-impaired adults aged between 18 and 64 years. These data are presented in Table 4.

In terms of the APHAB scores, the participants in the present study had lower scores than the participants in Cox and Alexander’s study. In fact, scores here fall below the 50th percentile of the score of the participants in the study of Cox and Alexander, even though the degree of hearing impairment of participants in both studies is similar. Cox and Alexander point out that individuals with EC, RV, and BN scores below the 50th percentile are likely to be unsuccessful hearing aid users. In terms of the HHIE, participants in the present investigation had considerably higher scores (29.9 versus 41.4) than those in Ventry and Weinstein’s study, even though they were of a similar age and had a similar degree of hearing impairment. Participants in the present study who completed the HHIA also had higher handicap scores than the normative data of Newman et al (1990); however, these data are not directly comparable because participants in that study were younger and had better hearing thresholds than those in the present study. These comparisons are nonetheless important as studies show that individuals with greater perceived handicap are more likely to pursue amplification and are more successful with amplification (Weinstein, 1990; Humes et al, 2003; Helvik et al, 2006). The participants in this study perceived considerable emotional and social impacts from hearing loss but report few communication difficulties. This would likely impact expectations and reported hearing aid benefit.

**Hearing Aid Benefit**

Statistically significant hearing aid benefit was measured on the HHIE/A and the APHAB. Reported social and emotional handicap decreased, as did problems reported on the EC, RV, and BN subscales of the APHAB. As is typical, scores on the AV subscale increased. From Table 2, it is seen that the HHIE/A scores of approximately 50% of participants improved
Figure 5. Mean postcounseling APHAB, ECHO, and PIADS scores respectively for low and high benefit individuals along with error bars showing ±1 standard error of the mean. Low benefit group is shown with dark gray bars; high benefit group is shown with light gray bars.
by the 95% CD, and that the scores of about 35% of participants changed by the 95% CD on the EC, RV, and BN scales of the APHAB. This difference in outcome on the two questionnaires might result from the fact that, as mentioned above, participants in this study reported considerable emotional and social impacts of hearing loss but few communication difficulties.

**Figure 6.** Reported daily hearing aid use in hours for each experimental group separately. Group 1 is depicted by dotted shaded bars, Group 2 by light gray bars, and Group 3 by dashed shaded bars.

### Effect of Counseling on Expectations

The primary purpose of this study was to examine the impact of prefitting counseling on hearing aid expectations and outcome, using a verbal-only form of counseling and verbal counseling supplemented with auditory demonstrations of “real-world” listening situations. The analyses showed statistically significant

### Table 4. Comparison of Average Unaided HHIE/A Scores and APHAB Subscale Scores (with standard deviations)

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Mean better ear 3F-PTA</th>
<th>Questionnaire score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study: All participants</td>
<td>70.2 (7.6)</td>
<td>36.9 (9.3)</td>
<td>EC: 39 (20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RV: 55 (22)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BN: 53 (20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AV: 29 (20)</td>
</tr>
<tr>
<td>Cox and Alexander (1995)</td>
<td>68 (*)</td>
<td>Mild-to-moderate sloping or flat loss</td>
<td>EC: 55 (23)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RV: 72 (19)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BN: 70 (19)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AV: 26 (22)</td>
</tr>
<tr>
<td>Present study: Participants completing HHIE</td>
<td>74.3 (4.8)</td>
<td>38.1 (9.1)</td>
<td>41.4 (21.8)</td>
</tr>
<tr>
<td>Ventry and Weinstein (1982) HHIE</td>
<td>75.0 (*)</td>
<td>37.6 (16.5)</td>
<td>29.9 (27.3)</td>
</tr>
<tr>
<td>Present Study: Participants completing HHIA</td>
<td>61.1 (3.8)</td>
<td>34.2 (9.5)</td>
<td>48.2 (19.8)</td>
</tr>
<tr>
<td>Newman et al (1990) HHIA</td>
<td>48.7 (12.0)</td>
<td>22.3 (11.6)</td>
<td>37.3 (22.8)</td>
</tr>
</tbody>
</table>

Note: 3F-PTA = three-frequency pure-tone average (mean of air-conduction thresholds obtained at 500, 1000, and 2000 Hz); AV = Aversiveness subscale of the APHAB; EC = Ease of Communication subscale of the APHAB; BN = Background Noise subscale of the APHAB; HHIE = Hearing Handicap Inventory for the Elderly; HHIA = Hearing Handicap Inventory for Adults; RV = Reverberation subscale of the APHAB.

*Value not available from publication.
Relationship between Expectations and Outcome

Comparison of expectations scores with aided questionnaire scores (Figures 2, 3, and 4) shows that expectations scores on all but the EC scales of the APHAB and the PI scale of the ECHO/SADL were significantly higher than outcome scores. These findings are consistent with those reported by Cox and Alexander (2000) for SADL/ECHO scores, by Bille and Parving (2003), who found that new hearing aid users have higher expectations than experienced users, and with those of Kricos et al (1991) and Sur and Hawkins (1988), who report that new users often have unrealistically high expectations. Saunders and Jutai (2004) also found a mismatch between expectations and outcome. They found that expectations scores of nonhearing aid users on the PIADS and on the PE and NF scales of the ECHO were higher than those of new hearing aid users (worn hearing aids for <6 weeks) but were similar to those obtained from individuals who had worn hearing aids for more than one year. Although this study and others (Gatehouse, 1994; Cox and Alexander, 2000; Jerram and Purdy, 2001) have shown that positive expectations are associated with better outcome, there is a concern that overly positive expectations will result in disappointment and, thus, abandonment of hearing aids before there has been time for adjustment. As stated by Kricos et al, “While this positive outlook in a sample of elderly adults is encouraging…. we caution that it potentially might also lead to ultimate dissatisfaction if the original expectations are not met in subsequent hearing-aid use” (1991, p. 132). Thus, there is considerable value in working to develop counseling aimed toward bringing prefitting expectations closer to reality. An exception to this might be the need to have highly positive expectations regarding the psychosocial impact amplification will have for successful hearing aid outcome. This is suggested by the data shown in Figures 5a–c and in Table 3, showing weak relationships between positive expectations and outcome for the APHAB and HHIE/A scales but strong relationships between expectations and outcomes for the PIADS scales. It can be hypothesized that it is necessary for a patient to approach amplification with the expectation that it will improve their quality of life and psychosocial well-being, while they also need to have realistic expectations about the limitations of amplification in terms of hearing-related outcome.

In contrast to all other questionnaire scales, expectations scores on the PI scale of the ECHO were less...
positive than outcome scores on the SADL. In other words, participants expected the hearing aids to impact their personal image more negatively than reported outcome would suggest they did. The difference seen in this study is small and not statistically significant but is of note because others have reported this in the past (Surry and Hawkins, 1988; Cox and Alexander, 2000; Saunders et al, 2004). This aspect of self-image could be discussed with hesitant patients when addressing the cosmetic aspects of hearing aids in the clinic. The AV scale of the APHAB was the only scale on which the high-benefit group (those whose HHIE/A score improved by >95% CD) had fewer positive expectations than the low-benefit group. This shows the importance of ensuring that new hearing aid users are aware that environmental sounds can be highly disturbing. Together the data underscore the need for clinicians to find a balance between bringing excessively high expectations closer to reality without lowering them so much as to discourage or demotivate the individual.

Effect of Fine-Tuning on Outcome

The questionnaire responses did not show any group differences in the effect of fine-tuning on outcomes; however, as illustrated in Figure 6, participants in Group 1 reported wearing their hearing aids significantly more than participants in Groups 2 and 3. Group 1 participants received hearing aid fine-tuning; Groups 2 and 3 did not. Cunningham et al (2001) also reported no questionnaire benefits for fine-tuning in a study in which half of the participants received subject-driven hearing aid fine-tuning and half did not. Daily hearing aid use was not assessed.

Although no significant difference in daily hearing aid use was seen as a function of expectations, the number of hours a day hearing aids are worn has been shown to be an indicator of satisfaction in several studies. For example, Jerram and Purdy (2001) found that individuals who wore their hearing aids for more than four hours a day reported more hearing aid benefit on a modified version of the APHAB than did those who wore their hearing aids for less than four hours a day. Similarly, Humes and Halling (1996) found significant correlations between reported hearing aid use and reported satisfaction, and Saunders and Jutai (2004) reported that the more hours per day participants reported wearing their hearing aids, the more benefit they reported on the APHAB.

SUMMARY

This study has shown that prefitting hearing aid counseling, to make new users aware of potential difficulties they will encounter in adverse listening situations, and to reassure them that hearing aids provide benefits in quiet listening situations, can have small but significant effects on expectations. Although the two forms of counseling provided here did not differ in their effectiveness at changing expectations or in reported outcomes, anecdotally we learned from many participants that that they enjoyed listening to the auditory demonstrations and that they found them to be an interesting listening exercise. Therefore, even though this study did not show measurable benefit from the use of auditory demonstrations in counseling, they might still be useful in the clinic if the patient is interested and when time permits because the study participants enjoyed the AVE demonstrations, and the research staff found them easy to use and felt they improved their ability to provide the counseling. Moreover, daily hearing aid use was greater among patients who received the counseling demonstrations and hearing aid fine-tuning. This research revealed a positive relationship between prefitting expectations and outcomes and suggests that hearing aid fine-tuning might lead to a greater number of hours of daily hearing aid use. From a clinical perspective, we do recommend the addition of prefitting counseling to address expectations associated with quality of life and self-image. This could be best achieved in a group setting. We also believe the data emphasize the need to address unrealistic expectations prior to fitting hearing aids cautiously, so as not to decrease expectations to the extent of discouraging and demotivating the patient.

Acknowledgments. We thank ShienPei Silverman and Rebecca Cox for their assistance with this study.

REFERENCES


