Understanding Desired Benefits of a Hearing Aid: A Consumer Behavior Perspective

Nancy A. Hawes
Department of Communication Disorders
Auburn University

Richard M. Durand
Department of Marketing and Transportation
Auburn University

Sandra R. Clark
Department of Communication Disorders
Auburn University

The purpose of this study was to determine if experienced hearing aid wearers could be meaningfully grouped on the basis of preferred hearing aid characteristics. Subjects were hearing aid users drawn from two diverse samples. A total of 149 subjects, or 42%, returned the survey, which included questions dealing with attributes sought in a hearing aid, attitudes, normative beliefs and motivation to comply, demographics, and hearing aid use. Statistical analysis resulted in three groups or segments, subsequently identified as "Ambivalent," "Ease and Comfort," and "Usefulness." Significant differences among the three clusters or segments were encountered in degree of hearing aid use.

Since the late 1970s, an increasing amount of research has focused on hearing aid use and satisfaction with aids. Many of these studies have emphasized audiometric variables such as degree of loss and speech discrimination ability (Birt & Alberti, 1975; Cunningham, Merle, & Drake, 1978; Foster, Haggard, & Iredale, 1981; Hayes, Jerger, Taff, & Barber, 1983; Jerger & Hayes, 1976; Kapteyn, 1977a, 1977b; Oja & Schow, 1984; Scherr, Schwartz, & Montgomery, 1983; Surr, Schuchman, & Montgomery, 1978) or demographics such as gender and age (Cunningham et al., 1978; Hayes et al., 1983; Jerger & Hayes, 1976; Kapteyn, 1977a, 1977b; Oja & Schow, 1984; Surr et al., 1978). Although this research has provided important insight into understanding some aspects associated with using a hearing aid, other potentially relevant dimensions involving the hearing aid user's perceptions have not been addressed. This study employed a marketing technique called benefit segmentation to assess

some of these other variables.

Market segmentation has long been a dominant concept in business practice and marketing-related research. It has been applied to preferences for consumer goods such as toothpaste and automobiles as well as opinions on allocation of federal tax dollars (Durand, Klemmack, & Roff, 1982) and energy conservation (e.g., Cunningham & Lopreato, 1977).

The fundamental assumption underlying segmentation analysis is that no single population is a homogeneous entity and that no one fits the description of the average person. Understanding the population under investigation, therefore, necessitates identifying those subsets of individuals who have important similarities with one another yet differ significantly from others on the same dimension. For example, one segment of consumers may be most interested in a brand of toothpaste that prevents cavities. Another may be interested in one that makes teeth shiny or bright. Identical marketing strategies are not suitable for both segments. The goal of segmentation analysis, therefore, is to group or subdivide consumers on the basis of some characteristic and then ascertain how these groups or segments differ with respect to the variables of interest.

Numerous bases of segmentation are available for use in any product market. As noted above, demographics and degree of hearing loss have often been selected to study hearing aid use. The basis for segmentation selected for this analysis is desired hearing aid benefits. Benefits in a marketing study refer to the bundle of product attributes sought in the selection of a product. In the toothpaste example provided above, cavity prevention and brightness represent two such benefits. They are thought to represent causal factors that explain why a particular product is consumed (Haley, 1968). To some researchers, the most meaningful segmentation basis is benefit, "as it directly facilitates product planning, positioning, and advertising communications" (Young, Ott, & Feigin, 1978, p. 406).

Hearing-impaired clients' expectations about a hearing aid as well as external social forces may influence their attitudes toward wearing a hearing aid and subsequent hearing aid use. This study employed the benefit segmentation approach described above to determine if experienced hearing aid wearers could be meaningfully differentiated on the basis of preferred hearing aid characteristics. Specifically, are there groups of people for whom some characteristics of hearing aids are relatively more important than for others? Furthermore, do these groups differ with respect to demographic characteristics, the influence of relevant others, their attitudes toward wearing hearing aids, and hearing aid use?

METHOD

Subjects

Subjects participating in this study were drawn from two geographical

areas in order to study possible geographical differences in hearing aid-related variables. Two hundred clients of a speech and hearing clinic in San Francisco and 169 clients of a university clinic in Auburn, Alabama, were sent questionnaires. In the San Francisco sample, the participants were all adult clients seen over a 3-month period who were due for a 1-year hearing aid check. In the Auburn sample, the participants were all clients over the age of 18 who owned a hearing aid and had visited the university's clinic during the previous two years.

The cover letter accompanying the questionnaire stressed that replies would be anonymous in an attempt to elicit candid responses from subjects. However, this also precluded the possibility of any comparison with audiometric variables.

Instrumentation

Five areas of questions were included in the survey. The questions dealing with hearing aid attributes were the basis for segmentation. The remaining four areas, attitudes, normative beliefs, hearing aid use, and demographics, were used as profile variables (i.e., segment descriptors). Each area is discussed below.

Hearing Aid Attributes. A free elicitation procedure identified hearing aid attributes to be included in the survey (Fishbein & Ajzen, 1975). Seven audiologists, ten experienced hearing aid users, and five new hearing aid users were available as consultants. They were asked to list attributes that are relevant in selecting hearing aids. The six most frequently mentioned in order of frequency were: (a) noticeability, (b) comfort, (c) ability to hear speech in a quiet room, (d) ability to hear better when talking to people in a noisy room, (e) ease of operating controls, and (f) ease of inserting and removing the aid. Employing six attributes is consistent with many marketing research studies (Wilkie & Pessemier, 1973). Subjects were asked to rate between 1 *(extremely unimportant)* and 7 *(extremely important)* how important each of the product attributes was in selecting a hearing aid.

Attitudes. This section included four global measures of attitude toward wearing hearing aids. The respondents marked 7-point bipolar scales in answer to the question, "Wearing my hearing aid is. . . ." The endpoints of the four 7-point scales were labeled (a) *good-bad*, (b) *pleasant-unpleasant*, (c) *wise-foolish*, and (d) *beneficial-harmful.* Measures such as these are quite consistent with attitude research (Fishbein & Ajzen, 1975).

Normative Component. A normative component was included in the questionnaire to capture the influence of relevant others associated with wearing hearing aids. This component, following Fishbein and Ajzen (1975), is comprised of a normative belief (a person's belief that an individual or group thinks that he/she should behave in a specific manner) and motivation to comply with the group's or individual's expectation. The three groups who were used in the free elicitation procedure for attributes were also asked to

identify salient referent others. All of the responses to this item could be grouped into four categories which were included in this study: (a) spouse/girlfriend/boyfriend, (b) family, (c) friends, and (d) co-workers.

Hearing Aid Use. Questions assessing hearing aid use in nine listening situations were presented in the survey. Subjects were asked to rate how likely they were to use a hearing aid in each situation: (a) in an audience, (b) small gathering, (c) watching TV, (d) talking on the telephone, (e) during a party, (f) listening to music, (g) talking to one person in a quiet room, and (h) relaxing at home. Because some of these listening situations may not have been relevant for all subjects, two additional measures were included. These overall measures were worded in two different ways in an attempt to create items which would most realistically represent actual consumer behavior. They ascertained how likely a hearing aid would be worn in "situations where wearing a hearing aid is helpful" and the extent to which a hearing aid was worn during working hours. All items were 7-point scales.

Demographics. The demographic items requested subjects' age, sex, race, marital status, occupation, education, and income. There were also questions concerning the duration of hearing loss, length of hearing aid ownership, and number and brands of hearing aids owned.

RESULTS

Of the 352 questionnaires delivered (17 of the original 369 were returned to sender), 149 (42%) were returned and 125 (36%) were complete and deemed usable for this study.

Significant differences in most demographic characteristics (age, education, race, sex, marital status, and occupation) between the San Francisco and the Auburn groups were not encountered. However, the mean income for the San Francisco sample was approximately $29,000, and that for the Auburn sample approximately $21,000, $t(116) = 3.26$, $p < .01$. The average age for the combined sample was 66.4 years (range = 22 to 91 years); 55% were females and 10.6% were non-whites. Subjects also reported that they had worn hearing aids for an average of 5.7 years (range = 1 to 45 years) and had owned, on average, 1.7 aids. The mean number of years in which a hearing aid had been worn was greater for the San Francisco sample ($M = 8.3$ years, $SD = 9.32$) than the Auburn one ($M = 2.49$, $SD = 3.70$, $p < .05$). Because no significant differences were encountered between the two samples on any of the items assessing attributes, attitudes, normative beliefs, or hearing aid use, the two samples were combined for subsequent analysis.

A two-phase analytical procedure was used in this study. First, respondents were grouped or clustered according to the importance of the attributes sought in hearing aids. Second, demographics, attitudes, normative beliefs, motivation to comply, and hearing aid use were compared across attribute segments.

In clustering the importance values, normalized scores were used. Normalization rescales numbers in such a manner that within-subject variation in responses is adjusted, helping to eliminate the problem of different anchor points and response sets for each respondent. The procedure proposed by Bass and Wilkie (1973) is

$$NI_{jk} = I_{jk} / \sum_{i=1}^{6} I_{jk}.$$

NI_{jk} represents the normalized importance rating for the j^{th} person and k^{th} attribute and I_{jk} represents the "raw" or original importance rating for the j^{th} person and k^{th} attribute.

Assume that a subject rated all six scales as extremely important (ratings of 7), and another rated all as slightly important (ratings of 5). Using normalized values, each rating would receive an equal value (.167) regardless of the absolute scale value. Now assume that a subject rated the six attributes using the values 2, 3, 4, 5, 6, and 7. In this instance the 7 would receive a normalized rating of .259, and the 2, a .074.

Grouping subjects into homogenous clusters based on attribute importance ratings was achieved by a K-means iterative clustering routine (Ray, 1982). This procedure assigned each subject, based on the subject's vector of standardized scores for the six attributes, to the cluster or group whose attribute profile was most similar to that of the subject. Three clusters were selected as optimum in minimizing within-cluster homogeneity and maximizing between-group heterogeneity and were employed in the second phase of the analysis. The overall R^2 for the three cluster solution was .48.

As a check of the categorization procedure, a series of multivariate analysis of variance (MANOVA) tests were conducted to determine if differences in raw importance ratings varied significantly among the three clusters. Differences in importance across the three clusters, taken as a set, were significant ($F(12,234) = 56.3$, $p = .001$), as were all possible two group comparisons (e.g., cluster 1 vs. 2, 1 vs. 3). Subsequent univariate analysis of variance tests indicated that all attributes differed significantly across the three clusters ($p < .05$).

Cluster Results

The three clusters, the numbers of subjects in each, and the mean normalized scores of each cluster are presented in Table 1. The first cluster, labeled as "Ambivalent," contained 49 (39.2%) of the respondents. This cluster appears to reflect a general lack of differentiation in importance ratings across attributes. Although this cluster had the greatest mean normalized importance ratings for noticeability of the three clusters and had the lowest importance ratings on three of the remaining attributes, it still had the smallest range of normalized mean importance ratings (.153 to .176) of the three clusters.

Table 1
Normalized Mean Importance Ratings Across Attribute Clusters

Attributes[a]	Cluster			
	Ambivalent (n = 49)	Usefulness (n = 58)	Ease and Comfort (n = 18)	Overall Mean Importance
Hear in a quiet room	.175 (6.43)	.180 (6.55)	.161 (5.56)	.175 (6.36)
Hear in a noisy room	.176 (6.49)	.189 (6.81)	.109 (3.78)	.172 (6.25)
Comfort	.176 (6.45)	.191 (6.86)	.201 (6.78)	.187 (6.69)
Insert and removal ease	.162 (6.04)	.186 (6.71)	.194 (6.56)	.178 (6.43)
Ease of controls	.158 (5.90)	.182 (6.59)	.192 (6.50)	.174 (6.31)
Noticeability	.153 (5.78)	.071 (2.67)	.144 (4.94)	.114 (4.22)

[a] The higher the score the more important the product attribute. Raw importance scores are in parentheses.

The second cluster contained the largest number of respondents, 58 (46.4%). This cluster, because it had the highest normalized ratings of the three clusters on the two attributes pertaining to usefulness (hear in a quiet room and hear in a noisy room), was labeled as the "Usefulness" cluster. Compared to the other two clusters, these individuals were least concerned with the noticeability of the aid and moderately concerned with comfort, ease of insertion, and ease of controls.

The final cluster was the smallest, containing 18 respondents (14.4%) and was labeled "Ease and Comfort." Compared to the other two clusters, subjects in this cluster rated the hearing-related attributes as least important and comfort, insertion and removal ease, and the ease of controls as most important (normalized importance ratings).

Differences Among Cluster Profiles

Differences among the clusters in terms of demographic, attitudinal, normative, and hearing aid use variables were analyzed using a series of chi-square and univariate analysis of variance tests depending on the nature of the variables (categorical or interval scaled). These results are presented in Table 2.

In demographic characteristics, none of the variables differed significantly across clusters. Even the degree of hearing aid experience and the duration of hearing loss were not significantly different ($p > .10$) These findings pro-

Table 2
Profiles of Attribute Segments

Profile Variable	Cluster			F-Ratio	X^2 Value
	Ambivalent	Usefulness	Ease and Comfort		
Demographics:					
Age (years)	64.6	66.4	63.8	0.26	
	(17.5)	(13.1)	(19.1)		
Hearing aid experience (years)	5.6	7.0	3.1	1.65	
	(6.3)	(10.2)	(2.3)		
Duration of hearing loss (years)	14.0	20.0	14.6	1.95	
	(11.5)	(16.6)	(17.2)		
Education (years)	14.6	14.3	13.6	1.19	
	(2.4)	(2.4)	(2.6)		
Income (thousands of dollars))	26.8	27.3	23.8	0.46	
	(13.8)	(12.9)	(12.4)		
Sex					0.70
Male (%)	49.0	56.9	55.6		
Female (%)	51.0	43.1	44.4		
Occupation					2.75
White collar (%)	62.2	69.1	60.0		
Blue collar (%)	20.0	20.0	33.3		
Unemployed (%)	17.8	10.9	6.7		
Race					1.36
White (%)	93.2	96.3	100.0		
Black/other (%)	6.8	3.7	0.0		
Marital Status					3.88
Single/resingled (%)	46.9	32.8	55.6		
Married (%)	53.1	67.2	44.4		
Location					0.27
San Francisco (%)	55.1	56.9	50.0		
Auburn, AL (%)	44.9	43.1	50.0		
Attitudes:[a]					
bad-good	5.87	6.07	6.22	0.47	
	(1.6)	(1.2)	(1.5)		
unpleasant-pleasant	4.89	5.00	5.41	0.50	
	(2.0)	(1.7)	(1.9)		
foolish-wise	6.21	6.61	6.59	2.12	
	(1.3)	(0.8)	(0.8)		
harmful-beneficial	6.08	6.55	6.44	3.03	
	(1.3)	(0.8)	(0.9)		
Normative beliefs:[b]					
Spouse/girlfriend/boyfriend	6.44	6.53	6.53	0.11	
	(1.0)	(1.0)	(0.9)		
Family	6.51	6.61	6.17	1.26	
	(1.1)	(0.9)	(1.4)		
Friends	6.23	6.14	6.00	0.25	
	(1.2)	(1.2)	(1.3)		

Continued

Table 2 *Continued*

Profile Variable	Cluster			F-Ratio	X^2 Value
	Ambivalent	Usefulness	Ease and Comfort		
Co-workers	6.11	6.04	5.87	0.20	
	(1.2)	(1.3)	(1.3)		
Motivation to comply:[c]					
Spouse/girlfriend/boyfriend	4.92	5.17	4.94	0.21	
	(2.0)	(1.9)	(2.0)		
Family	5.21	5.35	5.29	0.08	
	(1.9)	(1.9)	(1.6)		
Friends	4.64	4.98	4.06	1.54	
	(2.1)	(1.9)	(1.9)		
Co-workers	4.78	5.10	4.33	0.96	
	(2.0)	(2.0)	(1.6)		
Hearing Aid Use:[d]					
In an audience listening to a speaker	6.15	6.60	6.56	1.23	
	(1.8)	(1.3)	(1.5)		
Small gathering of family/friends	5.86	6.45	5.61	2.43	
	(1.8)	(1.5)	(2.0)		
Watching TV	4.98	5.47	5.00	0.68	
	(2.6)	(2.1)	(2.3)		
Telephone	3.57	3.42	3.06	0.23	
	(2.6)	(2.8)	(2.6)		
Party setting	4.19	4.39	2.61	3.50*	
	(2.6)	(2.6)	(1.9)		
Listening to music	5.33	4.89	5.00	0.45	
	(2.2)	(2.5)	(2.3)		
Talking to one person in quiet room	5.70	6.19	4.94	2.76	
	(2.1)	(1.8)	(2.5)		
Relaxing at home	3.66	4.38	2.22	5.23*	
	(2.5)	(2.6)	(2.1)		
Situations where helpful	6.48	6.88	6.50	3.18*	
	(1.2)	(0.4)	(0.5)		
Working hours	4.90	5.71	4.11	4.52*	
	(2.3)	(2.0)	(2.1)		

Note. Standard deviations are in parentheses below mean values.

[a]The higher the value the more positive the attitude.

[b]The higher the value the greater the likelihood that the referent other believes that the hearing aid should be worn.

[c]The higher the value the greater the motivation to comply.

[d]The higher the value the greater the likelihood of wearing a hearing aid.

*$p < .05$.

vide some evidence that, in identifying hearing aid attributes desired by hearing-impaired persons, demographic characteristics are not as relevant as one might suppose. In a secondary analysis, sex, age, race, education, and income

were correlated individually with each of the normalized importance ratings. The average correlation coefficient, following Fisher's r to z transformation (Cohen & Cohen, 1975), was approximately .076, indicating an average shared variance among normalized importance ratings and demographics of less than 1%.

Few differences among the clusters were also found for attitudes, normative beliefs, and motivation to comply. On average, subjects in all three clusters perceived wearing hearing aids positively, with the "Usefulness" and "Ease and Comfort" clusters having slightly more positive ratings than the "Ambivalent" group. Further, all referent others were perceived by the hearing aid users to be supportive of their use of an aid, as indicated by the relatively high normative belief ratings. The motivation to comply ratings were not as high, however, as the normative belief ratings. Again, except for one attitudinal variable (harmful/beneficial), no significant differences were found among these three sets of measures.

A secondary analysis was conducted with respect to attitudes to ascertain if the findings in this study were consistent with other related studies. The sum of the 10 hearing aid use variables (e.g., watching TV, in a party setting) and four attitude variables (e.g., good/bad, harmful/beneficial) were correlated. Consistent with research by Kapteyn (1977a, 1977b), Oja and Schow (1984), and Walden, Demorest, and Hepler (1984), a positive correlation between hearing aid use and attitude was found ($r = .46$, $p < .0001$). Responses to the four attitude questions also revealed a moderately positive attitude toward wearing a hearing aid, consistent with previous results in the audiological literature (e.g., Cunningham et al., 1978; Oja & Schow, 1984; Walden et al., 1984).

The hearing aid use portion of the questionnaires produced the greatest number of differences across clusters. Differences were significant at the .05 level for a party setting, relaxing at home, situations where helpful, and working hours. Overall, subjects in the "Usefulness" cluster reported the greatest degree of hearing aid use. Following Tukey's post hoc procedure, the "Usefulness" cluster scored significantly higher ($p < .05$) than the "Ease and Comfort" cluster for a party setting, relaxing at home, and working, and higher than the "Ambivalent" group for situations where helpful.

DISCUSSION

Rehabilitative audiologists and others interested in extending research in this area can draw major implications from the results of this investigation. For those audiologists and hearing aid dealers who make assumptions regarding the attributes that their clients are seeking in a hearing aid, the results of this study indicate that preconceived notions based on demographic factors alone must be discarded. While it may be tempting to make inferences regarding which characteristics are most relevant to a client of a particular

age, sex, and occupation, no significant differences were found among clusters across the demographic variables.

It should also be noted that the subjects in the clusters differed on hearing aid use in general (Table 2, Hearing Aid Use). Thus, it is especially important that the hearing aid dispenser ascertain the hearing aid characteristics each client feels are most desirable. At times, the client's wants and the audiologist's recommendations may differ. As marketers and public policy makers have found, rationality of decision-making by consumers cannot be dictated. In those instances of disagreement, the audiologist will need to counsel the client through teaching and discussion or reconsider the original recommendation to insure a high probability that the client will wear the aid.

Rehabilitative audiologists are well aware that the task of providing amplification does not end with the fitting and delivery of the most appropriate aid. Rather, audiologists must try to increase the degree of clients' effective hearing aid use. In this particular study, a segment was identified ("Ease and Comfort") that was significantly less likely to wear the hearing aid than other segments across several hearing aid usage situations. The cause of this reduced use is unclear, and further research is needed to study this problem.

Subjects in the "Ease and Comfort" cluster attached greatest importance to the ease and comfort dimensions but generally discounted the importance of the hearing aid in improving hearing, especially in a noisy room. It would be of interest to know if, because of the nature of their hearing loss, this group felt that hearing in a noisy environment was a virtual impossibility, with or without a hearing aid. As this was an anonymous questionnaire, identification of audiometric variables associated with each cluster was not possible. One might hypothesize, however, that individuals with different degrees and configurations of hearing loss may evaluate attributes of hearing aids differently.

While one might dismiss the "Ease and Comfort" cluster as too small to be meaningful (8.4%), subjects in the "Ambivalent" cluster also displayed a low degree of likelihood of wearing a hearing aid. Further, subjects in the "Ambivalent" cluster also reported the poorest attitudes toward wearing a hearing aid, although the difference was significant on only one of the four items. These two groups, which accounted for 54% of the subjects, could be considered special targets for rehabilitation because they may not be realizing their fullest potential from a hearing aid.

In this study, not all attributes of hearing aids were evaluated; several possible attributes such as length of warranty, service record, and cost were not included. Also, as this study was cross-sectional, the effects of hearing aid experience could not be assessed. The subjects in this study had at least one year of experience. Different clusters might have been formed if new hearing aid users had been included in the analysis.

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