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QUESTIONNAIRES ON DESIRABLE PROPERTIES
OF HEARING AIDS

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ABSTRACT

Three questionnaires were presented to 49 hearing impaired patients. They were asked to rank different properties of hearing aids considering their importance. The first questionnaire dealt with some physical properties (size, weight, battery-cost etc.) but also with the importance of good sound quality. The second questionnaire focused on the relative importance of various sound quality dimensions, such as softness, clarity, fullness, and others. The third questionnaire asked for suitable sound programs to be used in the procedure of hearing aid fitting at the clinic.

The sound quality got the highest rank by 43 of the patients, and clarity was considered to be the most important sound quality dimension. The most preferred sound programs included male and female voices with or without a background of other voices.

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INTRODUCTION

Evaluations of hearing aids are usually based on some kind of speech discrimination test. Recently we tried another approach based on judgments of perceived sound quality (Gabrielsson et al., 1980; see also Grover & Martin, 1979 and Punch & Parker, 1981). Twelve hearing impaired subjects judged the perceived sound quality of different hearing aids by means of nine rating scales, which resulted from multivariate studies of perceived sound quality (Gabrielsson & Sjögren, 1979a, 1979b). Ten stimuli representing speech, music and everyday sounds were used. The results indicated that most subjects were able to use the scales in a reliable way, and that the perceived sound quality was an important factor in each subject's final choice of hearing aid.

However, the whole procedure was very time-consuming. Furthermore, there are many factors beside sound quality influencing the choice of a specific hearing aid, e.g., its size, appearance, easiness in handling etc. In order to investigate the relative importance of such factors and also to study which properties of perceived sound quality and which stimuli are the most important, we designed three questionnaires, which were answered by hearing aid users.

METHODS

Questionnaires

The patients were asked to rank different properties of hearing aids with regard to their importance.

In the first questionnaire the properties to be ranked were the following:

that the hearing aid has a suitable size and weight,
that the battery cost is low,
that the controls of the aid are easy to handle,
that the hearing aid has a good sound quality, and
that the hearing aid is invisible when placed behind the ear.

In the second questionnaire the task was to rank different properties of the sound quality, namely how important it is

that the sound is soft (not sharp),
that the sound is distinct and clear,
that the sound is full (not thin),
that the sound is neither too bright nor too dull
that the sound is near (not distant), and
that there are no extraneous sounds.

In the third questionnaire the patient was asked to rank the five most important programs to be used for trying out a hearing aid. A list of programs was given, but the patient was also encouraged to suggest other programs.

The original versions of the questionnaires in Swedish and their translations into English are given in the Appendix.

Subjects

Five groups of patients, participating in training courses at the audiological department of Danderyd Hospital, were given the questionnaires during an intermission. There were about ten patients in each of the five groups, and 49 of these patients answered the questionnaires, 28 men and 21 women. The age of the patients ranged between 16 and 74 years with a mean value of 53. Almost all of them were still active in their work. The purpose of the course was to teach the patients how to handle and manage their hearing aid and other technical aids, and further to give some information about the hearing system and hearing impairments.

RESULTS

The results of questionnaire No. 1 are seen in Figure 1. The histogram shows the number of patients (Y-axis) assigning rank 1, 2 etc. (X-axis) for each of the five properties (sound quality, easy to handle etc.). The sound quality is obviously by far the most important property, followed by "easiness to handle", "size/weight", "aid invisible" and finally "battery-cost". This order of importance seems to be rather firmly established.

The results of questionnaire No. 2 appear in Figure 2. Above all, the patients want the sound of the hearing aid to be "clear and distinct". Next comes "no extraneous sounds". It is doubtful, however, that all patients have understood that only sounds created in the hearing aid itself were meant here. The noise levels in modern hearing aids usually do not cause problems to the hearing aid user. The answer rather reflects irritation due to any extraneous sounds appearing when listening to something. Then follows, in descending order, "soft", "near", "bright/dull" and "full". The rank order of the total material is, however, not as clear here as in Figure 1. The order chosen is based on the mean values of the ranks, which are shown in Table I.

Table I also shows the results of questionnaire No. 3 regarding preferred programs. The most important program is obviously a male voice with or without a background of multi-talker babble, followed by a female voice in the corresponding conditions. After these follows a male or a female voice at a distance. Among the music programs these patients favour a singing voice, piano and orchestra. Singing birds or the sound of playing children seem to be useful programs as well. The label "other" contains a diversi-

ty of proposals, almost all of them suggesting speaking voices of different kinds. Examples: "group conversation", "speaker at a distance", "speaker in reverberation".

To investigate any influence on the results due to sex, the material was divided in a male and a female group, N=28 and N=21 respectively. A division was also made regarding age (an older group vs. a younger group) and regarding degree of hearing loss (more impaired vs. less impaired, referring to average hearing loss of the better ear at 0.5, 1 and 2 kHz). However, the mean age of the male and the female groups differed considerably, 57 years for the males and 49 years for the females. Thus the older group mainly contained males, while the younger group mainly consisted of females. Furthermore, the average hearing loss differed between the younger (43 dB) and the older (34 dB) group. All this means that the three factors sex, age and hearing loss interact. Taking this into account the following statements can be made. On the whole, the results for the sub-groups are similar to those for the whole group. There may be some small differences. For young female patients the size and weight of the aid seems more important than the easiness to handle the aid, while the opposite holds for old male patients. It seems more important for women than for men that the sound is "near".

DISCUSSION

It should be remembered that the results refer to a group of some 50 hearing impaired people. We do not know, of course, how far these results can be generalized to other groups or to hearing impaired individuals in general. However, certain results from the present group are very obvious and also confirm our expectations. Thus the relevance of perceived sound quality is demonstrated by the fact that almost all subjects considered it as the most important property. It was followed by easiness in handling and (proper) size/weight. Among the sound quality properties, clarity (clearness) was rated as the definitely most important, followed by softness and nearness (the data concerning "no extraneous sounds" are questionable as discussed earlier). The preferred programs for testing a hearing aid are dominated by various speech programs, but there are also many examples of music and everyday sounds.

These results emphasize the need for continued work on developing suitable methods for judging the perceived sound quality of hearing aids and on investigating the relations between the physical properties of the aids and the perceived sound quality. Such work is going on and will be described in forthcoming reports.

ACKNOWLEDGEMENTS

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	RANK	1	2	3	4	5	6	MEAN	N
Quest. No. 1	SIZE/WEIGHT	3	11	21	11	2		2.96	48
	BATTERY-COST	1	4	8	11	24		4.10	48
	EASY TO HANDLE	2	28	10	6	2		2.54	48
	SOUND QUALITY	43	4	0	1	0		1.15	48
	AID INVISIBLE	3	3	9	15	18		3.88	48
Quest. No. 2	SOFT	7	6	11	15	5	5	3.41	49
	CLEAR	29	13	4	3	0	0	1.61	49
	FULL	2	3	7	6	20	11	4.47	49
	BRIGHT/DULL	2	2	10	9	12	14	4.41	49
	NEAR	5	10	10	9	4	11	3.61	49
	NO EXTR. SOUNDS	11	17	6	8	4	3	2.71	49
Quest. No. 3	MALE SPEAKER	10	1	1	1	1			
	DO. IN BABBLE	10	3	2	1	1			
	DO. AT DISTANCE	4	4	2	0	1			
	FEMALE SPEAKER	4	12	0	1	3			
	DO. IN BABBLE	3	11	4	3	0			
	DO. AT DISTANCE	3	2	1	5	0			
	PLAYING CHILDREN	2	2	3	5	3			
	CRYING BABY	0	0	1	0	0			
	SINGING VOICE	2	3	6	4	6			
	PIANO	0	2	3	5	4			
	ORGAN	0	0	0	0	0			
	VIOLIN	0	0	0	0	0			
	TRUMPET	1	0	0	0	0			
	ORCHESTRA	1	0	3	7	2			
	JAZZ	0	0	1	0	1			
	POP	0	0	0	0	0			
	SINGING BIRDS	1	2	8	6	4			
	TRAFFIC SOUNDS	0	1	5	3	7			
	DISH-WASHING	1	0	0	0	4			
	OTHER	6	5	8	5	8			
MISSING VALUES	1	1	1	3	4				

Table I. Number of patients assigning the different ranks, and mean rank values. The table contains the results of all the questionnaires.

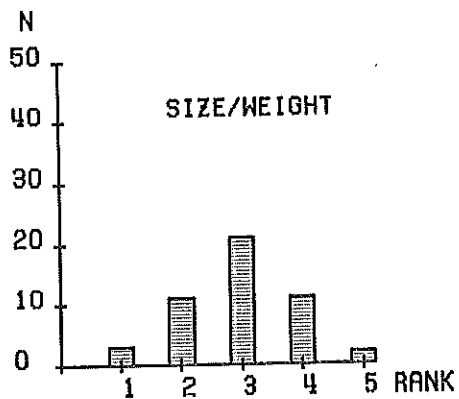
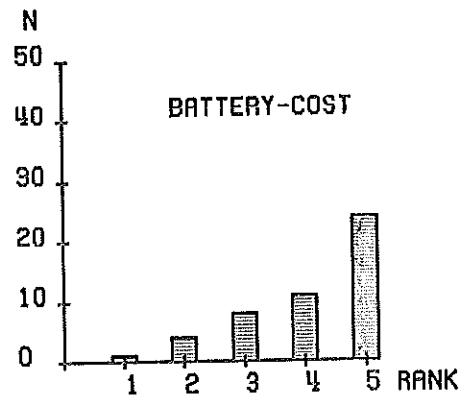
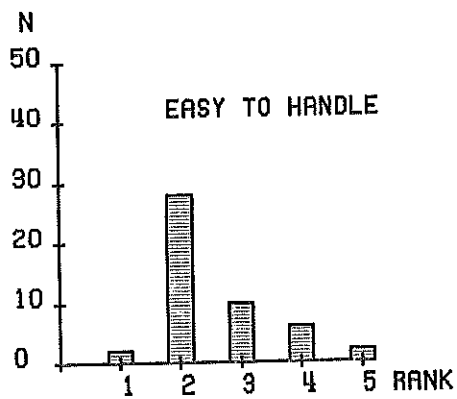
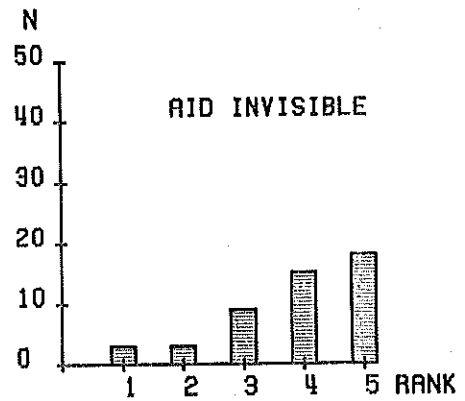
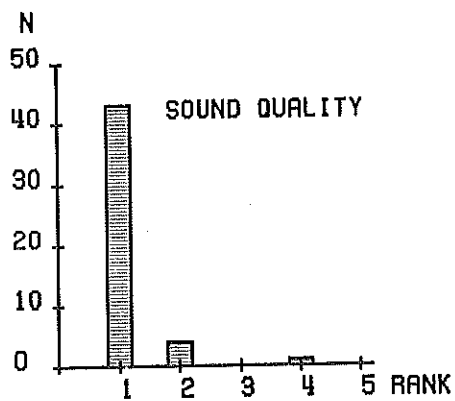


Fig. 1. Number of patients (Y-axis) assigning different ranks (X-axis) for different properties.
 Rank 1 = most important,
 rank 5 = least important.

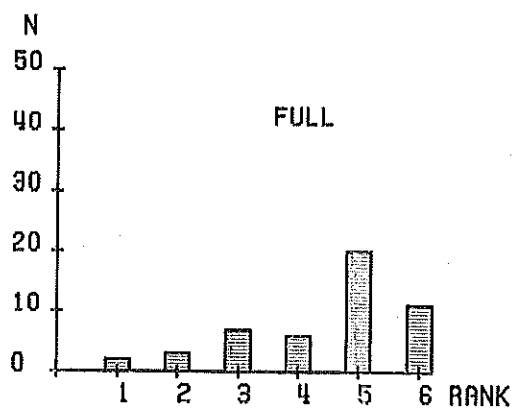
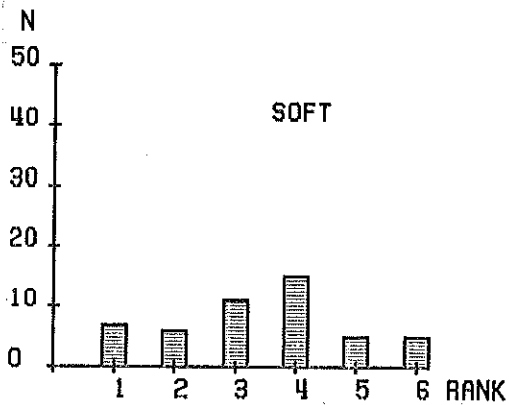
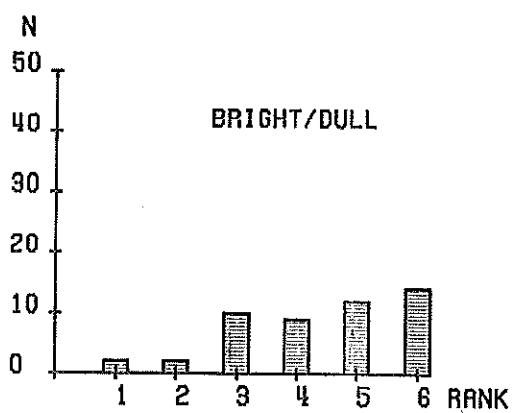
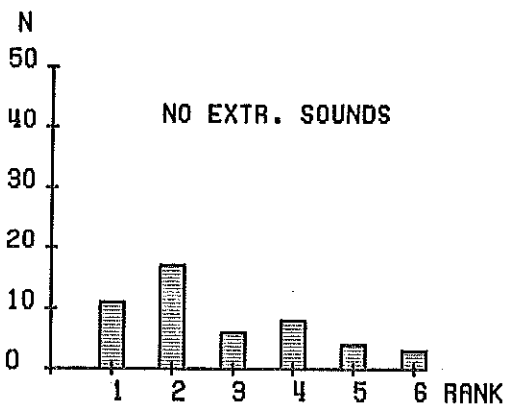
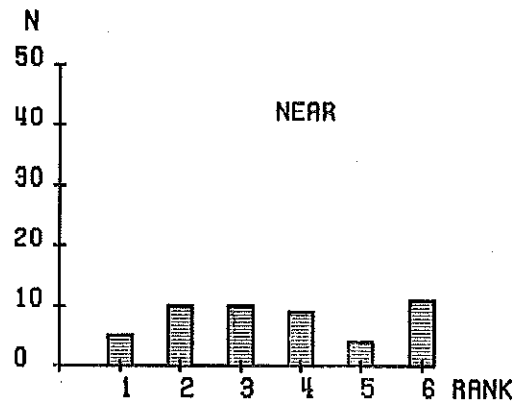
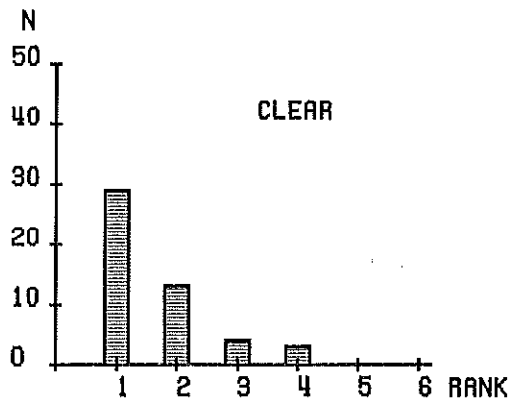


Fig. 2. Number of patients (Y-axis) assigning different ranks (X-axis) for different properties of sound quality. Rank 1 = most important, rank 6 = least important.

APPENDIX

The appendix contains the instructions of the three questionnaires. They are given in the original Swedish versions as well as in translations into English.

Questionnaire No. 1 (Swedish)

Vi vill försöka förbättra metodiken vid hörapparat-
utprovningen. Speciellt vill vi veta vilka krav som är
viktigast att tillgodose då en viss hörapparat skall
väljas. Du kan hjälpa oss genom att försöka rangordna
nedanstående egenskaper med hänsyn till hur viktiga
Du tycker att de är. Sätt 1 för den viktigaste, 2 för den
näst viktigaste osv till och med 5 för den allra minst
viktiga egenskapen. Tänk efter noga innan Du svarar och
gör Ditt bästa, även om Du tycker det är svårt.

att hörapparaten har lämplig storlek och tyngd

att batterikostnaden är låg

att apparatens olika reglage är lätta att manövrera

att hörapparaten har bra ljudkvalitet

att hörapparaten inte syns då den sitter på örat

Questionnaire No. 1 (English)

We try to improve the procedure for fitting of hearing aids. Especially, we want to know which requirements that are most important to fulfill, when choosing a hearing aid. You can help us by trying to rank the properties listed below, regarding how important you think they are. Put 1 for the most important, 2 for the second most important etc. until 5 for the least important property. Please, think carefully before answering and do your best, even if you find it difficult.

That the hearing aid has a suitable size and weight,
that the battery cost is low,
that the controls of the aid are easy to handle,
that the hearing aid has a good sound quality,
that the hearing aid is invisible when placed behind
the ear.

Questionnaire No. 2 (Swedish)

Om Du tänker på ljudkvaliteten i hörapparater, försök att rangordna följande egenskaper med hänsyn till hur viktiga Du tycker att de är. Sätt 1 för den viktigaste, 2 för den näst viktigaste osv till och med 6 för den allra minst viktiga egenskapen. Tänk efter noga innan Du svarar och gör Ditt bästa, även om Du tycker det är svårt.

att ljudet låter mjukt (inte skarpt/vasst)

att ljudet låter tydligt och klart

att ljudet låter fylligt (inte tunt)

att ljudet låter lagom ljust eller lagom mörkt

att ljudet låter nära (inte långt bort)

att det inte är några störande biljud

Du kanske tycker att det finns andra egenskaper som borde vara med i listan? Skriv gärna upp dem här nedanför och förklara varför de är viktiga.

Questionnaire No. 2 (English)

Thinking of the sound quality of hearing aids, try to rank the following properties regarding how important you think they are. Put 1 for the most important, 2 for the second most important etc. until 6 for the least important property. Please, think carefully before answering and do your best, even if you find it difficult.

That the sound is soft (not sharp),
that the sound is distinct and clear,
that the sound is full (not thin),
that the sound is neither too bright nor too dull,
that the sound is near (not distant),
that there are no extraneous sounds.

Perhaps you think that there are other properties which should be included in the list. Please note them below and explain why they are important.

Questionnaire No. 3 (Swedish)

INSTRUKTION FÖR ENKÄT TILL HÖRAPPARATANVÄNDARE

Tänk dig att Du bara får provlyssna hörapparaterna på hörcentralen när Du skall prova ut en ny. Du får alltså inte pröva någon apparat hemma innan Du slutligen bestämmer Dig för en viss apparat. Vilka fem ljudprogram skulle Du då helst vilja ha för provlyssning på hörcentralen? Det gäller alltså att välja ut sådana program som är representativa för vad Du mest lyssnar på och som Du tror är kritiska för hörapparatvalet, vare sig det gäller behagliga eller obehagliga ljud.

Välj bland nedanstående förslag eller, kanske ännu hellre, välj egna ljud som Du tycker är viktiga! Skriv dem så att det viktigaste kommer som nummer 1, det näst viktigaste som nr 2 osv.

Några förslag:

Manlig talare	Sång
Manlig talare i sorl	Piano, Orgel, Fiol, Trumpet osv
Manlig talare på långt håll	Orkestermusik, Jazz, Pop, osv
Kvinnlig talare	Fågelkvitter
Kvinnlig talare i sorl	Trafikljud
Kvinnlig talare på långt håll	Diskslammer
Lekande barn	
Spädbarnsskrik	

Svar:

1. _____
2. _____
3. _____
4. _____
5. _____

Questionnaire No. 3 (English)

INSTRUCTION FOR QUESTIONNAIRE TO HEARING AID USERS

Imagine that you are allowed to try the hearing aids only at the clinic, when you want a new one. You are thus not allowed to try any aid at home before you make your final decision. Which five programs would you then prefer to use for listening trials at the clinic? Thus the object is to choose programs, which are representative for what you usually listen to, and which you think are critical for the choice of the hearing aid, whether it regards pleasant or unpleasant sounds.

Please, choose among the programs below or, even better, choose other sounds, which you think are important. Please mark the most important as No. 1, the second most important as No. 2 etc.

Some proposals:

Male speaker	Singing voice
Male speaker in babble	Piano, Organ, Violin, Trumpet, etc.
Male speaker at distance	Orchestra, Jazz, Pop, etc.
Female speaker	Singing birds
Female speaker in babble	Traffic sounds
Female speaker at distance	Dish-washing
Playing children	
Crying baby	

Answers:

1. _____
2. _____
3. _____
4. _____
5. _____