

# Level of User Satisfaction with Hearing Aids and Environment: The International Outcome Inventory for Hearing Aids

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Int Arch Otorhinolaryngol 2014;18:229–234.

## Abstract

**Introduction** The main function of hearing is to enable oral communication. Hearing loss impairs communication skills.

**Objective** To evaluate the level of user satisfaction with hearing aids.

**Methods** This is a cross-sectional group study comprising 108 subjects (56% men and 44% women). The average age of the subjects was 77 years. These subjects had been recently fitted with their hearing aids and showed sensorineural (90%) and mixed (10%) hearing loss as determined via the Questionnaire International Outcome Inventory for Hearing Aids Outcome Inventory (IOI-HA), which determined the benefit and satisfaction obtained by sound amplification.

**Results** The hearing aids improved the quality of life of 52.78% of the patients, which was revealed by their high scores (mean = 27.3). The relationship of the user with the environment was significantly better ( $p < 0.001$ ) than that of the user with the hearing aid.

**Conclusion** IOI-HA is a simple and easy-to-use tool. Based on the results of this study, we can show a high degree of satisfaction with their hearing aids in the majority of the participants, which improved the quality of life.

## Keywords

- quality of life
- hearing loss
- consumer satisfaction

## Introduction

Hearing is one of the most important senses for human beings. It is due to hearing that humans communicate, because most communication is achieved through sound patterns.

The impact of hearing deprivation in an individual's life is huge because it not only affects one's ability to properly comprehend auditory information, but also, predominantly, how to relate to one's environment and culture. Furthermore, this sensory deprivation causes biological, psychological, and social consequences.<sup>1</sup>

Monitoring adults and seniors with hearing loss minimizes the hardship and handicap that occur as a consequence of this

pathology. An important component of this monitoring is to indicate one or two hearing aids (HAs). The services offered in this area are configured in different ways but always contain elements associated with the technical performance of hearing aids and how these devices help listeners overcome deficits and disadvantages experienced in their day-to-day lives.

Alpiner and Schow suggested that hearing aid users should know the limitations of the devices in an attempt to decrease the rejection of the use of amplification.<sup>2</sup> According to the authors, the expectation of normal hearing ends in frustration.

Hearing loss generates three different effects: impairment, incapacity, and handicap. Impairment is measured by the

received  
September 12, 2013  
accepted  
October 23, 2013  
published online  
January 16, 2014

DOI <http://dx.doi.org/10.1055/s-0033-1363782>.  
ISSN 1809-9777.

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probable loss of hearing, verified by the audiogram. Incapacity is the effect of this hearing loss in some specific day-to-day situation, for example, watching television. Handicap is the effect of injury and disability but relates to nonauditory aspects including social and emotional aspects.<sup>3</sup>

Audio (re)habilitation can be defined as a process of problem solving to minimize the difficulties (activity limitation) and handicap (participation restriction) of an individual with a hearing disability. *Activity limitation* refers to the difficulty faced by the individual in performing activities. *Participation restriction* refers to the problems that an individual may have in the method or extent of their involvement in everyday situations.<sup>4</sup>

HAs are extremely important in the (re)habilitation of sensorineural deficiencies. These miniature electronic devices amplify sounds so as to allow for the stimulation of residual hearing.

In the past, research in the area of health was focused on physiologic change. Although these are important aspects to be studied, it is also necessary to address the effect of treatment on clinical outcomes of functional status and quality of life for the individual in question.<sup>5,6</sup>

Gatehouse described that we should not limit ourselves only to the audiogram.<sup>7</sup> According to the author, we should have access to the individual experiences of all hearing-impaired patients, their descriptions of the problems they have experienced, the impact this had on each of them, and their abilities to deal with the problems.

In recent years, clinical practice has been very concerned to assess the handicap, benefit, and satisfaction of HA users and then document the information. Despite the various approaches, all available instruments assess user self-perception and the impact of HAs in subjects' day-to-day lives. To assess these effects, some instruments are available in the form of questionnaires.

The benefit of HAs can be observed by means of improved performance of the individual, always involving the comparison of two measurements that express the magnitude or degree of difference between these two conditions. Different procedures can help to quantify the performance and benefit of sound amplification, as measured by such things as functional gain, insertion responses, restoration of sound intensity, intelligibility of speech, and judgments of speech quality.<sup>8,9</sup>

The self-assessment questionnaire for HAs, the International Outcome Inventory for Hearing Aids (IOI-HA),<sup>10,11</sup> aims to document the point of view of the individual regarding the evolution of everyday use with the device, considering not only the degree of satisfaction but also limitations of basic activities, participation restrictions, impact on others, and quality of life.<sup>11,12</sup>

The IOI-HA was developed as a product of an International Workshop on Results Evaluation Measurement in Audiological Rehabilitation.<sup>10</sup> Workshop participants recognized the need to combine and compare data from different investigations and models of clinical services. The questionnaire is sufficiently short and inclusive, with the potential to be used in different studies to provide more direct data and enable the

combination or comparison of results that would otherwise be incompatible.

The questionnaire consists of seven items, each addressing a different dimension of responses, that were written to be nonambiguous. It is easy to interpret and can be applied regardless of the cultural level of the patient. All questions were designed with five possible answers, which are arranged so that the more favorable item always appears on the right. The same questionnaire has been translated into 21 languages and, in Portuguese,<sup>13</sup> is called the "Questionário Internacional – Aparelho de Amplificação Sonora Individual."

By using the IOI-HA questionnaire, one can document the progress of the use of sound amplification considering its uses in daily routines, its benefit, and the degree of user satisfaction. This makes it possible to observe improvement in more limited activities, such as hearing in noisy places, and especially in the reduction of the impact the disability can have on others, thus improving quality of life.

The aim of this study is to assess the level of adult user satisfaction with their HAs in relation to their environment, using the IOI-HA questionnaire translated into Portuguese as a tool for self-assessment.

## Methods

The studied population consisted of 108 adults with sensorineural and mixed hearing loss who were users of personal HAs. The sample of this voluntary probabilistic study used the following criteria:

- Inclusion criteria: be over 18 years of age by the date of full realization of the tests; have sensorineural, mixed, acquired, or postlingual hearing loss; be an HA user for at least 2 weeks; complete the consent form; not have any health or physical problems that prevent assessment participation
- Exclusion criteria: not performing the proposed questionnaire comprehensively; being outside the expected age; not being an HA user

For the project in question, an identification sheet and questionnaire were used as research tools. The identification sheet was used to determine basic information about the subject, describe hearing loss, and identify HAs. The IOI-HA, translated into Brazilian Portuguese<sup>14,15</sup> was applied at least 2 weeks after beginning use of HAs and assessed satisfaction with HA use retirar o appendix.

This project was approved by the ethics committee of human research at the University of Tuiuti under registration CEP-UTP No. 53/2004. This study was conducted at the Center for Hearing and Language, Curitiba, PR, working with a private service of recommending and selecting HAs. All individuals in the sample signed a consent form for voluntary participation in this study. All audiologists on the team were able to carry out the questionnaires and were aware of how these tools collect data.

A previous study suggested that the use of the IOI-HA in the rehabilitation process of HA users is of paramount importance,<sup>13</sup> but it is believed that the questionnaire can be

difficult for subjects with low social and economic status when self-administered. Therefore, the IOI-HA and the questionnaire were presented verbally by a researcher with the individual, ensuring understanding of the questions and answers. This examiner was not involved in the fitting of HAs.

This questionnaire consists of seven questions and evaluates the result subjectively regarding HAs under the following criteria: (1) use; (2) benefit; (3) residual limitation of activity; (4) satisfaction; (5) residual restriction of participation; (6) impact on others; (7) quality of life. The questionnaire offers a choice of five answers graded from left to right, so the first option refers to a worse performance, graded as 1, and the last option refers to better performance, graded as 5. The patient was instructed to choose only one answer, the one that best described the result of his or her HA adaptation.

Statistical analysis was performed using techniques of descriptive and inferential statistics, with a significance level of 0.05. The paired Student *t* test was used.

The IOI-HA was used because it is brief, comprehensive, and accessible to different social and cultural factors for use and for various comparisons.<sup>10</sup>

## Results

The subjects of this study were 108 adults with sensorineural and mixed postlingual hearing loss who were users of HAs for at least 2 weeks. The identification data for the subjects were composed of information to characterize the type of device (monaural or binaural), degree of hearing loss, duration of use of the apparatus, and gender.

Most of the hearing loss was sensorineural (90%), moderate (46%), severe (26%), or ski-slope (19%), and a minority (1.5%) had mild hearing loss. Of these, 44% opted for the use of hearing in both ears, and 56% opted to make use of a single HA. Age ranged between 18 and 94 (mean 77), with 56% being male and 44%, female.

The IOI-HA questionnaire was analyzed by studying the responses of each item, individually and grouped. Thus, the score of each question, the total score obtained in the seven questions, and the score obtained concerning factors 1 and 2 of the questionnaire were considered.<sup>15</sup> Factor 1 referred to the joint analysis of items 1, 2, 4 and 7, showing the

relationship between the user and his HA. Factor 2 referred to the analysis of questions 3, 5, and 6, showing the relationship between the user and his environment.

It is important to note that items 1 through 7 of the questionnaire have a minimum score of 1 and a maximum score of 5. The total score involves the response of the first seven items totaling a minimum score of 7 and maximum of 35. The analysis of factor 1 corresponds to the sum of four items totaling at least 4 points and at most 20 points, and factor 2 corresponds to the sum of three items totaling at least 3 points and at most 15 points. A higher score indicates better results in relation to the HA fitting.

Analysis of the questionnaire was performed using the Student *t* test, with a significance of 0.05.

In ►Fig. 1, it is clear that use of the device in the previous 2 weeks gradually increased in frequency, along with an increase in daily time of use; 85.19% of participants used the HA between 4 and 8 hours, and only 2.78% used the device less than 1 hour per day.

►Fig. 2 shows that the frequency of use of the individual sound amplification device increased with user satisfaction. For those who were not helped, the frequency response was only 2.78%, and for those who were helped a lot or very much, the percentage reached 69.45%.

The degree of difficulty encountered in hearing in the same situation after the use of the HA is shown in ►Fig. 3, where it can be seen that 50.93% of users had high to moderate difficulty hearing in those situations, and 47.23% had little or no difficulty in hearing.

►Fig. 4 summarizes the results related to the efficiency of the use of HAs, and the vast majority (i.e., 77.78%) reported that HA use was advantageous. This result is correlated with that already obtained in ►Fig. 2. Only 7.41% thought HA use was a little efficient or not efficient at all.

►Fig. 5 shows that 47.22% of HA users found that their activities were greatly affected, significantly affected, or moderately affected, and the remaining 52.78% thought that little or nothing affected their activities.

Regarding the impact of the use of HAs in others, ►Fig. 6 shows that 67.6% of the subjects noted a little or no affect, and 31.48% were at least moderately affected.

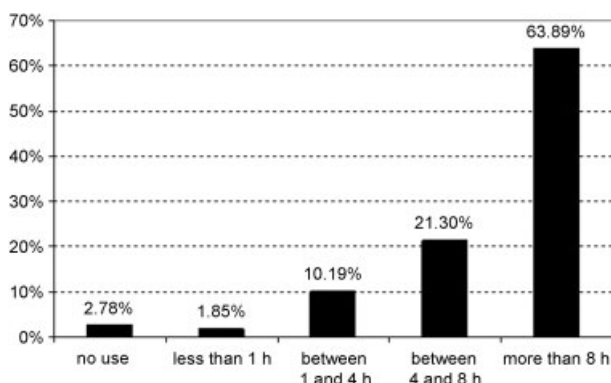


Fig. 1 Question 1: time of use of device in the last 2 weeks.

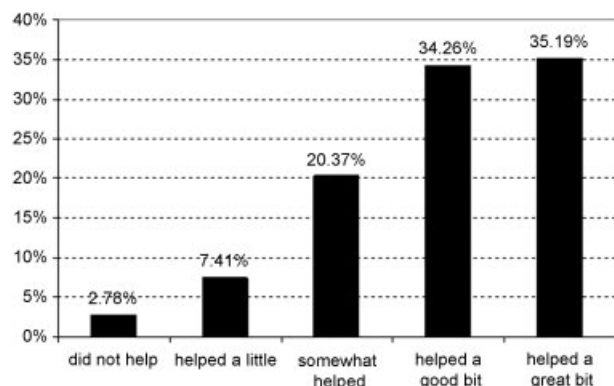
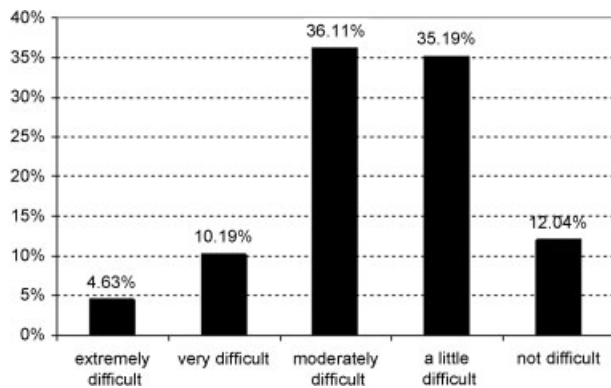


Fig. 2 Question 2: In a situation that the listener wanted to hear better before getting the hearing aid (HA): Did the HA help?



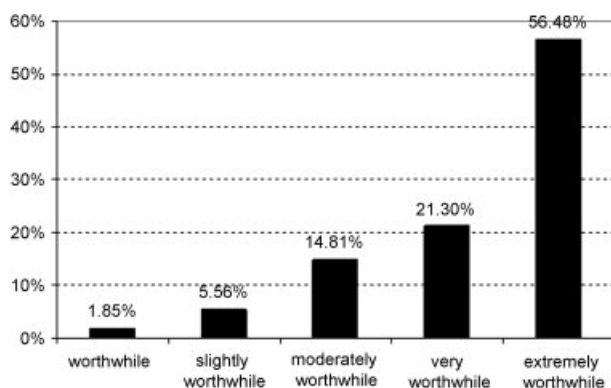
**Fig. 3** Question 3, regarding degree of difficulty for situations while using the hearing aid.

► **Fig. 7** shows the frequencies that use of HAs changed the lives of users, noting that HA use was very positive for 52.78% of subjects, moderately positive for 24.07%, and only 13.89% saw no change.

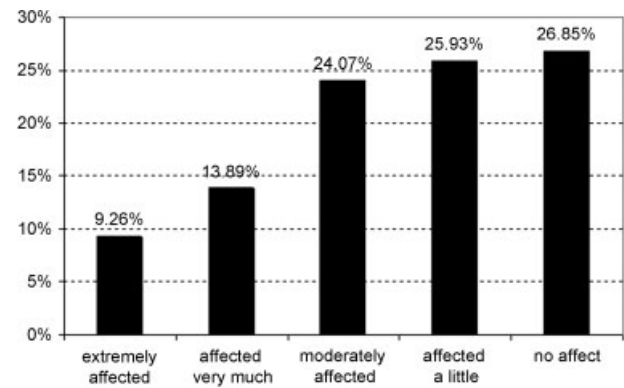
► **Table 1** shows the results of the seven items of the questionnaire for self-assessment (IOI-HA). The total scores are shown in ► **Table 2**. One can observe the positive adaptation of the HA, as evidenced by the high score (mean = 27.2 points) of the sum total issues.

► **Table 3** illustrates the relationship between the user and the HA (factor 1) and the user and his environment (factor 2). There was a significant difference ( $p \leq 0.01$ ) between the mean scores of factors 1 and 2, with factor 1 (hours of use per day, benefit, satisfaction, and quality) showing a significantly higher average than factor 2 (activity limitations, participation restrictions, and impacts on others). These data reflect the degree of satisfaction with HA use. Therefore, it can be observed that user satisfaction with respect to the HA was significantly better than user relationship with the environment.

Still on the IOI-HA, the averages obtained in the analysis by item were positive and greater than 3 points (above 50% of the score), noting that the maximum possible score per question is 5. Consequently, analyzing the sum of all the issues, factor 1 and factor 2 were also positive, indicating a good subjective result in adaptation to the use of HAs.



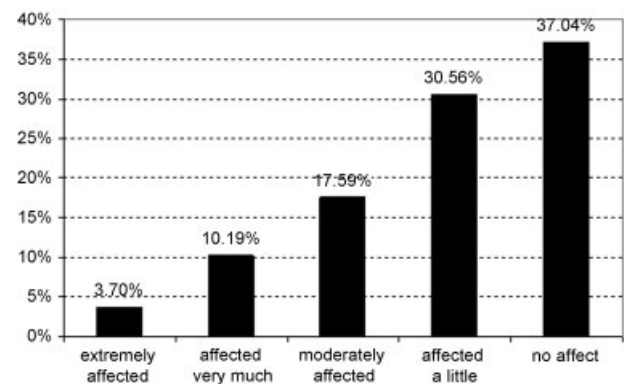
**Fig. 4** Question 4: Considering everything, is it worth using the hearing aid?



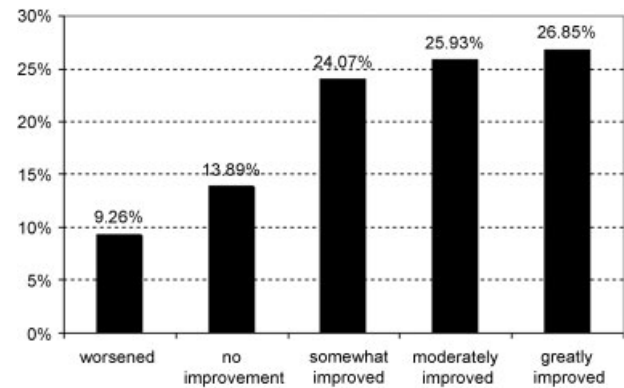
**Fig. 5** Thinking of hearing use in recent weeks: How much have participants' hearing problems affected their activities?

## Discussion

According to the American Speech-Language-Hearing Association,<sup>16</sup> the validation process, which reviews the impact of the intervention on the perception of disability and handicap, should be part of the HA fitting. Therefore, at this stage, the application of self-assessment questionnaires is extremely important as user satisfaction is closely related to the success of rehabilitation.<sup>17</sup>



**Fig. 6** Question 6: Thinking of the previous 2 weeks, using the hearing aid, how much has participants' hearing problems irritated (or affected) others?



**Fig. 7** Question 7: Considering everything, how has hearing aid use changed participants' enjoyment of life?

**Table 1** Descriptive statistics of scores per question

Question	Descriptive statistics				
	Subjects (n)	Mean	Minimum	Maximum	Standard deviation
1	108	4.42	1.00	5.00	0.95
2	108	3.92	1.00	5.00	1.05
3	108	3.41	1.00	5.00	0.99
4	108	4.25	1.00	5.00	1.02
5	108	3.47	1.00	5.00	1.28
6	108	3.88	1.00	5.00	1.14
7	108	3.85	1.00	5.00	1.07

**Table 2** Total scores

Descriptive statistics				
Subjects (n)	Mean	Minimum	Maximum	Standard deviation
108	27.3	13	35	4.7

Speech perception is only one aspect of the evaluation of understanding, but other measures such as the perception of sound quality and user satisfaction are also important.<sup>18</sup>

Our survey results (► **Table 1** and **2**) showed a high score of the variables (mean = 27.3, with a maximum of 35 points). These results show a high level of satisfaction with the HA and significant improvement in quality of life, translated by effective use of the HA. This result is in agreement with the literature.<sup>13,15,17,19–21</sup>

Cox and Alexander also observed high scores with the IOI-HA questionnaire, suggesting favorable attitudes toward participants' HAs.<sup>15</sup> The researchers commented on the likely sensitivity of the questionnaire to detect individuals with negative experiences regarding HA.

Other studies emphasized the noticeable improvement in the skills of speech or subjective benefit after continuous use of HA<sup>12–22</sup>; however, there is no agreement on the ideal time to observe a significant change on improvements in speaking skills.<sup>23</sup> In a study of 3,000 HA users, only 59% reported being satisfied with the performance of their devices,<sup>24</sup> with a strong association in patients who perceived sounds clearly, resocialization in leisure activity, and use in noisy or difficult listening situations, among others.<sup>25</sup>

Regarding the domains assessed by the questionnaire, 85.19% of subjects reported using HA between 4 and 8 hours per day, 69.45% reported that the HA has helped a lot, 47.23%

reported little or no difficulty in hearing with HAs, 77.78% thought it was very worthwhile to wear HAs, 52.78% reported that the problems of hearing had little or no affect on their activities, 67.6% reported that their trouble hearing had little or no affect on other people, and 52.78% thought that the HA significantly or very much increased their enjoyment of life. Given these results, there was a high degree of satisfaction for HA users.

In ► **Table 3** we verified the relationship between the individual and his or her HA (factor 1) and between his or her environment (factor 2), and the high score of these factors, 4.11 and 3.61 (maximum score of 5), respectively, reflected good adaptation results, as well as in other studies.<sup>20,26,27</sup> Comparing factors 1 and 2, we found a statistically significant difference ( $p \leq 0.001$ ), indicating a better relationship between the individual and the environment. This result may indicate that the fitting of HAs is able to help the user reenter contact with society, because, in the process of aging, hearing loss, among sensory deprivation, produces the greatest impact on communication of the elderly (most of our sample), leading to isolation.<sup>19–27</sup>

The World Health Organization considers someone elderly if he or she is over 60 years of age; this study sampled predominantly elderly individuals with a mean age of 77. Among the consequences of the natural aging process, we may mention auditive alterations, which occur mainly due to

**Table 3** Descriptive statistics of the scores of factors 1 and 2

Factors	Descriptive statistics				
	Subjects (n)	Mean	Minimum	Maximum	Standard deviation
Factor 1 (questions 1, 2, 4, and 7)	108	4.11	1.25	5.00	0.84
Factor 2 (questions 3, 5, and 6)	108	3.61	2.67	5.00	0.85



disturbances that affect the inner ear, degrading the auditory organ.<sup>28</sup>

In a study that evaluated the quality of life of adults and elderly people after HA fitting, the authors observed an improving quality of life as a whole with HA use, showing the importance of using HAs and referring users to adaptation programs and training for communication strategies.<sup>29</sup> Furthermore, the authors emphasized the need for the creation of programs for the reintegration of the individuals to society, such as the referral of individuals to social groups, aiming at improvement of social relationships.

Thus, in all cases monitoring is essential, because orientation and follow-up are keys to successful, effective use of the HA, and its importance in the process of adaptation should therefore not be minimized.<sup>21,27,30,31</sup>

With this study, we demonstrated the high degree of satisfaction from the use of HAs in all areas analyzed. We demonstrated user satisfaction with the interrelation of the user with his or her HA and environment (factors 1 and 2), especially with the environment.

## Conclusion

The results of this study demonstrate that the use of a protocol to assess the degree of user satisfaction was simple and easy to apply to register HA performance. The study group showed satisfaction with its use of HAs, which presents as a direct result of improved quality of life for these patients.

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