

# Abandonment analysis of the use of Personal Sound Amplification Device (AASI) received through the Health Care Hearing Program of Taubaté's Municipal University Hospital

## Original Article

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### Abstract

**Introduction:** Hearing impairment negatively affects an individual's quality of life, and the Personal Sound Amplification Device (AASI) aims to improve this condition. The Municipal University Hospital of Taubaté (HMUT) offers the Hearing Health Care Program (PASA) with a multidisciplinary team serving over 2,9 million people.

**Objectives:** To reduce abandonment of the device in SUS, it is essential to understand the challenges faced by patients regarding the use of the hearing aid.

**Materials and Methods:** This is an observational, descriptive, and analytical study assessing 277 patients in December 2021, using a survey form through Google Forms and individual interviews.

**Results and Conclusions:** The results highlighted that the main complaints linked to the abandonment of the AASI include noise, dizziness, headaches, and recurrent otitis. Based on that, it is fundamental to provide information about the use and adjustment of the AASI, as well as to ensure ongoing medical follow-up after its acquisition.

**Keywords:** hearing loss; hypoacusis; presbycusis; hearing aids.

### Introduction

Hearing loss is defined as an inability or reduced ability to hear, with varying degrees of auditory impairment that negatively affect an individual's quality of life.<sup>1</sup> Because communication is directly related to hearing, auditory deprivation can contribute to social withdrawal.<sup>2</sup> Hearing loss also limits the ability to respond to life-threatening situations; for example, individuals with certain levels of hearing impairment may not hear alarms.

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In this context, one of the interventions aimed at improving the patient's quality of life by mitigating the challenges associated with hearing loss is the Personal Sound Amplification Product (PSAP), whose function is to amplify environmental sounds and deliver them at an audible and comfortable intensity.<sup>6</sup> There are three main types of hearing loss: conductive, sensorineural, and mixed. The degree of impairment relates to the ability to hear speech, ranging from mild hearing loss (difficulty in understanding distant speech) to profound hearing loss (often unable to understand even amplified speech).<sup>3</sup>

According to the World Health Organization (WHO), hearing loss generates an annual burden of USD 67–105 billion for healthcare systems due to unemployment and early retirement caused by this condition.<sup>4</sup> Furthermore, an estimated 466 million people worldwide live with hearing loss, including 432 million adults and 34 million children.<sup>5</sup>

Therefore, hearing loss is an important public health issue. In September 2004, Ordinance No. 2,073 established the National Policy for Hearing Health Care in Brazil, aimed at ensuring comprehensive care through multiprofessional and interdisciplinary assistance, health promotion, rehabilitation, and harm prevention. As the Ministry of Health is responsible for comprehensive hearing loss care, the Brazilian Unified Health System (SUS) provides hearing rehabilitation with PSAP to patients who meet the criteria for using them.<sup>7</sup> The Hospital Municipal Universitário de Taubaté (HMUT) is a referral center in the Vale do Paraíba region, serving more than 2.9 million inhabitants. Its Hearing Health Care Program (PASA) comprises a multidisciplinary team that adapts new PSAPs, providing approximately 164 devices per month and up to 984 devices annually. A 2007 assessment of the quality of life of patients who received hearing aid through this service showed that 8% of PASA participants discontinued PSAP use due to handling difficulties, otalgia, or battery cost. Data from HMUT indicate that each hearing aid costs PASA approximately

BRL 1,000, and roughly 1,800 devices are distributed per year. Consequently, 8% of users who discontinue PSAD use generate an estimated annual loss of BRL 140,000.<sup>8</sup>

PSAD non-use is not restricted to Brazil. A study in Northern Ireland on older adults with hearing loss found that the reported reasons for insufficient device use, defined as fewer than eight hours per day, were lack of information and support for adjusting the device, absence of follow-up during the adaptation period, discomfort or pain caused by the ear mold, and uncertainty about whether the device was functioning properly.<sup>9</sup>

These findings highlight the need for a better understanding of the difficulties faced by PASA patients at HMUT that contribute to PSAP abandonment, with the aim of implementing strategies and reducing dropout rates within SUS, thus improving the quality of life of individuals with hearing loss.

## Materials and Methods

This observational, descriptive, and analytical study was approved by the Plataforma Brasil Ethics Committee (55479721.0.0000.5501). A total of 277 patients residing in the Vale do Paraíba region who received PSADs through HMUT's PASA program between January and December 2019 were interviewed. The PASA program evaluates 82 patients per month, totaling 984 annually. Sample selection was based on statistical sampling calculations performed using the SurveyMonkey<sup>10</sup> website, which indicated that 277 participants were required to achieve a 95% confidence level and 5% margin of error. Data were collected from the medical records between December 1 and December 31, 2021, including name, age, sex, etiology of hearing loss, type and degree of loss, unilateral or bilateral adaptation, type of hearing aid, and onset date of auditory symptoms. Subsequently, from January 1 to January 31, 2022, patients were contacted for interview scheduling via an online questionnaire (Google Forms), which was sent by e-mail. Patients who preferred in-person interviews were scheduled after receiving the

second dose of the COVID-19 vaccine and at least 15 days post-immunization. Electronic informed consent was obtained through an online form, while printed consent forms were used for in-person interviews. A total of 277 patients were interviewed between February 1 and March 1, 2022, and the interview included signing of the Informed Consent Form (ICF). This study used the University of Taubaté (UNITAU) questionnaire on effective PSAP use, updated as needed, presented in the following images entitled as “*Images of the administered questionnaire*”. It was developed using the International Outcome Inventory for Hearing Aids (IOI-HA) and Satisfaction with Amplification in Daily Life (SADL) questionnaires, and consists of eight yes/no questions, including five questions with predefined response options following a “no” response, and eight open-ended questions, **one of which also includes a yes/no option with a predefined response.**

The exclusion criteria were refusal to participate, inability to contact, lack of signed ICF, age under 18 years, and unvaccinated status. After applying these criteria, 52 complete questionnaires were obtained.

Data analysis, results generation, and discussion were carried out between March 2 and April 1, 2022. A literature search was conducted in Scielo, PubMed, the Pan American Health Organization, United Nations, Federal and Regional Councils of Speech-Language Pathology and Audiology, and saude.gov.br, specified in Table 1. Articles unrelated to the study topics, such as PSAP abandonment and hearing loss, were excluded, along with duplicate articles.

## Results

The questionnaire was completed by 32 women and 23 men, aged between 18–93 years (mean 58.4 years). Among them, 74.5% participants had bilateral hearing loss, of whom 47.3% had moderate loss, and presbycusis was the most common etiology (31%).

Regarding PSAP use, 83.64% participants used PSAP, while 16.36% participants did not. Among the nonusers, 55.5% participants abandoned the device within the first year. Among the users, 82.6% participants used the device daily, with 60% using it 8–12 hours/day and 23% using it more than 12 hours/day. Most users (85%) had 1–5 years of experience with PSAP use. Among those who discontinued PSAP use, 44.4% participants had used the device for less than three months. Battery lasted for 10–15 days according to 50% participants. Overall satisfaction was high: 93% participants were satisfied with the PSAP, 52.1% reported that it met their expectations, and 24% felt it fell short. In terms of overall satisfaction, 71.1% participants were satisfied and 17.3% unsatisfied; nevertheless, 98% participants still considered PSAP use worthwhile.

The reasons for PSAP abandonment included lack of information on device use, inability to return for follow-up, discomfort, theft, and malfunction. The most common complaints were background noise, dizziness, headaches, and recurrent otitis. The common reasons for seeking help included lack of information, distance to the hearing health program, waiting lists, limited time, and restrictions imposed by the COVID-19 pandemic. Regarding follow-up visits, 13 participants

**Table 1**  
Databases and retrieved articles

| Databases used   | Articles retrieved from each database |
|--|---------------------------------------|
| Scielo   | 1; 6; 10; 11; 13; 14; 16; 17; 19; 20  |
| PubMed   | 9; 12; 15; 18                         |
| Pan American Health Organization   | 5                                     |
| United Nations   | 4                                     |
| Federal and Regional Councils of Speech-Language Pathology and Audiology | 3                                     |
| Saúde.gov.br   | 2; 7                                  |

## Appendix A

### Questionnaire on effective use of hearing aids in daily life

Date of data collection

Name:

City:  Date of birth:

Age at the time of the interview:  Sex: Female  Male

#### Education

Illiterate  Completed elementary school  Did not complete elementary school

Completed high school  Did not complete high school  Completed higher education

Did not complete higher education

#### Monthly per capita income

< 1 minimum wage  1 to 2 minimum wages  3 to 4 minimum wages  > 4 minimum wages

Date of first hearing symptoms (year):  Date of appointment (month/year):

Date of hearing aid receipt (month/year):

#### Type of device received

Behind-the-ear  In-the-ear  Open-fit  Unilateral  Bilateral

#### Etiology of deafness

Presbycusis  Chronic otitis media  Noise-induced hearing loss  Genetic

Congenital infectious  Ototoxicity  Unknown  Other

#### Degree of hearing loss in the right ear

Mild  Moderate  Profound  Severe

#### Degree of hearing loss in the left ear

Mild  Moderate  Profound  Severe

#### Type of hearing loss in the right ear

Sensorineural  Conductive  Mixed  Central

#### Type of hearing loss in the left ear

Sensorineural  Conductive  Mixed  Central

**INSTRUCTIONS:** The questions below are about your hearing aid. For each question, select the answer that best applies to you.

1. Have you been using your hearing aid? Yes  No

If the answer above is NO, what caused you to stop using the device?

If the answer above is NO, why did you not seek help?

If the answer above is NO, how long did you use it?

If the answer above is NO, how long has it been since you last used it?

**2. How many days a week do you use your hearing aid?**

How many hours a day?

**3. How long does the battery in your hearing aid last?**

1 to 4 days  5 to 9 days  10 to 15 days  More than 15 days

**4. Do you feel embarrassed about wearing your hearing aid, or are you satisfied with its appearance?**

Embarrassed  Satisfied

**5. Does your current device represent more, less, or exactly what you expected?**

More than expected  Exactly what expected  Less than expected

**6. Has your hearing aid helped improve communication with people at home?**

Yes  No

**7. Has your hearing aid improved your ability to understand conversations when multiple people are talking at once, such as in restaurants, churches, or markets**

Yes  No

**8. Has your hearing aid helped you hear better when using technological devices, such as watching TV or talking on the phone?**

Yes  No

**9. Do you feel more independent since you started using your hearing aid?**

Yes  No

**10. How many times have you returned for hearing evaluations after receiving your hearing aid?**

**11. Are you satisfied with the number of times your hearing aid needed repair?**

Yes  No

**12. Do you believe using a hearing aid is worthwhile?**

Yes  No

**13. How long have you been using your current hearing aid?**

Less than 3 months  3 to 11 months  1 to 5 years  More than 5 years

**14. Have you used another hearing aid before?** Yes  No

**If yes, for how long?** Less than 3 years  3 to 5 years  6 to 10 years  More than 10 years

**15. In your opinion, are there any disadvantages of using a hearing aid? If so, which ones?**

returned once after receiving the PSAP, seven returned twice, 10 returned three times, and 17 patients (35%) never returned.

Regarding the quality of life, 93% participants reported better communication with family members in quiet environments and 85% in noisy environments. Additionally, 89% participants noted improved understanding of technological devices, and 83% felt more independent after receiving the PSAP.

However, 31% participants experienced device-related discomfort, primarily difficulty in hearing in noisy environments, adaptation problems, moisture exposure, device complexity, device repair difficulties, embarrassment while using the device, and battery depletion. More details about the patients in general are in Table 2; More information about those who discontinued PSAP use are in Table 3. The subgroup of patients who abandoned PSAP use comprised nine individuals, a limited sample due to pandemic-related contact difficulties. All were bilateral users of behind-the-ear devices. Sensorineural loss predominated in 77.8% participants, while mixed and conductive losses each accounted for 11.1%. The degree of

hearing loss ranged from mild to profound, with moderate bilateral loss being the most frequent (33.3%). Participants were aged between 40–78 years (mean 65 years), indicating a predominance of older adults.

## Discussion

The female predominance (58.18%) noted in this study may reflect the higher life expectancy and more frequent healthcare-seeking behaviors among women, even when their hearing loss is less severe than that in men.<sup>12</sup> Moderate hearing loss (grade I up to 55 dB HL and grade II up to 70 dB HL) was reported by 47.3% participants, consistent with individuals seeking care when hearing deficit interferes with daily activities and social communication.<sup>11</sup>

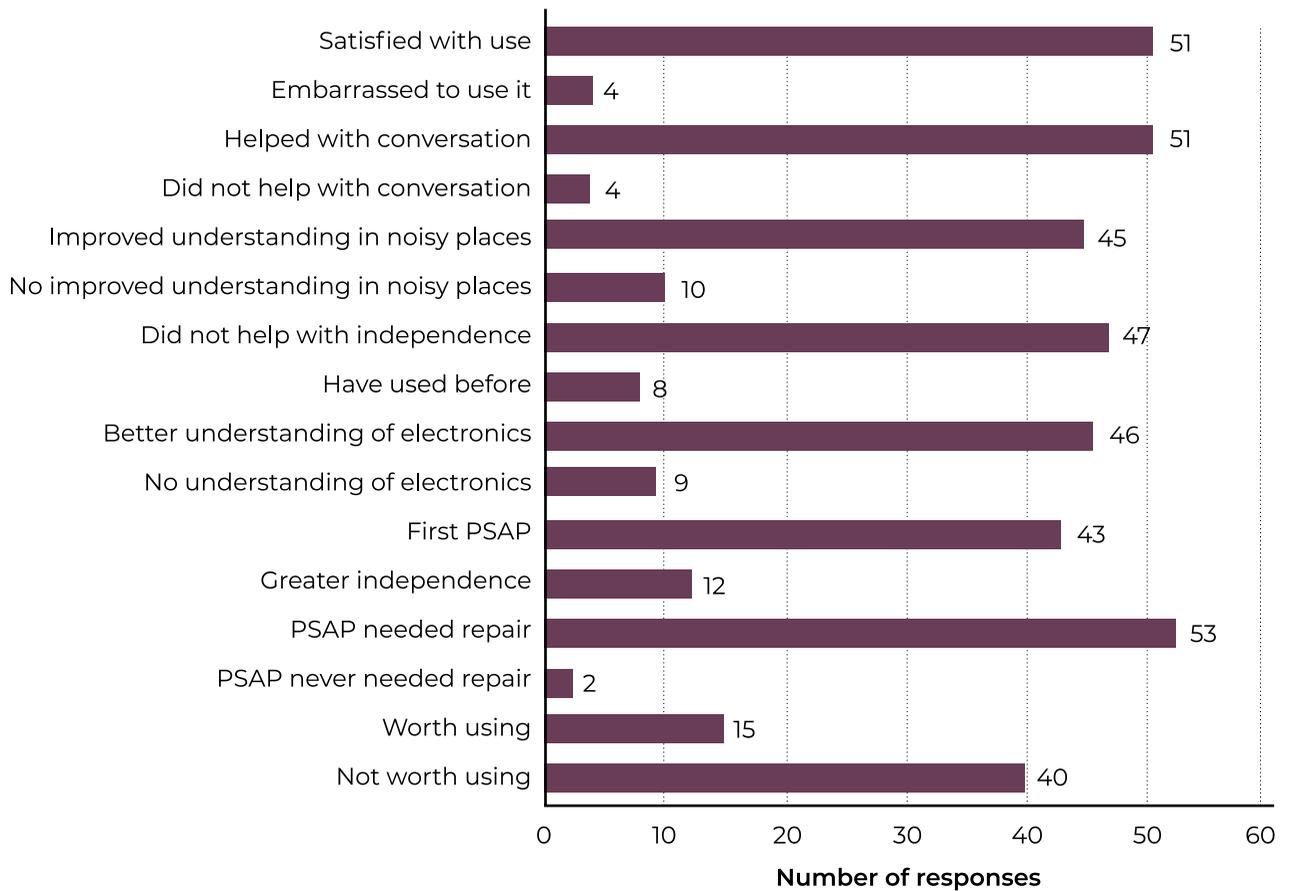
Presbycusis was the most prevalent etiology (31%), consistent with the predominance of older adults, in whom bilateral sensorineural age-related hearing loss is the most common.<sup>11</sup> Behind-the-ear devices were the most frequently provided devices, benefiting 50 patients, with an average waiting time of 3.34 months, which is an improvement compared with the previous record of 4.4 months.

**Table 2**  
PSAP-related discomfort and reported frequency

| Categorias de Inconveniência no uso do AASI                                    | Number of participants | % of sample |
|--|------------------------|-------------|
| No discomfort  | 24                     | 44          |
| With discomfort  | 24                     |             |
| Sensitivity  | 19                     | 38          |
| Tinnitus   | 4                      |             |
| Tinnitus + pruritus  | 3                      |             |
| Pruritus   | 3                      |             |
| Pruritus + difficulty in understanding people speaking at the same time        | 3                      |             |
| Difficulty in understanding people speaking at the same time                   | 2                      |             |
| Headache   | 1                      |             |
| Tinnitus + pain  | 1                      |             |
| Tinnitus + difficulty in understanding people speaking at the same time        | 1                      |             |
| Pruritus + difficulty in understanding people speaking at the same time + pain | 1                      |             |
| Functional   | 6                      | 12          |

**Figure 1**

Questionnaire responses analyzed in the article. PSAP, personal sound amplification product



**Table 3**

Patients who discontinued PSAP use

| Laterality and model | Bilateral          |                  | Behind-the-ear      |                       |                       |                       |                     |
|----------------------|--------------------|------------------|---------------------|-----------------------|-----------------------|-----------------------|---------------------|
|                      |                    |                  |                     |                       |                       |                       |                     |
|                      | 100% (9)           |                  | 100% (9)            |                       |                       |                       |                     |
| Type of loss         | Neurosensory       | Mixed            | Conductive          |                       |                       |                       |                     |
|                      | 77,8% (7)          | 11,1% (1)        | 11,1% (1)           |                       |                       |                       |                     |
| Degree of loss       | Moderate bilateral | Severe bilateral | R mild + L moderate | R severe + L moderate | R profound + L severe | R moderate + L severe | R normal + L severe |
|                      | 33,3% (3)          | 11,1% (1)        | 11,1% (1)           | 11,1% (1)             | 11,1% (1)             | 11,1% (1)             | 11,1% (1)           |
| Age                  | Minimum            | Maximum          | Mean                |                       |                       |                       |                     |
|                      | 40                 | 78               | 65                  |                       |                       |                       |                     |

This model is preferred for its versatility, power, ease of adaptation, and lower operational costs.<sup>1,13</sup> Most users (82.6%) wore the PSAP seven days a week, and 83% used it for more than eight hours daily. A study at the Hearing Health Care Service of Hospital das Clínicas

da Universidade Federal de Minas Gerais (HC/UFMG) found that regular PSAD users were more satisfied with their devices,<sup>9</sup> suggesting that the duration of daily use influences satisfaction, adaptation, and adherence. Battery life ranged from 10 to 15 days but

was not used as an analytical parameter due to the multiple variables involved.<sup>1</sup> Handling difficulties, discomfort, lack of technical support, and absence of battery provision by SUS were the main factors associated with low adherence, as described by Fonsêca et al. To improve adherence, the Audiology team at the University of São Paulo (Bauru, SP) developed multimedia educational material (DVD) to provide information on PSAP use and handling after researching the major difficulties faced by patients.<sup>16</sup> Older adults often require more time to absorb information, and multimedia material facilitates repetition. Another factor mentioned by Fonsêca et al. that directly influenced their results was the lack of battery provision by the SUS, which led to reduced duration of daily PSAP use.<sup>14</sup>

Family influence plays a significant role in the adaptation process. While 93% participants reported improved communication with family members, Laplante-Lévesque et al. found that family can facilitate adaptation by encouraging device use, or hinder it by demonstrating impatience during communication.<sup>15</sup> Thus, better communication occurs when family members encourage the patient to use the device. Regarding the use of technological devices, 89% participants reported improved comprehension when using such devices, which can enable older adults to maintain remote communication and reduce social isolation.<sup>17</sup> Furthermore, 83% participants reported increased independence in social, domestic, or work environments. Hearing loss is associated with the social exclusion of deaf individuals, particularly in workplaces where verbal communication predominates, and this reduces the productive capacity of this population.<sup>10</sup> Regarding follow-up, 35% patients did not return to PASA after PSAD acquisition. Although not a majority, this represents a significant proportion of patients who no longer undergo hearing assessment, which is essential after the receipt of a hearing aid for proper adaptation. Comparable absenteeism rates (38% in Espírito Santo and 21.3% in an Argentinian public hospital) indicate that this

problem affects other services at a percentage similar to that found in the PASA.

Regarding patient follow-up within the Hearing Health Care Program, a study published in *Seminars in Hearing*, which analyzed disparities in hearing health, demonstrated that access to the public healthcare system is affected by multiple factors, including financial, organizational, social, accessibility, and acceptability barriers. One potential measure that can improve accessibility to hearing health care was highlighted in a report by the National Academies of Sciences, Engineering, and Medicine (NASEM), which recommended the promotion of community health agents (CHAs) to potentially increase adherence to these services.<sup>18</sup> Furthermore, a study conducted in Northern Ireland emphasized the importance of regular follow-up to provide support and device adjustment for patients.<sup>9</sup> Most users reported satisfaction with their PSAP, although 31% mentioned inconveniences such as difficulty in understanding speech in noisy environments and physical discomfort. These findings highlight the fact that PASA needs to provide better assistance to patients seeking device adjustment and adaptation, and guidance for those requiring device repair. In addition to these factors, there are certain variables beyond the program's control. Based on experience with hearing aids, a study at the UCL Ear Institute (London, England) reported that a patient's use of a hearing aid can be influenced by factors such as lifestyle, degree of hearing loss, perceived hearing impairment, and perceived benefit from hearing aid use, among other considerations.<sup>19</sup> Therefore, the patient's experience with the PSAP is also shaped by these variables.

Among patients who discontinued PSAP use, the majority (44.4%) had used the device for less than three months, a period considered insufficient for proper adaptation and full perception of auditory benefits. These findings reinforce the importance of multidisciplinary follow-up and educational interventions to promote sustained adherence to PSAP use.<sup>9,20</sup>

## Conclusion

The results revealed that the primary factors associated with PSAP abandonment were using the device for less than three months, lack of encouragement from family members, battery cost, failure to return to PASA after obtaining the device, and absence of support in case of difficulty handling the device or need for repair. Additionally, the primary reasons for discontinuing PSAP use included noise, dizziness, headache, and recurrent otitis. Patients who discontinued PSAP use predominantly had moderate bilateral sensorineural hearing loss; however, the small sample size limits the generalizability of these findings. In conclusion, it is essential to provide patients with information on proper PSAP use and adjustment, in addition to ensuring continuous medical and multidisciplinary follow-up after PSAP acquisition. Future studies with larger sample sizes are needed to confirm these findings.

## Conflicts of interest

The authors declare that they have no conflict of interest regarding this article.

## Data confidentiality

The authors declare that they followed the protocols of their work in publishing patient data.

## Human and animal protection

The authors declare that the procedures followed are in accordance with the regulations established by the directors of the Commission for Clinical Research and Ethics and in accordance with the Declaration of Helsinki of the World Medical Association. Privacy policy, informed consent and Ethics committee authorisation. The authors declare that they have obtained signed consent from the participants and that they have local ethical approval to carry out this work.

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## Scientific data availability

There are no publicly available datasets related to this work.

## Declaration on the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the author Rebeca Carrijo de Sá Alves Mendes used ChatGPT to adapt the manuscript to the maximum page limit required by the Portuguese Journal of Otorhinolaryngology and Head and Neck Surgery, following additions and revisions requested by the reviewers. The tool was also used to adjust the conclusion regarding patients who discontinued the use of the Individual Sound Amplification Device, as required. After using this tool, the author reviewed and edited the content as necessary and assumes full responsibility for the content of the publication.

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