Hearing Aid Patients in Private Practice and Public Health (Veterans Affairs) Clinics: Are They Different?

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Objective: **In hearing aid research, it is commonplace to combine data across subjects whose hearing aids were provided in different service delivery models. There is reason to question whether these types of patients are always similar enough to justify this practice. To explore this matter, this investigation evaluated similarities and differences in self-report data obtained from hearing aid patients derived from public health (Veterans Affairs, VA) and private practice (PP) settings.**

Design: **The study was a multisite, cross-sectional survey in which 230 hearing aid patients from VA and PP audiology clinic settings provided self-report data on a collection of questionnaires both before and after the hearing aid fitting. Subjects were all older adults with mild to moderately severe hearing loss. About half of them had previous experience wearing hearing aids. All subjects were fitted with wide-dynamic-range-compression instruments and received similar treatment protocols.**

Results: **Numerous statistically significant differences were observed between the VA and PP subject groups. Before the fitting, VA patients reported higher expectations from the hearing aids and more severe unaided problems compared with PP patients with similar audiograms. Three wks after the fitting, VA patients reported more satisfaction with their hearing aids. On some measures VA patients reported more benefit, but different measures of benefit did not give completely consistent results. Both groups reported using the hearing aids an average of approximately 8 hrs per day. VA patients reported age-normal physical and mental health, but PP patients tended to report better than typical health for their age group.**

Conclusions: **These data indicate that hearing aid patients seen in the VA public health hearing services are systematically different in self-report domains from those seen in private practice services. It is therefore risky to casually combine data from these two types of subjects or to generalize research results from one group to the other. Further, compared with PP patients, VA patients consistently reported more favorable hearing aid fitting outcomes. Additional study is indicated to explore the determinants of this result and its generalizability to other public health service delivery systems such as those in other countries. Moreover, efforts should be made to assess the potential for transferring positive elements from the VA system to the PP service delivery system, if possible.**

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It is arguable that audiology in the United States had its origins in the programs designed to provide rehabilitation for veterans who had sustained hearing damage as a result of military service in World War II. One of the major components of those programs was provision of amplification and counseling about its use. Since that time, the Department of Veterans Affairs (VA) has been a major supporter of research oriented toward the acquisition of scientific and clinical knowledge about provision of hearing aids for adults. A large volume of literature has accumulated describing the results of experiments that have featured hearing-impaired veterans as subjects. These patients receive services in a public health system in which public funds are used to provide services to improve or protect the health of veterans.

At least two other entities have supported and produced research exploring hearing aids and fitting methods: hearing aid manufacturers and academic institutions such as universities and the National Institutes of Health. Many of the subjects serving in these studies were recruited from sources that would not be classified as public health services, such as free-standing dispensing practices or university-based dispensing clinics. In this article, patients seen in free-standing dispensing practices are classified as receiving services in a private practice (PP) system. University-based clinics might differ from freestanding dispensaries along several dimensions.[a] Some university-based clinics operate in a way that is similar to a private practice, whereas others do not follow this model.

The VA public health service delivery setting is different in several key respects from most PP service delivery settings. The VA clinic is usually lo-

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[a] For example, differences might occur in the extent to which the operating expense of the practice must be recouped from patient fees and/or in the presence of students during appointments.

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cated in a hospital, and many VA audiology patients are referred from another service such as primary care. At the time this research was done, VA audiology patients received hearing services and treatment without charge.[b] PP patients are generally seen in clinics not associated with hospitals. PP patients are usually self-referred. They always present with hearing as the main complaint, and they almost always pay for the service and treatment they receive.

For the most part, the data emanating from hearing aid studies in VA-based clinics and private practice clinics have not been distinguished from each other when results are generalized to other potential hearing care patients in the population. Undoubtedly, the relative paucity of scientific data regarding amplification effectiveness supports merging the available evidence. Nevertheless, there is justification for questioning the validity of the implied assumption that experimental results are equivalent from VA and non-VA subjects, because studies in the health domain have shown that VA patients are significantly different from non-VA patients. For example, Kazis et al. (1999) studied health status in a large number of veterans and found that VA outpatients report substantially poorer subjective health than non-VA outpatients. Agha, Lofgren, VanRuiswyk, & Layde (2000) observed the same kind of effect. These authors concluded that differences between VA patients and non-VA patients should be considered in health care planning and that extrapolating data from one population to the other should be done with caution.

On the basis of these considerations, we hypothesized that VA hearing aid patients would be significantly different from non-VA hearing aid patients in self-reported health and perhaps other subjective variables. Further, it seemed possible that hearing aid fitting outcomes might be different for these two groups, even when clinical treatment is essentially the same. This issue is of more than academic interest because if VA and non-VA hearing aid patients are substantially different in functional status and rehabilitation outcomes, this might have an impact on the optimal clinical management strategies for each type of patient. In addition, the appropriateness of generalizing research results from one group to the other group would be called into question. This article reports an exploration of these matters.

The study was designed to determine whether hearing aid patients presenting in VA clinics are significantly different in several key respects from those who present in PP clinics. The specific variables assessed were self-rated health, hearing aid expectations, subjective hearing disablement, and self-assessed hearing aid outcomes.

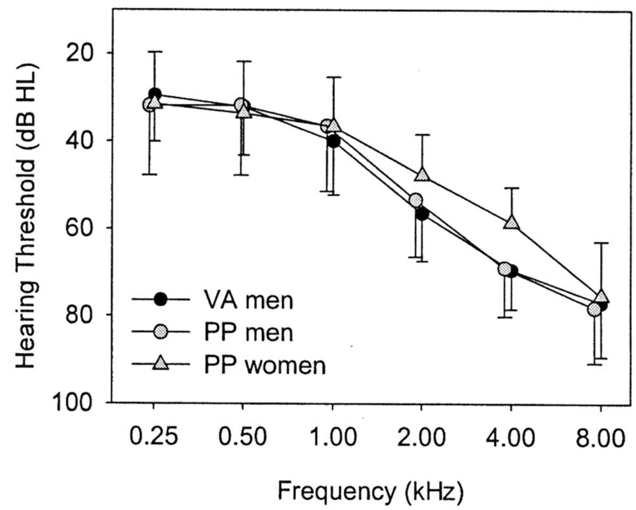

Fig. 1. Composite audiograms of the VA subjects (N = 151) and of the male and female PP subjects (N = 79). Bars show 1 SD.

METHODS

Participants were patients who were seeking hearing aids at one of 11 audiology clinics. Five clinics were located in VA Medical Centers in Florida, Washington State, Washington, DC, and east and west Tennessee. These sites provided services and hearing aids without charge to eligible veterans. Six PP clinics charged for hearing aids and services. These clinics were situated in Tennessee, Texas, Ohio, Florida, and California. One of the PP sites (contributing seven subjects) was a university-based clinic in which patient care and treatment fees are similar to some free-standing dispensaries.

Subjects

There were a total of 230 subjects, 151 VA patients and 79 PP patients. All of the VA subjects were men, 26 of the PP subjects were men and 53 were women. Figure 1 depicts the composite audiograms of the VA subjects and of the men and women PP subjects. The VA patients and the men from the PP group provided almost identical mean audiograms. The average woman from the PP group had less high-frequency hearing loss than the men. These gender differences are in line with the patterns reported by Jerger, Chmiel, Stach, & Spretnjak (1993) for audiograms of older men and women. Inclusion criteria were bilateral, symmetrical, sen-

[b] Since these data were collected, VA clinics have instituted modest service charges for some patients.

TABLE 1. Scores generated by both the ECHO and the SADL questionnaires

Score	Name	Content	No. of items
PE	Positive effect	Improved functioning (psychoacoustic and psychological)	6
SC	Service and cost	Dispenser competence and hearing aid value	3
NF	Negative features	Impact of potentially unpleasant side effects	3
PI	Personal image	View of self as a hearing aid wearer	3
GL	Global	Average of all items	15

sorineural, mild to moderately severe hearing impairment; sufficient vision and reading ability to comprehend and respond to the questionnaires; generally good health (adequate to participate in a 7- to 8-month experiment); at least 60 yrs old[c]; and noninstitutionalized living status. The average age of the VA subjects was 72 yrs (SD = 7.15; range, 41 to 87). The average age of the PP subjects was 75 yrs (SD = 7.93; range, 59 to 95). Forty-one percent of the subjects were previous hearing aid users, 59% were acquiring their first hearing aid. The proportion of new versus experienced users was about the same for VA and PP patients.

Procedure

All subjects were recruited when they presented for a routine clinic visit. Subject recruitment procedures were as follows in each clinical setting: in a given week, the first patient who met the inclusion criteria was invited to participate in the research. If that individual declined, the next eligible patient was invited to participate, and so on. The actual day of subject enrollments varied across the week. No more than one new subject per week was recruited at each site. Participation rate was approximately 93% for VA patients and approximately 77% for PP patients. Each subject completed questionnaires both before and after the hearing aid fitting.

Prefitting Questionnaires

The prefitting set of questionnaires was completed after the decision to obtain new hearing aids but before extensive counseling was provided by the audiologist. The typical experience of each subject before completing the prefitting questionnaires was history interview, audiometric testing, informational counseling about the hearing impairment, and estimate of the appropriateness of obtaining amplification. The questionnaires were completed by the subject in the audiologist's office. They included measures of general health, hearing aid expectations, and hearing disablement. The term disablement encompasses both activity limitations and participation restrictions as defined by the International Classification of Functioning, Disability and Health (ICF, 2001). Activity limitations are the difficulties the hearing-impaired person has in performing everyday hearing-related tasks such as understanding speech, localizing sounds, and so forth. Participation restrictions are the problems or barriers the hearing-impaired person encounters that circumscribe his/her opportunities for involvement in the situations of daily life. They can include such things as partaking in church services or feelings of embarrassment at bridge club meetings. The details of activity limitations and participation restrictions experienced by a specific patient will differ across individuals, depending on the demands of that person's lifestyle and variables such as age, cultural factors, social factors, and gender.

This article focuses on four prefitting questionnaires:

- The Medical Outcomes Study Short Form 36-item (SF-36) Health Survey (Ware & Sherbourne, 1992) was used to measure self-reported health status. This generic inventory has been used extensively with veterans and nonveterans. The SF-36 generates eight subscale scores that are combined to produce two overall scores: the physical component score (PCS) and the mental component score (MCS). The PCS encompasses physical health issues such as activities and pain. The MCS encompasses mental health issues such as mood and energy level.
- The Expected Consequences of Hearing Aid Ownership (ECHO) scale (Cox & Alexander, 2000) was used to quantify expectations about the hearing aid. This questionnaire generates four subscale scores and a global expectation score (see Table 1). There are 15 items, one of which addresses the extent to which the hearing aids are worth their cost. For the VA subjects, it is standard practice to omit this item. This item also was omitted for 19 PP subjects whose hearing aids were wholly or partially purchased by a third party payer.
- The domain of participation restrictions was quantified by using the Hearing Handicap Inventory for the Elderly (HHIE). This 25-item questionnaire

[c] Because of errors, 8 subjects younger than 60 were included (7 VA subjects and 1 PP subject).

produces two subscales (Ventry & Weinstein, 1982). The emotional subscale focuses on feelings such as anger and frustration. The social subscale is concerned with reduction in contact with others. In addition, the subscale scores may be summed to generate a total score. Each HHIE item can be answered with respect to unaided listening or aided listening. Before the hearing aid fitting, the questionnaire was completed to describe problems in unaided listening.

- A measure of activity limitations was obtained using the Abbreviated Profile of Hearing aid Benefit (APHAB). This 24-item questionnaire generates a profile of four scores showing the percentage of time that problems arise during certain everyday activities (Cox & Alexander, 1995). The Aversiveness (AV) subscale addresses the acceptability of environmental sounds. Three subscales concern speech understanding: The Ease of Communication (EC) subscale addresses listening in quiet; the Reverberation (RV) subscale concerns reverberant spaces; and the Background Noise (BN) subscale describes listening in noisy situations. The scores for the EC, RV, and BN subscales may be averaged to generate a Global speech communication score. Each APHAB item can be answered with respect to unaided listening or aided listening. Before the hearing aid fitting, the questionnaire was completed to describe problems in unaided listening.
- In addition to the questionnaires that are the topic of this paper, there were prefitting questionnaires about personality, locus of control, and coping strategies. These data are reported elsewhere (Cox, Alexander, & Gray, 2005). The entire prefitting set of questionnaires required about 60 to 90 minutes to complete.

Hearing Aid Fitting

Hearing aids were fitted after completion of the prefitting questionnaires. Subjects at all sites were fitted using programmable devices with similar processing options. The fittings were completed in the years 2000 to 2003 and the devices were current at that time. All of the VA patients were fitted with similar models of Starkey Sequel hearing aids. However, it was not practical to attempt to standardize the make and model of the fitted hearing aids for PP patients, nor did there seem to be any compelling scientific reason to do so (e.g., Humes, Humes, & Wilson, 2004; Larson et al., 2000). The general guidelines for the study called for wide dynamic range compression (WDRC) hearing aids in the case style judged most appropriate for the patient. Fine tuning adjustments of compression parameters were permitted. Bilateral fittings were preferred but unilateral fittings were permitted.

TABLE 2. Summary of fitted hearing aids

	PP patients (%)	VA patients (%)
Wide-dynamic-range compression (2 kHz knee point <65 dB SPL)	65	54
Mid-range compression (2 kHz knee point = 65 to 80 dB SPL)	21	22
Compression limiting (2 kHz knee point >80 dB SPL)	14	24
Behind the ear (BTE)	28	1
In the ear (ITE)	35	52
In the canal (ITC)	26	28
Completely in canal (CIC)	11	19
Unilateral fitting	15	1
User volume control	54	63
Telecoil	32	13
Multichannel	46	7
Directional microphone	41	21
Programmable analog	62	100
Programmable digital	38	0

Data are in percentages.

After completing the prefitting questionnaires and consulting with the audiologist about obtaining new devices, four PP subjects elected not to pursue amplification, thus reducing the number of PP subjects to 75 at that stage of the study. Of the 75 PP subjects, nonsystematic technical problems resulted in incomplete hearing aid data for 17 subjects. Table 2 summarizes the known data on hearing aid features for both groups.

After fine tuning, volume/gain controls were adjusted by the audiologist, in consultation with the subject, to achieve a comfortable listening level for conversational speech presented at 65 dB SPL in a moderately reverberant room[d]. The fittings were then documented as follows.

- Audibility of soft sounds was assessed by using aided sound field thresholds for warble tones. In the few subjects who wore devices with feedback management or noise reduction features, these were disabled for warble tone threshold measures. Low-frequency audibility was represented as the average of thresholds at 250 Hz and 500 Hz. High-frequency audibility was represented as the average of thresholds at 2000 Hz and 4000 Hz.
- Gain for conversational speech was assessed by computing the ratio of average coupler gain at 1000, 2000, and 4000 Hz (for input = 65 dB) to average prescribed gain at the same frequencies using the

[d] Patients with previous hearing aid experience used a criterion of "comfortably loud" to judge the appropriate gain setting. Patients receiving their first hearing aids used a criterion of "comfortable but slightly loud" for this adjustment.

NAL-R prescription procedure, (Byrne & Dillon, 1986).
• Level of loud sounds was assessed by computing the difference between the optimum high-frequency average (HFA) OSPL90 prescribed using the NAL procedure (Dillon & Storey, 1998) and the HFA OSPL90 measured in a 2-cc coupler for the fitted hearing aids.
• Finally, input/output functions were obtained for 500 Hz and 2000 Hz tones.

After the fitting was completed, subjects were provided with standard, written material covering orientation and adjustment to amplification as well as the verbal orientation and adjustment customarily provided by the dispensing audiologist.

Postfitting Questionnaires

At this stage, a further 13 subjects were lost to the study. The reasons were, kept hearing aids but did not return outcomes (5), protocol violations (7), and illness (1).

Each of the remaining 213 subjects wore the amplification system for a nominal 3-wk period and then completed the postfitting set of questionnaires that was mailed to him or her at this time. The postfitting questionnaires were completed at home and returned by mail. The median interval between fitting and outcome measurement was 21 days. Eighty percent of the subjects completed the postfitting questionnaires within 35 days of fitting. A small number took longer as a result of necessary hearing aid repairs or recasing or postage delays.

All subjects were informed that the audiologist who dispensed their hearing aids would not see their outcome measures. This was done to encourage subjects to be completely candid in their feedback about fitting effectiveness. Five measures of self-report outcomes were obtained. These included the outcome domains of residual problems in performance and participation in daily life, benefit, satisfaction, and use.

• Two measures of postfitting disablement were obtained. Residual problems in participation were measured using the HHIE, completed to describe problems during aided listening. Residual problems in performance (activity limitations) were measured using the APHAB, completed to describe problems during aided listening.
• Three measures of benefit were obtained, encompassing exemplars of both relative and absolute types of measurement. Relative benefit is defined as the difference between aided and unaided functioning. The difference between aided and unaided problems on the HHIE provided a measure of relative benefit in the participation domain. The difference between aided and unaided problems on the APHAB provided a measure of relative benefit in the performance domain. Absolute benefit is defined as the magnitude of change produced by the hearing aid, independent of the starting (unaided) and ending (aided) points. The Shortened Hearing Aid Performance Inventory for the Elderly (SHAPIE, Dillon, 1994) provided the measure of absolute benefit. The SHAPIE comprises 25 items that each describe a listening situation, such as listening to soft speech in a quiet room. The patient selects a response category to indicate how helpful the hearing aids are in that situation. The five response categories are very helpful, helpful, very little help, no help, hinders performance. The questionnaire can be scored to produce three subscale scores and a total score.
• Two measures of satisfaction were obtained. Overall satisfaction was quantified by using a single item query ("Overall, how satisfied are you with your new hearing aids?"). There were five possible responses: very satisfied, satisfied, neutral, dissatisfied, very dissatisfied. An analytic measure of satisfaction was obtained using the Satisfaction with Amplification in Daily Life (SADL) Scale (Cox & Alexander, 1999; Cox & Alexander, 2001). This 15-item questionnaire was developed as a companion to the ECHO questionnaire. It generates a profile of four subscale scores and a global satisfaction score. The SADL scores are described in Table 1. One of the items addresses the extent to which the hearing aids are worth their cost. For the VA subjects, it is standard practice to omit this item. This item also was omitted for 19 PP subjects whose hearing aids were wholly or partially purchased by a third-party payer.
• Daily hearing aid use was quantified by using a single item that requested the subject to select one of four categories to describe the average number of hours that he or she used amplification each day.

RESULTS

A variety of statistical methods were chosen to evaluate the data. Exact probability values are reported to facilitate interpretation. Because questionnaire items were sometimes omitted or unscorable, not every subject yielded usable data for every comparison. The subject numbers for each comparison are noted in the figure legend. Any result with an associated probability value greater than 0.05 was considered nonsignificant.

In several analyses, it was postulated that a subject's hearing loss might impact his or her self-report data. For example, a person with a moderate hearing loss might have higher expectations regarding amplification than one with a mild hearing loss. To minimize this potential effect (given the differences in hearing loss between VA and PP subjects shown in Fig. 1), hearing loss was used as a covariate in these analyses. The covariate was PTA, defined as mean pure-tone threshold (for 500, 1000, and 2000 Hz) averaged across left and right ears.

Although the focus of this investigation was the differences between patients originating in VA and PP service systems, there is a potential influence of gender on the results. This occurs because VA patients are almost invariably men, whereas PP patients are divided among men and women. In this investigation, the sampling procedure produced groups that were all men in the VA group and two-thirds women in the PP group. In the analyses reported below, whenever significant differences were detected between the VA and PP groups, questions about potential influences of gender on the result were addressed by analyzing only the data for PP subjects, with men and women separated. For each analysis, it was hypothesized that differences between PP men and PP women would be similar to the analogous differences observed between the VA (all men) and PP (mostly women) groups. If this hypothesis was supported, it would suggest that gender might have played a part in the observed VA-PP group differences.

Self-Reported Health Status

Responses to the SF-36 questionnaire were scored by using the standard method and eight subscales were combined into the two component scores (PCS and MCS). The SF-36 user's manual (Ware, Kosinski, & Keller, 1994) provides norms for the general US population by age group. The manual provides separate norms for men and women, but the difference between genders is minimal and not statistically significant. Based on this, it was determined to combine the data from PP men and women to maximize the power of the analyses. The subjects in this study were partitioned into the following age groups: <65 yrs, 65 to 74 yrs, and >74 yrs. There was a total of only 23 subjects younger than 65 yrs of age, so these data were not analyzed further. MCS and PCS scores in the two other age groups were compared across VA and PP service delivery systems and the age-appropriate norms. Figure 2 depicts the means and standard deviations for MCS and PCS scores for VA and PP subjects and for the normative groups. Data are given in two age groups: 65 to 74 yrs and older than 74 yrs. A higher score is indicative of better self-assessed health.

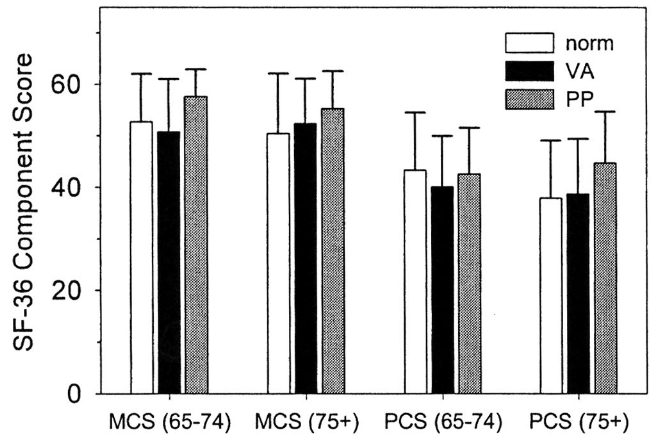

Fig. 2. Means and standard deviations for SF-36 component scores (MCS and PCS) for VA and PP subjects and for corresponding normative groups. Two age groups are included (65 to 74 yrs and 75+ yrs). Bars show 1 SD.

The statistical significance of differences across scores within each component was tested and the results are depicted in Table 3. These data yield the following conclusions.

- The self-assessed health of VA hearing aid patients was not significantly different from the age-appropriate general population norm in either the physical or mental health component in either age group.
- The self-assessed health of PP hearing aid patients was significantly better than the age-appropriate general population norm for both physical and mental health components in subjects older than 74 yrs and for the mental health component in subjects 65 to 74 yrs of age.
- The self-assessed health of PP hearing aid patients was significantly better than that of VA hearing aid patients in two comparisons: the mental health component in subjects 65 to 74 yrs of age and in the physical health component in subjects older

TABLE 3. Results of post hoc tests (Tukey's HSD, alpha = 0.05) comparing SF-36 PCS and MCS component scores for normative, PP, and VA groups

Age	PCS	MCS	No. of subjects
65 to 74 yrs	VA PP Norm	VA Norm PP	VA = 86, PP = 24, Norm = 442
75+ yrs	Norm VA PP	Norm VA PP	VA = 50, PP = 47, Norm = 264

Underlining indicates groups that were not significantly different.
The last column gives the number of subjects in each group.

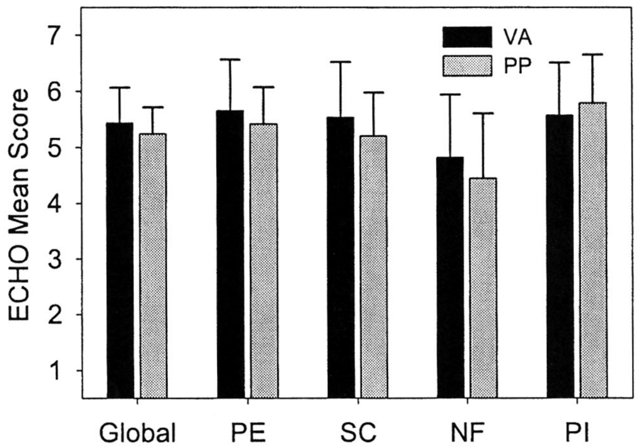

Fig. 3. Mean global and subscale scores for VA (N = 151) and PP (N = 78) groups for the ECHO questionnaire. Bars show 1 SD.

than 74 yrs. In the two other comparisons, there were no differences between VA and PP subjects.

Potential Influence of Gender on Self-Reported Health

MCS and PCS scores were compared across men and women PP subjects, using a multivariate analysis of variance (all ages together). There were no significant gender differences for PCS [$F(1,77) = 2.76, p = 0.1$] or MCS [$F(1,77) = 0.12, p = 0.7$] data. Thus, there was no evidence that the differences between VA and PP patients in reported health could be attributed to subject gender.

Expectations About Hearing Aids

Responses to the ECHO questionnaire were scored as recommended, yielding a global score and the four subscale scores described in Table 1. For all scores, the possible range is 1 to 7, and higher scores are indicative of more positive expectations. Figure 3 illustrates the scores for VA and PP groups. Mean scores for the two groups were similar. However, there was a general trend for VA patients to report higher expectations than PP patients on all scores except the Personal Image subscale.

It could be argued that experience with amplification might curb expectations and thus eliminate any expectation differences between VA and PP patients. To explore this, the groups were further divided into experienced and new hearing aid users. The pattern of differences between VA and PP patients was not changed by this procedure: experienced VA patients recorded higher mean expectations than experienced PP patients for every subscale except Personal Image. The same pattern was seen for new user VA and PP patients. Therefore, the experience categories were pooled for analysis.

A multivariate analysis of variance with hearing loss as a covariate was used to assess the significance of differences between VA and PP subjects in each ECHO subscale. The results of the analysis indicated that VA subjects reported significantly higher expectations than PP subjects in the Service and Cost subscale [$F(1,226) = 7.17, p = 0.008$], and in the Negative Features subscale [$F(1,226) = 6.62, p = 0.011$]. The differences in Global expectation scores also were statistically tested, controlling for hearing loss. The results indicated that VA patients reported significantly higher expectations than PP patients overall [$F(1,226) = 5.48, p = 0.02$].

Potential Influence of Gender on Prefitting Expectations

ECHO global and subscale scores were compared across men and women PP subjects, using a multivariate analysis of variance, with hearing loss as a covariate. The lone significant difference was observed for the Negative Features subscale [$F(1,75) = 4.12, p = 0.046$], in which the expectations reported by men were lower than those reported by women. Since this difference was opposite in direction from the hypothesis, there was no evidence that the differences between VA and PP patients in prefitting expectations could be attributed to subject gender.

Prefitting Disablement: Hearing Problems in Daily Life, Without Amplification

Responses to the HHIE questionnaire were scored as recommended, yielding two subscale scores. The possible range of scores for the Social subscale is from 0 to 48; the Emotional subscale range is from 0 to 52. Higher scores are indicative of more problems with participation restrictions in daily life. Figure 4 illustrates the scores for VA and PP groups. There was a general trend for VA patients to report more participation restrictions than PP patients. Multivariate analysis of variance, controlling for hearing loss using PTA, was used to assess the significance of differences between VA and PP subjects in each subscale. The results indicated that VA subjects reported significantly more participation restrictions than PP subjects in the Emotional subscale [$F(1,227) = 12.57, p < 0.001$] and in the Social subscale [$F(1,227) = 12.57, p < 0.001$].

Responses to the APHAB questionnaire were scored as recommended, yielding four subscale scores. The possible range for the subscale scores is 1 to 99. Higher scores are indicative of more frequent problems with performance (activity limitations) in daily life. Figure 5 illustrates the scores for

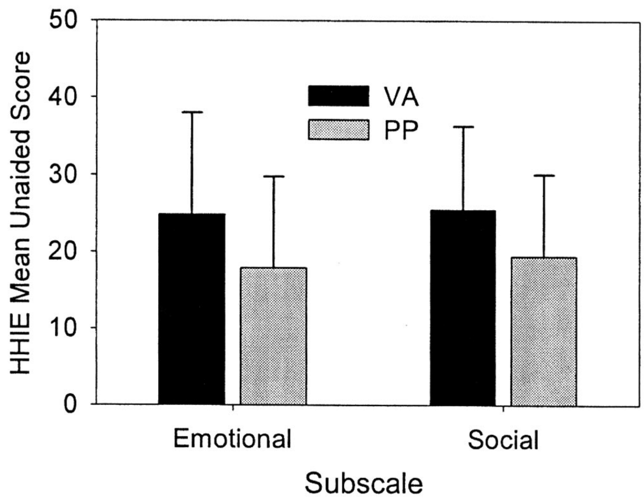

Fig. 4. Mean subscale scores for VA (N = 151) and PP (N = 79) groups for the HHIE questionnaire in unaided listening. Bars show 1 SD.

VA and PP groups. There was a general trend for VA patients to report more performance problems than PP patients, but the mean differences were small relative to variability. A multivariate analysis of variance, controlling for hearing loss using PTA, was used to assess the significance of differences between VA and PP subjects in each subscale. The results indicated that the differences between VA and PP subjects were statistically significant only in the Background Noise (BN) subscale [$F(1,227) = 4.49, p = 0.035$]. Mean scores for VA and PP patients were not significantly different on the three other APHAB subscales.

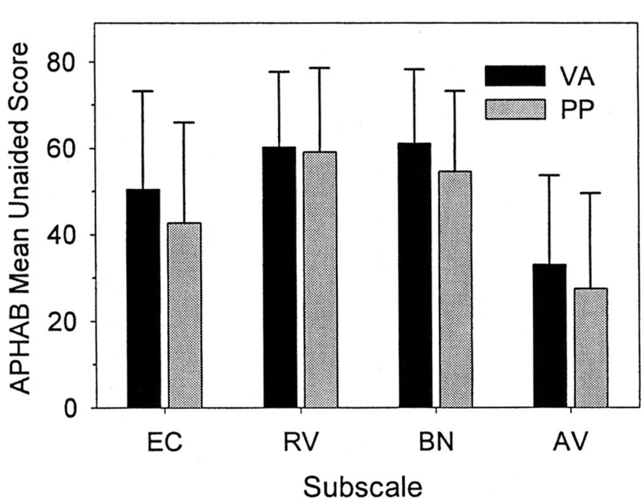

Fig. 5. Mean subscale scores for VA (N = 151) and PP (N = 79) groups for the APHAB questionnaire in unaided listening. Bars show 1 SD.

TABLE 4. Summary of hearing aid fitting indexes (average of right and left ears) for VA and PP patients

	PP patients	VA patients
Aided low-frequency SF threshold (250 Hz and 500 Hz)	24 dB HL (10.5) N = 60	20 dB HL (8.6) N = 147
Aided high-frequency SF threshold (2000 Hz and 4000 Hz)	36 dB HL (9.3) N = 60	39 dB HL (8.7) N = 147
Average gain ratio (used/ prescribed)	0.54 (0.38) N = 44	0.60 (0.32) N = 138
Average MPO difference (used/ prescribed)	−7.2 (7.1) N = 54	−6.6 (7.2) N = 148

Data are mean values, with standard deviations shown in parentheses. N = number of subjects.

Potential Influence of Gender on Prefitting Disablement

HHIE emotional and social subscale scores were compared across men and women PP subjects, using a multivariate analysis of variance with hearing loss as a covariate. The mean scores did show a trend for men to report somewhat higher HHIE scores than women, but these differences did not reach statistical significance. APHAB subscale scores were compared across men and women PP subjects, using a multivariate analysis of variance with hearing loss as a covariate. There were no significant gender differences for any subscale, nor any trend in the mean scores similar to the pattern of differences in Figure 5. Thus, there was no evidence that the differences between VA and PP patients in reported prefitting disablement could be attributed to subject gender.

Hearing Aid Fittings

VA and PP patients were fitted with amplification according to their preferences, in consultation with the participating audiologist. The final hearing aid fittings were documented using indexes that were designed to reflect audibility of soft sounds, gain for conversational speech, and acceptability of loud sounds. These data could not be obtained for some fittings for nonsystematic technical reasons. The known fitting data are summarized in Table 4. Although the hearing aid fittings were not a focus of this study, it was of interest to assess whether final fittings for VA and PP patients were systematically different, because differences might affect postfitting outcome reports.

Table 4 indicates that aided sound field thresholds for VA patients were 4 dB better in the low frequencies and 3 dB poorer in the high frequencies than for PP patients. Multivariate analysis of variance was used to assess the significance of these differences. Because PP and VA patients differed somewhat in mean high-frequency hearing loss (Fig. 1), and this could be expected to impact fitted gain, a high-frequency covariate (average of unaided thresholds at 2000 and 4000 Hz) was used in this analysis. Results indicated that the difference in aided high-frequency thresholds was not statistically significant. In contrast, the 4-dB difference in aided low-frequency thresholds was significant, with VA patients achieving significantly better low-frequency audibility than PP patients [$F(1,204) = 17.6, p < 0.001$]. Although the basis for this finding cannot be definitively determined, it is plausible that it derived from the greater use of more adjustable multichannel devices in the PP fittings. As shown in Table 4, 46% of PP patients were fitted with multichannel devices compared with 7% of VA patients.

Table 4 indicates that on the day the hearing aids were fitted, typical VA patients preferred average gain for conversational speech equal to 60% of that prescribed for their hearing loss by the NAL-R prescription. On average, PP patients preferred gain equal to 54% of the NAL-R prescribed gain. This difference was not found to be statistically significant.

As shown in Table 4, the HFA OSPL90 provided in fittings for both VA and PP patients was typically about 7 dB lower than the optimal HFA OSPL90 computed for their hearing losses using the NAL procedure. Not surprisingly, the small mean difference between VA and PP patients was not found to be significantly different.

Hearing Aid Fitting Outcomes

Postfitting Participation and Performance • The HHIE questionnaire was completed to describe participation problems while listening using the hearing aids. Responses were scored as recommended, yielding two subscale scores (Emotional and Social). Figure 6 depicts the subscale scores for VA and PP patients. The two groups produced very similar mean scores in both subscales. Multivariate analysis with hearing loss as a covariate confirmed that VA and PP patients did not differ significantly in terms of reported residual (i.e., postfitting) participation restrictions in either subscale.

The APHAB questionnaire was completed to describe performance problems (activity limitations) while listening using the hearing aids. Responses were scored as recommended, yielding four subscale scores (EC, RV, BN, AV). Figure 7 depicts the subscale scores for VA and PP patients. As seen for the HHIE questionnaire (Fig. 6), the two groups produced very similar mean aided scores in all subscales. Once again, these observations were confirmed with multivariate statistical analysis, with hearing loss as a covariate. VA and PP patients did not differ significantly in terms of reported residual (i.e., postfitting) performance problems in any subscale.

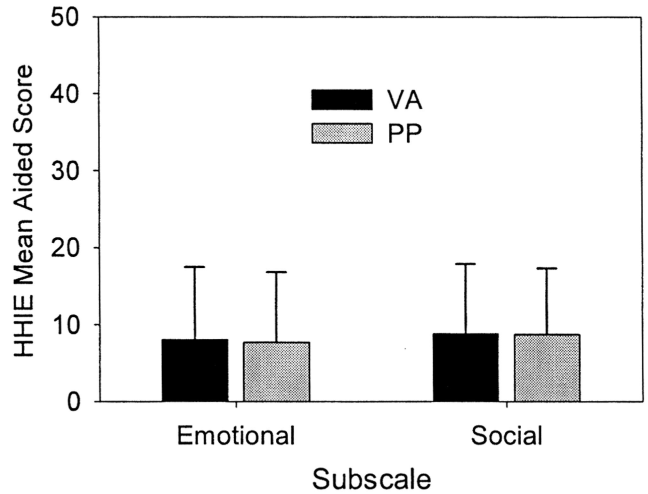

Fig. 6. Mean subscale scores for VA (N = 140) and PP (N = 70) groups for the HHIE questionnaire in aided listening. Bars show 1 SD.

Potential Influence of Gender on Postfitting Participation and Performance • Because there were no differences between VA and PP patients in postfitting participation and performance, gender effects in the PP group were not investigated.

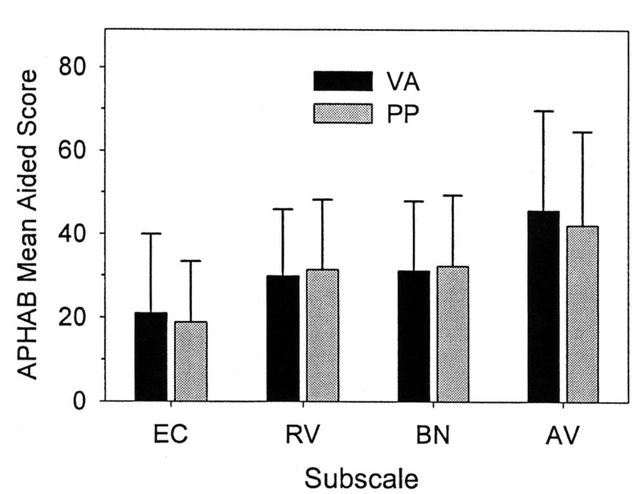

Fig. 7. Mean subscale scores for VA (N = 140) and PP (N = 71) groups for the APHAB questionnaire in aided listening. Bars show 1 SD.

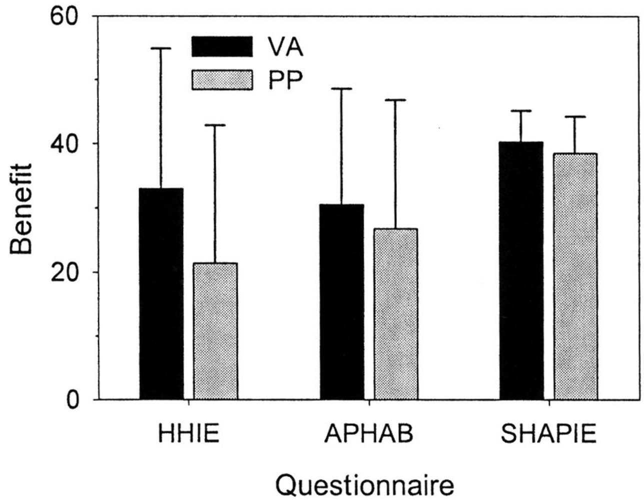

Fig. 8. Mean benefit scores for VA (N = 137) and PP (N = 68) groups for HHIE, APHAB, and SHAPIE questionnaires. Bars show 1 SD.

Hearing Aid Benefit

Relative benefit was computed by determining a difference in scores between aided and unaided listening conditions. In the participation domain, aided problems reported on the HHIE questionnaire were subtracted from unaided problems reported on that questionnaire. In the performance domain, aided problems reported on the APHAB questionnaire were subtracted from unaided problems reported on that questionnaire. Absolute benefit was computed directly from the responses to the SHAPIE questionnaire.

To maximize the interpretability and reliability of the benefit data, a single overall benefit score was generated for each of the three questionnaires. HHIE data were summed across all items using the standard scoring procedure to produce a Total HHIE benefit score for each subject. The APHAB data were averaged across the three speech communication subscales (EC, RV, and BN) to produce a Global APHAB benefit score for each subject. Finally, helpfulness scores from the SHAPIE were averaged across all 25 items to give a SHAPIE Total benefit score for each subject. The five response categories for the SHAPIE were scored from 1 to 5, with more help corresponding to a higher score. For display purposes the SHAPIE scores were multiplied by 10 so that the range would be comparable to the two other questionnaires.

Figure 8 illustrates mean benefit scores for VA and PP patients for the HHIE, APHAB, and SHAPIE questionnaires. There is a trend for mean VA benefit to be higher than mean PP benefit on all three measures. A multivariate analysis of variance, with hearing loss as a covariate, was used to explore the significance of differences between VA and PP patients on the three benefit measures, combined and separately. The main effect of dispensing site combined across all three measures indicated that VA patients reported significantly more benefit than PP patients [$F(3,200) = 4.72$, $p = 0.003$]. When questionnaires were examined separately, significantly different benefit between the two groups was seen for the HHIE questionnaire [$F(1,202) = 10.38$, $p = 0.001$], but not for the APHAB or SHAPIE questionnaires. For the SHAPIE questionnaire, the difference did not quite reach significance [$F(1,202) = 3.55$, $p = 0.061$].

Potential Influence of Gender on Benefit

The three benefit scores (HHIE Total, APHAB Global, and SHAPIE Total) were compared across men and women PP subjects, using a multivariate analysis of variance with hearing loss as a covariate. The main effect of gender combined across all three measures was significant [$F(1,63) = 3.82$, $p = 0.014$]. When questionnaires were looked at separately, it was seen that PP women reported significantly more benefit than PP men on the SHAPIE [$F(1,65) = 8.44$, $p = 0.005$] and on the APHAB [$F(1,65) = 4.31$, $p = 0.042$]. There was no gender difference in benefit on the HHIE. Note that the benefit differences observed between men and women PP patients were in the opposite direction from the hypothesis. Thus, there was no evidence that the differences between VA and PP patients in reported benefit could be attributed to subject gender.

Hearing Aid Satisfaction

Overall satisfaction was measured by using the single item query described above. Responses were scored on a five-point scale with very dissatisfied = 1 and very satisfied = 5. Figure 9 shows the results for VA and PP patients. Analysis of variance with hearing loss as a covariate confirmed the visual impression that the typical VA patient reported higher overall satisfaction than the typical PP patient [$F(1,208) = 8.25$, $p = 0.005$].

An analytic measure of satisfaction was obtained from the SADL questionnaire. Responses were scored using the recommended procedure, to yield the four subscale scores described in Table 1. Figure 10 depicts the mean scores for VA and PP patients on each subscale. A multivariate analysis of variance, with hearing loss as a covariate, was used to explore the significance of differences between responses for VA and PP patients on each subscale. Significant differences were found on two of the four subscales. On the Positive Effect (PE) subscale, VA

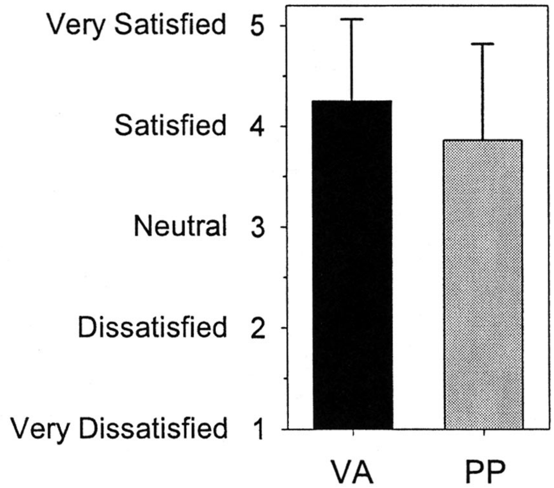

Fig. 9. Mean single-item overall satisfaction scores for VA (*N* = 140) and PP (*N* = 71) groups. Bars show 1 SD.

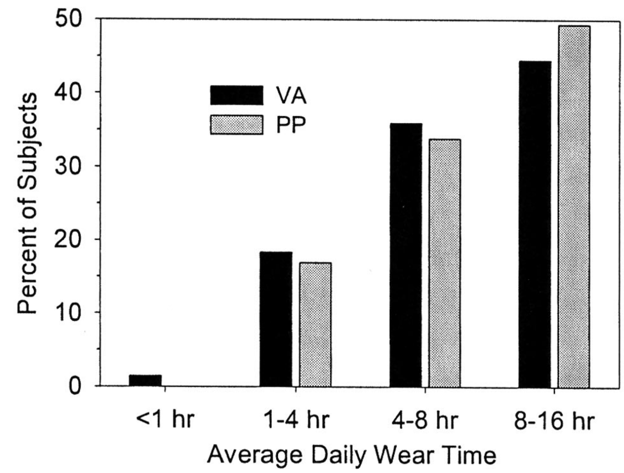

Fig. 11. Percent of VA (N = 141) and PP (N = 71) subjects who reported daily hearing aid use in each of four categories.

patients reported more satisfaction than PP patients [$F(1,176) = 7.78$, $p = 0.006$]. Similarly, on the Service and Cost (SC) subscale, VA patients reported more satisfaction than PP patients [$F(1,176) = 25.32$, $p < 0.001$]. There were no differences in satisfaction for the Negative Features or the Personal Image subscales.

Potential Influence of Gender on Satisfaction

Overall satisfaction scores and SADL subscale scores were compared across men and women PP subjects, using a multivariate analysis of variance with hearing loss as a covariate. There were no significant gender differences on any satisfaction score, nor any trend in the mean scores similar to the pattern of differences in Figure 9 and Figure 10. Thus, there was no evidence that the differences between VA and PP patients in hearing aid satisfaction could be attributed to subject gender.

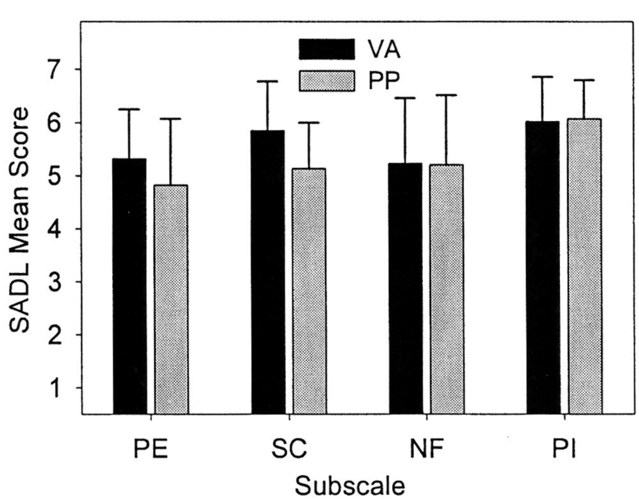

Fig. 10. Mean subscale scores for VA (N = 118) and PP (N = 61) groups for the SADL questionnaire. Bars show 1 SD.

Hearing Aid Use

Each subject selected one of four options to indicate how long they wore their hearing aids each day, on average. The results are summarized in Figure 11. Broadly speaking, 15 to 20% of subjects reported using amplification 1 to 4 hrs daily, 30 to 35% wore their hearing aids 4 to 8 hrs per day, and 45 to 50% reported full-time daily use of 8 to 16 hrs. Averaging across the data yielded a use-time estimate close to 8 hrs per day for the typical patient in both groups. Thus, the distribution of wear time categories was very similar for the two groups. Univariate analysis of variance (with a hearing loss covariate) supported the impression of no significant difference in use time between typical VA and PP patients.

DISCUSSION

Subjective Health

All subjects in both VA and PP groups were in generally good health before the study started (any potential subjects in relatively poor health would have been excluded because of the length of the study). Despite this preliminary screening, a clear pattern of differences in self-rated health emerged from the SF-36 data. Patients in VA hearing aid clinics were about equal in health to their age cohort in the general population. However, the typical patient in a private practice hearing aid dispensary was in especially good health compared with the general population. Further, PP hearing aid seekers were healthier than VA hearing aid seekers in two of four comparisons. These results are consistent with those of previous investigators who have shown that VA medical patients generally report poorer health than analogous patients in other medical settings, and they tend to support our hypothesis that hearing aid seekers in VA clinics would rate themselves as less healthy than hearing aid seekers in PP clinics. However, this result occurred not because VA patients are relatively sickly but because PP patients are especially healthy.

This finding is consistent with a hypothesis that typical patients who select a PP service delivery clinic do not seek hearing help unless other health concerns have been addressed. In other words, it suggests that in the PP health care system, hearing health has relatively low priority for individuals who have competing health concerns.

Expectations and Satisfaction

VA and PP patients differed in their patterns of prefitting expectations about, and postfitting satisfaction with, their hearing aids. Before the fitting, VA and PP patients did not differ in their expectations for improved functioning (PE subscale) or hearing aid stigma (PI subscale). On the other hand, VA patients had more confidence than PP patients that problems with the fitting would be adequately handled (NF subscale). Further, VA patients were more sanguine than PP patients about dispenser proficiency and hearing aid merit (SC subscale).[e]

Previous research has shown that patients who have higher expectations regarding their hearing aids generally report better outcomes on some outcome measures (Cox & Alexander, 2000; Schum, 1999). Nevertheless, the expectations of VA and PP patients were not fully realized, based on the satisfaction data obtained after the fitting from the SADL questionnaire. Consistent with expectations, VA patients were more satisfied than PP patients with the competence and value aspects of their fittings (SC subscale) and the two groups were equally unaffected by hearing aid stigma concerns (PI subscale). However, VA patients did not achieve better results than PP patients in the solution of device-related problems (NF subscale), and VA patients did report more improvement in functioning than PP patients (PE subscale).

These results support the following observations: First, patients in the VA system expect and report a higher level of dispenser competence and instrument merit when they are fit with amplification. Variables that may be associated with this finding could include the lack of a vested interest in hearing aid sales by VA audiologists and the difference in financial burden for hearing aid purchase between the VA and PP settings. Second, the reported improvement in functioning produced by the hearing aid was greater for VA patients than for PP patients, even though this was not anticipated before the fitting. The variables cited above might be operating in this result as well, but the association is less obvious. It is also conceivable that the slightly increased audibility of soft low-frequency sounds achieved in the fittings for VA patients (see Table 4) could partly be responsible for this result (but see more about this below). Third, despite differences in prefitting expectations, neither group reported superior handling of predictable problems with the fitting (such as background noises, feedback or disappointing telephone use). In other words, the negative effects of amplification were not different for VA and PP patients.

Finally, when asked to judge overall satisfaction, not only were VA patients significantly more satisfied than PP patients, but also the magnitude of the difference between VA and PP patients (VA-effect size, quantified as Cohen's d) was between 0.4 and 0.5, which would be regarded as a moderate effect (Thompson & Hill, 2004). Thus, although the single-item measure of overall satisfaction does not yield insights about the underlying bases of patients' responses, it is clear from these data that the VA type of delivery system was meaningfully superior to the PP type of delivery system from the point of view of the patients serviced in the two systems. It should be of considerable interest to the field of hearing health care to definitively determine why this is so in the hope of improving satisfaction levels within the entire profession.

Problems in Performance and Participation

Daily life hearing problems were measured for both unaided and aided listening and with two widely used questionnaires: HHIE and APHAB. The results revealed an intriguing pattern in which VA and PP patients differed significantly in extent of reported problems before the fitting (Fig. 4 and Fig. 5) but differed relatively little after the fitting (Fig. 6 and Fig. 7). Furthermore, the prefitting differences were much more pronounced for the questionnaire measuring participation restrictions (HHIE) than for the questionnaire measuring activity limitations (APHAB).

Specifically, before the fitting, VA patients reported much more frequent participation restric-

[e] Recall that VA patients did not respond to the item about hearing aid cost on the ECHO and SADL scales, whereas most of the PP patients did respond to that item. As we have reported elsewhere (Cox & Alexander, 1999), this difference tends to produce a higher score on the SADL SC subscale for VA patients.

tions than PP patients on both the Emotional and Social subscales of the HHIE. However, on the prefitting APHAB questionnaire, the pattern of differences was much weaker: Significant differences were seen on only one of the four APHAB subscales. The most obvious place to look for an explanation of these results is in the item content of the HHIE and APHAB questionnaires. The items of the HHIE tend to focus on feelings or reactions to the hearing impairment, whereas the items of the APHAB tend to focus on situational performance. For example, the APHAB might ask how well the patient communicates in a family conversation, whereas the HHIE might ask whether the patient is frustrated in these circumstances because of the hearing problem.

The results reported here suggest that the VA patients responded more strongly than the PP patients to the questions concerning affective reactions to hearing problems. It is important to determine the underlying bases for this discrepancy. Are VA patients intrinsically different from PP patients? In other words, do these different hearing aid delivery systems tend to attract systematically different types of people? Although not a topic of this article, our exploration of personality profiles in these VA and PP patients did suggest systematic differences on three of five basic personality factors (Cox et al., 2005). This dissimilarity in personality profiles might contribute to the observed disparity in responses, especially to the HHIE items. Additional research with other groups of VA and PP patients is needed to test the repeatability of these observations. Further, it would be of interest to determine whether these differences are observed in other public health delivery systems such as those operated in other countries.

It is interesting to note that after the introduction of amplification as a variable in the situation, the differences between VA and PP patients disappeared and their self-reports of aided functioning were essentially equal for both the HHIE and APHAB questionnaires. One explanation might be that in assessing aided listening, patients tend to focus on the device characteristics more than on their inner distress, and this ameliorates the effects of intrinsic differences that might exist between VA and PP patients.

Hearing Aid Benefit

In this study, both relative and absolute hearing aid benefit were assessed. Relative benefit, defined as aided functioning relative to unaided functioning, was determined using the HHIE and APHAB questionnaires. Measures of relative benefit are widely used and have putative efficiency advantages because they yield data on unaided and aided functioning as well as benefit. Absolute benefit was assessed using the SHAPIE questionnaire. Measures of absolute benefit have the advantages of requiring only one response per item and avoiding the increased variability associated with difference scores. Gatehouse has argued that absolute benefit data are more accurate than relative benefit data in reflecting audibility changes produced by amplification (Gatehouse, 1999).

All three measures of benefit are summarized in Figure 8. It would be reassuring if the three different measures produced similar results, and this did occur to the extent that all three measures suggest that typical VA patients reported more benefit than typical PP patients. However, the data produced some noteworthy details:

- Although the trends for the three questionnaires were similar, the VA-effect size was different for each one. With the APHAB and SHAPIE questionnaires, the VA-effect sizes were 0.2 and 0.3, respectively. Neither of these small effects was statistically different from zero. The VA-effect size was statistically significant, and much larger for the HHIE questionnaire (effect size >0.5).
- The two measures of relative benefit, although superficially similar, did not produce the same conclusions. The reports of unaided functioning (Fig. 4 and Fig. 5) show that the VA patients responded more strongly than the PP patients to the emotionally laden items of the HHIE, whereas the VA-PP difference was smaller for the emotionally more neutral items of the APHAB. When the two groups reported aided functioning on these questionnaires, the differences between them were effectively eliminated (Fig. 6 and Fig. 7). Because of this pattern, computations of relative benefit on the HHIE questionnaire produced a bigger VA-PP difference than the same computation on the APHAB questionnaire. In other words, relative benefit measured with the HHIE suggests substantial and significant differences between VA and PP patients, whereas relative benefit measured with the APHAB suggests essentially equivalent benefit for the two groups. These data show clearly that when relative benefit is the outcome indicator, patients with similar hearing loss in the two delivery systems may have similar or different fitting outcomes, depending on the specific questionnaire used.
- The theoretical disadvantage of using difference scores as an outcome measure is clearly confirmed by a comparison of benefit data for the three questionnaires in Figure 8. Standard deviations for the APHAB and HHIE are much larger than those for the SHAPIE. Thus, in research applications, abso-

lute benefit data might be more likely than relative benefit data to produce a definitive result.

Daily Hearing Aid Use

Despite the fact that VA patients reported more satisfaction with and more benefit from their hearing aids than PP patients, VA patients did not report using amplification more than their PP counterparts. In fact, 3 wks after the fitting, very few individuals in either group reported using the hearing aids less than 4 hrs per day (Fig. 11). The average of about 8 hrs of daily use observed in this study was very similar to that reported by Humes et al. (2002) for 108 hearing aid users with equivalent demographic characteristics.

Why Is There a Difference Between VA and PP Patients?

It was rather surprising to observe so many substantial self-report differences between VA and PP hearing aid patients, both before and after the hearing aid fitting. These results suggest that in research applications, data from VA and PP subjects should not be unreservedly combined. It is important to evaluate the possible explanations for this finding. The design of this investigation does not permit causation to be assessed. However, a review of the factors with potential to contribute to differences between the VA and PP groups suggested three candidate variables: gender, hearing aid fittings, and service delivery milieu. Each of these is considered below.

Gender

Because VA patients are almost all men whereas PP subjects are both women and men, it was important to explore the possibility that observed VA-PP differences reflected the typical gender imbalance between the two groups. As reported above, each significant difference between VA and PP patients was accompanied by an analysis of men and women PP patients. For each analysis, it was hypothesized that differences between PP men and PP women would be similar to the analogous differences observed between the VA (all men) and PP (mostly women) groups. None of the hypotheses was supported with significant statistical results. Because the subgroups of men and women were relatively small (N = 21 to 53 patients), the power of these analyses would be limited. However, the trends in mean results did not tend to suggest men-women differences that were parallel to the VA-PP differences. It is worth noting that previous research has not found substantial gender effects in self-reported hearing aid outcomes (Cox, Alexander, & Gray, 1999; Gatehouse, 1994). In any case, such differences as might occur between self-reports from men and women do not appear to parallel the differences we observed between VA and PP subjects.

Hearing Aids

For practical reasons, it was not feasible for all subjects in this investigation to be fitted with exactly the same hearing aid make and model. However, as noted earlier, there is little if any evidence in the peer-reviewed literature to suggest that this variable would have a systematic effect on fitting outcomes, as long as the hearing aids were competently fitted for the patients' needs. Nevertheless, we are cognizant of conventional wisdom suggesting that newer technology hearing aids should produce better fitting outcomes. Examination of Table 2 reveals that compared with VA subjects, PP subjects' hearing aids tended to have a higher proportion of high-tech features including digital processing, directional microphone, and multichannel devices. If anything, these differences would lead to the hypothesis that outcomes would be better for PP subjects than for VA subjects. This was not the case.

As shown in Table 4, there was a 4-dB mean difference between VA and PP subjects in the audibility of amplified low frequency soft sounds: VA subjects were able to detect softer sounds. Although it seemed unlikely that such a small effect could be responsible for the differences observed in benefit and satisfaction outcomes (especially considering the relative equivalence of the fittings on the other indexes), this possibility was examined by computing linear correlation coefficients for the VA subjects between aided low-frequency thresholds and each of the five benefit and satisfaction outcomes. It was reasoned that if aided low-frequency thresholds contributed to benefit and satisfaction outcomes in this research, significant correlations would be observed within the group of VA subjects. The computed correlation coefficients ranged from 0.009 to 0.123, and none was statistically significant. Thus, there was no evidence to suggest that differences in audibility of soft sounds were responsible for the different fitting outcomes for VA and PP groups.

Service Delivery Milieu

The most compelling remaining explanation for the self-report differences between VA and PP patients is the psychological influence of variables inherent in the different service delivery milieus under which hearing aids were provided. These influences include conspicuous variables such as financial commitment in hearing aid purchase and perceived independence of hearing care provider. To the extent that these variables are key determinants, it is perhaps worth noting that both VA and PP systems are evolving. As mentioned earlier, modest charges for services (but not for hearing aids) have recently been introduced for some VA patients. As a result, the hearing aid provision process is no longer completely free of charge in the VA system. Moreover, approximately 11% of patients in PP service settings currently receive reimbursement for part or all of their hearing care costs (Strom, 2004), and it is reasonable to expect that this proportion will increase in the future.[f] As a result, fewer PP patients will pay the full cost of hearing aid provision. Whether this blurring of distinctions between VA and PP milieus will change the patterns seen in this investigation is a matter for future study.

In addition to pecuniary variables that differentiate the VA and PP milieus, the personality differences observed by Cox et al. (2005) between patients who requested services in the two types of systems might have an important role in producing the self-report differences observed between the two patient groups. Finally, part of the explanation might be found in more subtle effects such as perceived pressure to minimize or exaggerate hearing problems and perceived cause of hearing loss (e.g., noise exposure versus aging).

CONCLUSIONS

The results of this investigation are limited to older individuals with symmetrical sensorineural hearing loss. Within that context, the results strongly suggested that typical VA hearing aid patients were different from typical PP hearing aid patients in several important ways.

- PP patients tended to feel healthier than the age-matched general population, whereas VA patients were typical in their subjective health status.
- Before the hearing aid fitting, VA patients had somewhat higher expectations than PP patients, although neither VA nor PP expectations were fully realized.
- Before the hearing aid fitting, VA patients reported more hearing-related problems than PP patients in performance and participation in daily life. However, these group differences disappeared after amplification was provided.
- In both benefit and satisfaction domains, VA patients reported better hearing aid fitting outcomes than PP patients. The magnitude of the difference in outcomes between the two patient groups was substantial for some measures, as evidenced by an effect size as high as $d = 0.5$.
- Different measures of self-reported benefit did not yield completely consistent results. It is clear that whether VA and PP patients report equivalent benefit can be dependent partly on the questionnaire used. Thus it is important to consider the item content as well as computational considerations (i.e., relative versus absolute benefit) before selecting a benefit questionnaire for a particular application. Further, the item content should be considered when the outcome results are interpreted.

Although the present investigation does not allow a definite conclusion about the underlying causes of the differences we observed, it is clear that hearing aid research protocols should give careful consideration to inclusion or exclusion of VA or PP subjects in research groups because this variable has the potential to significantly impact the research outcome. In addition, the results of this investigation suggest that it is risky to generalize results of hearing aid research from public health to private practice patients, and vice versa.

Further research is indicated to verify the differences seen between VA and PP patient groups and to explore the underlying reasons for the differences. If there are identifiable variables in the VA hearing aid delivery system that tend to produce improved fitting outcomes, it would be desirable to attempt to export these into the PP delivery system, if possible. Finally, it would be of interest to determine whether these differences also are seen between the public health and private practice systems in other countries.

[f] In this investigation, the hearing aids were fully covered expenses for 6 PP patients.

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