

Long-term Benefit, Satisfaction, and Use of Amplification Among Military Retirees

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This investigation surveyed the long-term satisfaction, benefit, and use of hearing aids among 330 military retirees. The results indicated 70 to 75 percent of the retirees rated general satisfaction and benefit in the highest categories. The type of amplification (ITE vs. BTE) did not influence ratings, but the binaural mode of use produced a finding of greater satisfaction/benefit. Under adverse listening conditions neither type or mode of amplification significantly altered overall negative satisfaction/benefit ratings. Typically, retirees used amplification 10 or more hours per day, with approximately 40% of binaural users reporting daily use of one hearing aid.

Today, hearing aids are considered part of routine military medical care and are dispensed directly to service members without the necessity of obtaining patient payment or even a requirement to document a "service connection" to the hearing loss. Military retirees may be fitted with amplification at any of several major medical centers operated by the three military branches (Sedge, 1987).

Despite the extensive history of clinical experience, there have been relatively few published reports of long-term patient evaluation of satisfaction with amplification in this type of institutional setting (e.g., Erdman & Sedge, 1981; Northern, Ciliax, Roth, & Johnson, 1969). The purpose of this study was to investigate the degree of long-term benefit and satisfaction with and the use of amplification as judged by the retiree population of one of these major facilities, Fitzsimons Army Medical Center, during the period of the late 1980's.

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METHOD

Questionnaire

An 8-item paper and pencil questionnaire was developed to assess long-term benefit, satisfaction, and use of hearing aids among retirees. The questionnaire had two general satisfaction and benefit questions. These two questions were employed because clinical experience with previous groups of military patients had suggested that some individuals might interpret "satisfaction" and "benefit" differently. For example, an individual might rate the benefit of amplification favorably if it significantly improved communication even in only a few critical situations, while rating satisfaction more unfavorably for cosmetic or other reasons. For these two questions, subjects could select any response from a five point descriptor rating scale. Choices ranged from "Extremely Satisfied/Beneficial" to "No Satisfaction/Benefit" (see Appendix).

There were four questions pertaining to listening and use under various conditions. These were: (a) difficulty hearing and understanding in quiet, (b) difficulty hearing and understanding in a noisy room, (c) need to turn off the hearing aid in noisy environments, and (d) annoyance with background noise when using amplification. Subjects could select a response from a five point descriptor rating scale. Choices ranged from the most favorable response of "Almost never" to the least favorable response of "Always or probably always."

Lastly, there were two questions devoted to the subjects' estimate of hours of daily use of amplification. Monaural hearing aid users answered the question pertaining to use of one hearing aid, while binaural users answered the questions regarding hours of daily use with one and with both hearing aids.

The questionnaire also contained 17 other items related to the auditory rehabilitation program, but they were not related to the topic of this paper.

Subjects

A mailing list of military retirees was developed from the patient records of the Audiology Section of Fitzsimons Army Medical Center. The list contained the names of 474 military retirees consecutively fitted with amplification during the most recent three year period. Of these, six were deceased and 32 no longer had known mailing addresses. The questionnaire was mailed to the remaining 436 retiree patients. These individuals had been fitted and issued amplification devices at Fitzsimons some time between 90 days and three years. A total of 330 usable questionnaires were returned, providing a response rate of 75.7 percent.

The respondents were male retirees from all military service branches, living within Colorado or any of eight surrounding states at the time of hearing aid fitting. At the time of the questionnaire, their mean age was 66.4 years, with a range of 44 to 88. There was roughly an equal number of subjects (with equivalent mean ages) divided among five periods of 0-6, 7-12, 13-23, 24-30, and 31-36 months post hearing aid fitting.

Hearing Aid Fitting

Since five audiologists served on the clinical staff and conducted hearing aid evaluations, dispensing, and auditory rehabilitation classes during the three year period studied, various criteria had been employed to select optimal amplification for the subjects in this study.

The 330 responding retirees had been fitted with a total of 469 hearing instruments selected primarily from the comprehensive inventory approved by the Veterans Administration. BTE aids had been fitted on 61.6% of the sample, while ITE aids were dispensed to the remaining 38.4%. Monaural amplification was provided to 57.8% of the subjects, while binaural instruments were fitted to the other 42.2%.

Each questionnaire respondent attended a small, half-day group auditory rehabilitation session conducted by an audiologist immediately following the hearing aid fitting. The purpose of the group therapy was to assist first-time hearing aid users in personal adjustment to amplification and to orient the patients to use and maintenance of the instruments. Since the group rehabilitation sessions were not routinely offered to experienced hearing aid users receiving only replacement instruments, it may be assumed that virtually all of the questionnaire respondents were new users of amplification.

RESULTS

Satisfaction and Benefit

The responses to the general satisfaction and benefit questions were quite similar (Table 1). A total of 71.2% of the retirees selected one of the top two categories of satisfaction and 72.2% chose one of the top two categories of benefit. Conversely, only a combined 12.7% of the respondents chose satisfaction and 9.1% rated benefit in the lowest two categories. These two questions produced a significant Spearman *rho* correlation of .80 ($p < .001$).

Satisfaction ratings were further examined by the type of hearing aid, BTE versus ITE, and the mode of amplification, monaural versus binaural (Table 2). The satisfaction ratings in the upper two categories of satisfaction were within six percent for BTE and ITE respondents, 68.6% and 74.4%, respectively. Also,

Table 1

Distribution in Percent of Overall Satisfaction (Question #1) and Benefit (Question #2) Ratings by All Hearing Aid Users ($N = 330$)

	Rating in Percent				
	Greatest 1	2	3	4	Least 5
Satisfaction	30.0	41.2	16.1	9.7	3.0
Benefit	27.1	45.1	17.9	7.0	2.1

Table 2
 Percent Distribution of Ratings of Overall Satisfaction (Question #1)
 by Type of Aid (BTE vs. ITE) and Mode of Fitting (Binaural vs. Monaural)
N = Number of Responses

Condition	Satisfaction Ratings					<i>n</i>
	Greatest 1	2	3	4	Least 5	
Type of Aid						
BTE	31.8	36.8	17.4	10.0	4.0	201
ITE	27.2	47.2	14.4	9.6	1.6	125
Mode of Fitting						
Monaural	24.6	42.4	17.8	10.5	4.7	191
Binaural	37.4	39.6	13.7	8.6	0.7	139

there was only a 2.8% difference between type of aid for ratings in the lowest two categories of satisfaction.

Slightly more than three-quarters (77%) of the binaural users rated their satisfaction in the highest two categories, compared with only approximately two-thirds (67%) of the monaural users. Monaural aid wearers selected overall satisfaction in the mid and lower two categories by four to six percent more than binaural users.

The benefit ratings also were examined according to the type of hearing aid and mode of fitting. As with satisfaction ratings, there was only a difference of four percent (71.2% and 75.2%, respectively) in the top two benefit rating categories between the BTE and the ITE users of hearing aids. Slightly less than 10% of both BTE and ITE users reported little or no benefit (the lowest two categories).

When benefit ratings were examined by mode of amplification, 82.7% of the binaural users selected the top two categories of benefit, compared to only 66.0% of the monaural users. Especially noteworthy was that nearly three times as many monaural users selected one of the two lowest benefit categories as compared with the binaural users (12.5% and 4.3%, respectively).

Satisfaction in Quiet and Noisy Environments

The data in Table 3 summarized the retirees' ratings for aided listening satisfaction in quiet and noisy environments, ratings for use of aid in noisy conditions, and ratings of annoyance with amplification under noisy conditions.

Under quiet conditions, half of the subjects chose the highest rating category of satisfaction and a combined 81.9% selected the highest two categories. Only 5.7% rated satisfaction in the lowest two categories under quiet conditions.

In sharp contrast, when rating satisfaction under noisy conditions, more retirees selected the lowest two categories (38.2%) than reported the highest two

Table 3

Percent Distribution of Ratings to Questions of Aided Listening Difficulty, Use, and Annoyance in Quiet and Noisy Conditions (Questions #5, 6, 7, and 8)
N = Number of Responses

Question	Satisfaction Ratings					<i>n</i>
	Highest 1	2	3	4	Lowest 5	
Quiet (#5)	50.6	31.3	12.3	4.6	1.2	326
Noise (#6)	6.1	25.9	29.9	21.7	16.5	328
Use in Noise (#7)	18.2	21.0	24.4	18.5	17.9	324
Annoyance in Noise (#8)	20.0	24.5	18.3	15.3	19.9	327

categories (32.0%).

The “use in noise” question indicated that approximately one-third (36.4%) of the subjects reported the need to “frequently” or “always” (the lowest two categories) turn off their hearing aids under noisy conditions. Slightly more than one-third (39.2%) reported, however, that this occurred “almost never” or “occasionally” (the highest two rating categories).

The “aided noise annoyance” question indicated that annoyance with noise was reported “frequently” or “always” (the lowest two rating categories) by 35.2% of the subjects and “almost never” or “occasionally” (the highest two categories) by 44.5%.

Type of Aid and Mode of Fitting Compared

The significance of satisfaction ratings under quiet and noisy conditions was further tested when responses provided by the BTE and ITE type of hearing aid users were compared, using the ratings for satisfaction questions regarding overall satisfaction (#1), aided difficulty in quiet (#5), or in noise (#6), and annoyance in noise (#8). A two factor completely randomized ANOVA was computed with the type of aid as one factor and the four questions as the second factor. No significant differences were found among the ratings for the two types of hearing aids. A significant difference ($F(3, 1330) = 94.41, p < .05$) was found, however, among the satisfaction ratings for the four questions. Post-hoc *t*-tests found the results of each question differed significantly from the others ($p < .05$). As would be anticipated, the most favorable satisfaction ratings were in regard to aided difficulty in quiet, followed in decreasing order of merit by overall satisfaction, annoyance in noise, and finally, aided difficulty in noise.

Differences in ratings provided by users of hearing aids fitted in the monaural and binaural modes also were compared, using the same four satisfaction items

from the questionnaire: overall satisfaction (#1), aided difficulty in quiet (#5), or in noise (#6), and annoyance in noise (#8). The ANOVA results indicated a significant interaction between satisfaction and mode of amplification ($F(3, 1330) = 106.27, p < .05$). Post-hoc t -tests isolated the source of the interaction as a significant difference between binaural and monaural user ratings of overall satisfaction ($p < .05$). Otherwise, there was no difference between binaural and monaural responses in satisfaction ratings for quiet or noisy conditions or annoyance with noise.

Hours of Hearing Aid Use

The reported hours of hearing aid use by retirees are summarized in Table 4. Subjects using monaural and binaural aids reported their typical daily usage in two hour increments on the questionnaire. For analysis, these results have been collapsed into four broad categories of usage: non-user, minimal day (< 3 hrs.), part-time (3-10 hours), and full-time (> 10 hrs.). Approximately 3 percent of the total sample were reportedly non-users of the fitted hearing instruments. Monaural and binaural users were similar in their reported patterns of daily use, with only one in six retirees using amplification for less than 3 hours per day. The most frequently reported usage was 12 hours or more per day for both monaural (26% of sample) and binaural (29.5%) users.

Interestingly, 39.5% of binaurally fitted patients reported additional usage of only one of the two hearing aids during some portion of the day. For example, some minimal day binaural users also reported part-time use of one aid, which would make their total use of amplification approach full-time status. Even a few binaural full-time wearers reported additional 2-to-4 hour usage of one aid.

Table 4

Distribution of Reported Hours of Use by Retirees Fitted with Monaural and Binaural Amplification
(Categories on Questionnaire Collapsed) $N = 330$

Reported Use	Percent of Sample		
	Monaural Fitting	Binaural Fitting	
		Two Aids	One Aid*
Non-user	2.9	3.1	--
Minimal day (2 hrs. or less)	14.7	18.0	9.4
Part-time (3 to 10 hrs.)	42.6	39.4	15.7
Full-time (more than 10 hrs.)	<u>39.8</u>	<u>39.5</u>	<u>14.4</u>
	100.0	100.0	39.5

*Percent of total binaural users reporting partial monaural use in addition to binaural use.

DISCUSSION

Follow-up studies of frequency of use and patient benefit and satisfaction are techniques that may help to validate hearing aid fitting procedures and insure a successful auditory rehabilitation program (Alberti, Pichora-Fuller, Corbin, & Riko, 1984; Brooks & Bulver, 1981; Cunningham, Merle, & Drake, 1978; Davis, 1980; Oja & Schow, 1984; Walden, 1982). This investigation of long-term patient satisfaction, benefit, and use of amplification may be summarized as follows:

1. The significant correlation of response distributions for the overall satisfaction and benefit questions suggested that the respondents in this sample did not discriminate between these two questionnaire items. A high degree of reported satisfaction predicted a high degree of reported benefit.

2. The response rates of 70% to 75% in the highest two categories of overall satisfaction and benefit were consistent with other reports in the recent literature using similar response methodology among older hearing aid wearers (Oja & Schow, 1984). Highly favorable responses have been elicited from as many as 88% of patients in other studies when employing fewer than five choices of satisfaction and benefit ratings used in this study (Cunningham et al., 1978; Northern et al., 1969).

The importance of the patient's clearly perceived satisfaction and benefit to successful long-term acceptance of amplification has been re-emphasized in a recent report by Madell, Pfeffer, Ross, and Chellappa (1991). They found that insufficient benefit was cited by patients seven times more frequently than any other reason for returning hearing aids to the clinic.

3. The type of amplification (BTE vs. ITE) did not appear to have any influence over benefit and satisfaction ratings or degree of hearing aid use. One reason for this finding may be that the military retirees did not choose a type or pay for their hearing aids. Rather, the instruments were selected and issued by the audiologist on the basis of professional judgment for optimal auditory rehabilitation. Also, the military retirees in this sample typically waited six months to a year before receiving amplification.

4. The binaural mode of amplification did produce significantly more favorable overall satisfaction and benefit ratings than did monaural amplification. But, there was no specific listening situation, either in quiet or noisy conditions, or with annoyance from amplified noise, that resulted in a significantly superior satisfaction rating with binaural hearing aids. Also, the group data on binaural users did not reveal any difference in total daily hours of wear which was different from monaural users. These results also were consistent with reports that binaural amplification wearers may have difficulty in asserting a precise benefit with the use of two aids although they appear more generally satisfied (Brooks & Bulver, 1981; Dirks & Carhart, 1962; Erdman & Sedge, 1981; Schreurs & Olsen, 1985).

5. Approximately 40 percent of the binaural hearing aid users in the sample

reported an additional use of one aid for a period of time each day. This suggested that listening conditions were sufficiently varied to create a monaural advantage some of the time. As previously reported by Schreurs and Olsen (1985), these conditions may include telephone usage and driving or riding in a car.

6. Difficulty hearing in noise and annoyance with amplified noise significantly degraded satisfaction and benefit ratings when compared with ratings for overall satisfaction and benefit and for listening in quiet. There appeared to be strong rationale for continued emphasis in post-fitting therapy sessions on coping and compensation strategies for effective listening under adverse acoustic conditions as well as clinical trial use of newer hearing circuitry designed to reduce amplification of noise.

Several additional studies among military retirees have been suggested by the results of this investigation. First, to what extent do these hearing aid users alter their use patterns or change their opinions about satisfaction with hearing aids during the first several months or years of use? Second, are there predictive audiometric or psycho-social characteristics of the military retiree population concerning perceptions of hearing aid satisfaction and use? Lastly, to what extent is it possible to modify negative perceptions of satisfaction or lack of hearing aid use with refitting and recounseling?

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REFERENCES

- Alberti, P.W., Pichora-Fuller, M.K., Corbin, H., & Riko, K. (1984). Aural rehabilitation in a teaching hospital: Evaluation and results. *Annals of Otology, Rhinology, and Laryngology*, 93(6, Pt. 1), 589-594.
- Brooks, D.N., & Bulver, D. (1981). Survey of binaural hearing aid users. *Ear and Hearing*, 2(5), 220-224.
- Cunningham, D.R., Merle, K.S., & Drake, K. (1978). Users; satisfaction with hearing aids. *Journal of the American Auditory Society*, 4, 81-85.
- Davis, J. (1980). Advice from some satisfied customers. *Journal of the Academy of Rehabilitative Audiology*, 13, 122-127.
- Dirks, D., & Carhart, R. (1962). A survey of reactions from users of binaural and monaural hearing aids. *Journal of Speech and Hearing Disorders*, 27, 311-322.
- Erdman, S.A., & Sedge, R.K. (1981). Subjective comparisons of binaural versus monaural amplification. *Ear and Hearing*, 2(5), 225-229.
- Madell, J.R., Pfeffer, E.B., Ross, M., & Chellappa, M. (1991). Hearing aid returns at a community hearing and speech agency. *The Hearing Journal*, 44(4), 18-19, 22-23.
- Newby, H.A., & Popelka, G.R. (1985). *Audiology* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Northern, J.L., Ciliax, D.R., Roth, D., & Johnson, R. (1969). Military patient attitudes toward aural rehabilitation. *ASHA*, 11, 391-395.
- Oja, G.L., & Schow, R.L. (1984). Hearing aid evaluation based on measures of benefit, use, and satisfaction. *Ear and Hearing*, 5(2), 77-86.

- Schreurs, K.K., & Olsen, W.O. (1985). Comparison of monaural and binaural hearing aid use on a trial period basis. *Ear and Hearing*, 6(4), 198-202.
- Sedge, R.K. (1987). Administration of a military-based program of speech-language pathology and audiology. In H.J. Oyer (Ed.), *Administration of programs in speech-language pathology and audiology*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Walden, B.E. (1982). Validating measures for hearing aid success. In G.A. Studebaker & F.H. Bess (Eds.), *The Vanderbilt report*. Upper Darby, PA: Monographs in Contemporary Audiology.

APPENDIX

**FITZSIMONS ARMY MEDICAL CENTER
AUDIOLOGY DEPARTMENT SURVEY**

Circle the best response to each question.

1. Please rate your level of satisfaction with your hearing aid(s):

1	2	3	4	5
Extremely Satisfied	Satisfied	Somewhat Satisfied	Little Satisfaction	No Satisfaction

2. Please rate the benefit your hearing aid(s) provides when used in a variety of listening situations (e.g., work, home, social):

1	2	3	4	5
Extremely Beneficial	Beneficial	Somewhat Beneficial	Little Benefit	No Benefit

3. How many hours a day do you use both hearing aids? (If you have only one hearing aid, this answer is the same as question 4.)

0 hrs.	1-2 hrs.	3-4 hrs.	5-6 hrs.	7-8 hrs.
	9-10 hrs.	11-12 hrs.	More than 12 hrs.	

4. How many hours a day do you use one hearing aid?

0 hrs.	1-2 hrs.	3-4 hrs.	5-6 hrs.	7-8 hrs.
	9-10 hrs.	11-12 hrs.	More than 12 hrs.	

5. Do you have any difficulty hearing and understanding in a quiet room when wearing your hearing aid(s)?

1	2	3	4	5
Almost never	Occasionally (about 25% of the time)	About half the time	Frequently (about 75% of the time)	Always or probably always

6. Do you have any difficulty hearing and understanding in a noisy room when wearing your hearing aid(s)?

1	2	3	4	5
Almost never	Occasionally (about 25% of the time)	About half the time	Frequently (about 75% of the time)	Always or probably always

7. Do you turn your hearing aid(s) off in a noisy, unfavorable environment?

1	2	3	4	5
Almost never	Occasionally (about 25% of the time)	About half the time	Frequently (about 75% of the time)	Always or probably always

8. Do background noises (e.g., pots and pans, papers rustling) annoy you when wearing a hearing aid(s)?

1	2	3	4	5
Almost never	Occasionally (about 25% of the time)	About half the time	Frequently (about 75% of the time)	Always or probably always

DISCLAIMER

This study solely represents the opinions of the authors and does not represent official Fitzsimons Army Medical Center, Department of the Army, or Department of Defense policy in regard to its results or to auditory amplification.