

PROFILE OF HEARING AID USERS WITH A VIEW TO AMPLIFICATION, COGNITION AND AUDITORY PROCESSING

Perfil dos usuários de AASI com vistas à amplificação, cognição e processamento auditivo

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ABSTRACT

Purpose: to establish the hearing aid users' profile attended in the Hearing Health Center with a view to amplification, cognition and auditory processing (AP). **Method:** 59 individuals participated in this study aged between 41 and 92 years old. In the first stage, it was realized the data assortment through the audiology and otolaryngologist evaluations, first interview, speech test wearing the hearing aid, molds and hearing aid information, orientations and the hearing training results. In the second stage, it was realized the Digits Dichotic test (DD) and the Frequency Pattern Test (FPT), Cognitive-Alzheimer' disease Evaluation (ADAS-Cog) and the Geriatric Depression Scale (GDE-15). In this stage, 47 people participated. **Results:** 67,80% of the individuals in this study are 60 years old or older. The most referred symptoms were dizziness, tinnitus and noise exposition. In the audiology evaluation, it was possible to identify sensorineural hearing loss of moderate levels and most frequently descendent configurations, coinciding with the imitanciometric findings: Type A curve with absent reflexes. In the hearing training, comprehension and identification were the most altered functions. In the DD test and the FPT test, the average number of right answers was under the normality level. In the ADAS, the evoked and recognized word and its comprehension had the biggest score. In the GDE, 20 individuals presented characteristics of depression. **Conclusion:** it was possible to establish the hearing aid users' profile with a view to amplification, cognition and (AP).

KEYWORDS: Hearing Loss; Hearing Aids; Cognition; Hearing Loss, Central; Aging; Rehabilitation of Hearing Impaired

■ INTRODUCTION

Hearing is a complex function that is part of a very specialized communication system. It is one of the senses that is fundamental in life which has an important role in the human communication basis. So, an individual with hearing loss could suffer serious damages in its social, psychological and professional life.

According to the Handicaped National Health Politics, presbycusia¹ in adults is a Noise-induced hearing loss (NIHL), being the most prevalent pathology in the elderly and in individuals exposed to noise respectively. These pathologies are characterized for the presence of sensorineural hearing loss compromising or not hearing discrimination in variable levels²⁻⁴.

One of the treatments for inner ear hearing loss is hearing aid (HA) adaptation, which is fundamental in restabilizing communicative abilities.

According to the ordinance 587, the services authorized by the Ministry of Health for the provision of HA, must provide to the person with hearing loss the best use of their residual hearing. Therefore, any individual who presents difficulty in communication due to hearing loss is a potential candidate to use HA. The law also forecast for monitoring and

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speech therapy session, besides the HA supply itself, thus ensuring the effectiveness of the rehabilitation program.

Despite the technological resources used in the preparation of the hearing devices, although there are reports from patients about difficulties in the adaptation process, especially difficulties of speech recognition in competitive situations, by the elderly. Some studies indicate that the central auditory abilities are related to cognitive functions^{5,6}.

Some authors mention the influence of auditory processing (AP) and cognition in favor of HA adaption^{7,8}. Such aspects can be considered in the selection, display and adaptation of hearing aids as well as therapy sessions to improve the skills of individual auditory perception, as well as compensatory strategies⁹.

The present study aims to establish a profile of users of hearing aids with a view to hearing, cognition and hearing loss treated at the Health Center.

■ METHOD

This study was conducted at the Center of Health Clelia Spinato Manfro in Nossa Senhora de Fátima College in the city of Caxias do Sul, Rio Grande do Sul. Participated in the study all patients who received hearing aids from December 2009 and finished the auditory training until the end of the collection of this study in October 2010. The sample comprised 59 patients, 12 were excluded for lack of attendance (health problems) or location (address change). Thus, the data collected from medical records were analyzed in 59 participants while the data collected in the next stage considered 47 participants.

The average age of the participants was 66.10 years, which was 41 years minimum, and maximum of 92 years. Furthermore, 19 (32.20%) patients were between 41-59 years of age at the time of data collection, and 40 (67, 80%) aged over 60 years of age. In relation to gender 32 (54.24%) were male and 27 (45.74%) were female.

Data collection was divided into two stages: the first was formed from the consultation of medical records, using a previously prepared statement for the study, data consisting of complete audiological, otorhinolaryngologist evaluation, medical history, measurements of acoustic impedance, speech test with hearing aids in use, data from the mold and hearing aid, guidance received and results of speech therapy (auditory training). To perform this step gave the authorization term to query the records signed by the direction of the Center for Health.

After data collection, patients were located by means of telephone contact to explain the

research, and scheduling for the completion of the second stage. At this stage, we performed auditory processing (AP) tests: the Dichotic Digits (DD) and Frequency Pattern Test (FPT) battery application for the Alzheimer's Disease Assessment Scale-Cognitive (ADAS-Cog) and the Geriatric Depression Scale (GDS). At this time, was presented the Statement of Informed Consent (IC) to the selected subjects, stating the research objectives and the proposed procedures as well as its potential benefits and risks. The completion of the second stage began only after signing the IC.

All participants made use of HA during the AP tests and also made an initial review to verify the conditions of the HA and its operation. First, the tests were performed using AP audiometer MAICO MA42 coupled to the apparatus of Philips CD player, properly calibrated. The CD Player was adjusted in volume 14 and the DD and FPT tests were carried out in the open field, because the study participants underwent evaluations using HA.

DD testing was performed only in the step called binaural integration, which requires the integrity of intra-hemispheric and inter-hemispheric (corpus callosum). Participants were positioned in front of the examiner between the two speakers at a distance of one meter between the ears and the boxes. In relation to height, the boxes remained at the level of the ears. We selected a channel one for one of the boxes and channel two for the other, with an intensity audible and comfortable for both channels (approximately 65dBNPS) considering that the participants performed the tests with the HA. All participants were instructed to listen to two different pairs of numbers presented to each ear, and soon after, repeat all four numbers heard. The results were expressed as percentages of correct responses for binaural integration steps on the right and on the left.

The FPT was established only in the naming condition which also requires the intra-hemispheric integrity to recognize the pattern and tonal inter-hemispheric to name it. It also assesses the ability of temporal sequencing, because the test consists in the presentation sequence of 03 tones that differ in height. To accomplish it, participants were positioned in front of a speaker using only one channel, since that test was dichotic (single message to both ears). The intensity used was approximately 65 dB SPL. Initially, we determined whether the participant knew the concept of time, directed a reference to "thin" for the high tones and "thick" for the bass. After the examiner presented three tonal patterns in live voice, the patient would appoint. It was then shown a test sequence for the patient to appoint and realize the speed which would be presented. The results

were expressed as percentage of correct one for the naming condition.

In both tests, participants who had difficulties in understanding the test were re-examined and restarted.

Following, the neuropsychological battery ADAS-Cog was performed, whose duties are assessed memory (50%), language (28%), praxis (14%) and controls (8%) through the following subtests: immediate recall of words, naming objects and fingers, commands, constructive praxis and ideational orientation, word recognition, memory instruction, skill in spoken language, word finding difficulties in spontaneous speech and comprehension.

The ADAS-Cog was developed in order to evaluate the magnitude of cognitive changes that characterize dementia such as Alzheimer's Disease. This aspect has motivated the choice of the instrument as well as be available for use free of charge. Furthermore, it may be administered from 30 to 45 minutes¹⁰.

The immediate recall of words is composed of a list of ten words in which the participant is asked to read them aloud and to try to memorize them. The words were presented on cards every 2 seconds. During recall, the words were marked in the same order they were mentioned. The subtest includes the use of three attempts to read and recall (same list in different order). For illiterate patients the list was read by the examiner.

For naming objects and fingers, were presented to the participant 12 real objects – flower, bed, whistle, pencil, rattle, mask, scissors, comb, wallet, tambourine, stethoscope and tweezers – in order to be appointed. If presented difficulty to name them, there was a possibility of receiving a suggestion, before performing the marking as incorrect or not named. It is noteworthy that one of the objects (harmonica) was replaced by the same criterion, musical instruments (tambourine) due to the difficulty of being acquired. In adaptation to Brazilian Portuguese, there is the possibility to choose other random objects. The other task was to name the fingers of your dominant hand. It was also accepted as correct naming popularly known.

To achieve the third subtest, commands, the participant was asked the following five commands requested by the examiner, one at a time. When the patient could not perform them, or made a mistake, the command was given once again. The item constructive praxis assessed the individual's ability to copy four geometric figures. The pictures were presented individually on a sheet of blank paper. For each participant was given the opportunity to try to play them twice. As for evaluating the praxis ideations was provided a sheet of paper, envelope,

and a pencil. The examiner read the instructions to be followed, with five key components. When the patient had difficulties or forgotten part of the task the instruction was repeated.

The guidance consists of a task composed of eight questions that were answered by the participant to verify if they were aware of themselves, time and space. The components of this item is the full name of the individual, day of the week, day, month and year, season, time and specific location. For recognizing words task the patient was asked to read 12 words. It was then provided another list composed of the same 12 words mixed with other 12 different ones. There were three attempts, and in each, the word order was changed.

The remaining items assessed were not carried out by means of specific tasks, but the judgment of the examiner to consider the previous steps. Thus, the recall of instructions evaluated the individual's ability to remember the instructions in the test of word recognition. The spoken language ability in evaluating the quality of speech, such as clarity and ability to make himself understood. In this item the examiner considered all speech produced by the individual during the test session and conversation beforehand. The word finding difficulties in spontaneous speech evaluated the reduction in expressive speech, difficulty finding words. Finally, understanding evaluated the individual's capacity to understand the speech of the examiner should consider whether it was able to understand his speech at the different stages of evaluation.

The results of the battery ADAS-Cog scores are expressed. The higher, more seriously impaired.

Finally, to detect traces of depression, it was used the Brazilian version of the GDS-15, consisting of 15 questions with two options (yes or no), worth 1 point for a "yes" and zero for "no." The index is given by the sum of all choices. It was considered the cutoff point of less than 5 points as normal, greater than or equal to 5 as a suspicion of depression, and greater than or equal to 11 as suggestive of severe depression as proposed by the literature. All questions were read aloud by the examiner allowing illiterate individuals to be included in the study. This scale was chosen, because it provides valid and reliable measures for assessing depressive disorders by considering the average age of study participants. The GDS-15 has the highest concordance with the ICD-10 and DSM-IV¹¹.

This study was approved by the Ethics Committee of Nossa Senhora de Fatima College under protocol 022/10.

Initially, it was elaborated a database specific worksheet. To describe the sample profile according to the variables under study, there were carried out

frequency tables of categorical variables (gender, age), with values of absolute frequency (n) and percentage (%) and descriptive statistics of continuous variables (age, test scores), with mean values, standard deviation, minimum and maximum values and median. For comparison of categorical variables between groups there were used chi-square or Fisher exact test for expected values below five. To compare the numerical variables between the two groups used the Mann-Whitney test, due to absence of normal distribution of variables. As for analyzing the relationship between the numerical variables was used Spearman correlation coefficient, because due to absence of normal distribution of variables. These analyzes were performed using the SAS software for Windows (Statistical Analysis

System) version 8.02. The level of significance for statistical tests was 5%, ie P by $p < 0.05$.

■ RESULTS

Table 1 shows the occurrence of the main aspects reported in the interview in that it is possible to observe the high prevalence of tinnitus, dizziness and noise exposure. By performing a comparative analysis between genders, 23 (71.88%) males and only 8 (30.77%) women reported exposure to noise while nine (28.13%) males and 18 (69.23%) women did not report the same exposure. This comparison was statistically significant ($P = 0.002$) and shows that men were more exposed to noise than women.

Table 1 – Occurrence of the main aspects reported in the interview

Aspects	Presence	Absence	No Answer
	n (%)	n (%)	(number of subjects)
Tinnitus	44 (74.58)	15 (25.42)	
Dizziness	30 (50.85)	29 (49.15)	
Noise Exposure	31 (53.45)	27 (46.55)	1
Use of PPE	7 (12.28)	50 (87.72)	2
Ototoxic Medication	2 (3.51)	55 (96.49)	2
Diabetes	8 (13.56)	51 (86.44)	

PPE – Personal Protective Equipment

Table 2 shows the results found in immittance testing, which type of tympanometric curve was the most frequent type A. Likewise, the absence of acoustic reflexes prevailed.

The results for pure tone audiometry of patients surveyed can be seen in Table 3, which shows that the type of hearing loss was more frequent for both ears. Likewise, with respect to the degree, there

Table 2 – Results for acoustic immittance testing by ear

Curve/reflexes	Right ear	No Data (RE)	Left ear	No Data (LE)
	n (%)	Number of ears	n (%)	Number of ears
Type A curve	32 (72.73)		35 (81.40)	
Type B curve	1 (2.27)	15	0 (0)	16
Type Ad curve	6 (13.64)		4 (9.30)	
Type As curve	5 (11.36)		4 (9.30)	
Ipsilateral acoustic reflex present	5 (11.36)		8 (19.05)	
Ipsilateral acoustic reflex absence	39 (88.64)	15	34 (80.95)	17
Contralateral acoustic reflex present	5 (11.36)		6 (14.29)	
Contralateral acoustic reflex absence	39 (88.64)	15	36 (85.71)	17

is the mild and moderate. The downward sloping was the most frequent, then the planar, also for both ears. By performing a comparative analysis between the age groups identified that the downward sloping was more prevalent in participants

aged 60 years or more, 27 (67.5%) while the plane was more prevalent in participants with less than 60 years, 8 (44.44%). This comparison was statistically significant ($P = 0.013$).

Table 3 – Results for pure tone audiometry

		Right Ear	Left Ear
		n (%)	n(%)
Type	Sensorineurall	37 (63.79)	41 (69.49)
	Mixed	21 (36.21)	18 (30.51)
	Absence (number of ears)	1	
Degree	Normal	1 (1.72)	2 (3.39)
	Slight	19 (32.76)	18 (30.51)
	Moderate	30 (51.72)	27 (45.76)
	Severe	7 (12.07)	10 (16.95)
	Profound	1 (1.72)	2 (3.39)
Configuration	Absence (number of ears)	1	
	High frequency loss	33 (56.90)	
	Flat	17 (29.31)	
	Other	8 (13.79)	
	Absence (number of ears)	1	

In relation to vocal audiometry, the average frequency of 500Hz, 1000Hz, 2000Hz for RE was 52.50 dBHL (± 16.17), whose minimum intensity was 20 dBHL, and a maximum of 95 dBHL. The mean SRT or LDV was 55.96 dBHL (± 16.76), whose minimum threshold was 15 dB HL, and a maximum of 95 dBHL. As for the OE, the average frequency of 500Hz, 1000Hz, 2000Hz was 52.88 dBHL (± 18.08), whose minimum intensity was 20 dBHL, and a maximum of 95 dBHL. The mean SRT or LDV was 55.08 dBHL (± 18.70), whose minimum threshold was 20 dB HL, and a maximum of 100 dBHL. It is noteworthy that one of the subjects showed no response, for the purpose of statistical calculations was taken as 120 dBHL.

Speech recognition was tested with lists of monosyllables and / or disyllabic, whose average was 82.72% (± 14.97), with minimum 40% and a maximum of 100% in OD. In OE, the average was 83.77% (± 11.05), whose minimum value was 52% and maximum of 100%.

The comparative analysis of speech recognition among the age groups was statistically significant for both ears whose percentage of correct answers was higher for participants aged under 60 years of age. To the right ear, the median was 94% for

participants under the age of 60 years and 84% for participants aged 60 years or more ($P = 0.06$). As for the left ear, the median was 92% for participants under the age of 60 years and 84% for participants aged 60 years or more ($P = 0.02$).

All hearing aids adapted were of the retroauricular type, which requires the use of ear molds. The type, the acoustic equipment and modifications can be observed in Table 4. The most common type was the simple invisible, and the material used was the hard acrylic.

Likewise, in relation to the number of channels present in the HA, only two patients (3.39%) had a 16-channel hearing aid, 2 (3.39%) had a HA of 15 channels, five (8.47%) of 6 channels, 13 (22.03%) of 4 channels, and in most cases, 37 (62.71%) patients had 2-channel hearing aid.

In the speech test with HA, we used two-syllable word lists. The average speech recognition was 94.10% and the minimum percentage was 68% and 100% maximum, standard deviation of 7.44%.

All patients received guidance in the delivery of hearing aids, and 30 (50.85%) had no difficulties in counseling and 29 (49.15%) had such difficulty.

Results related to speech therapy for auditory training can be seen in Figure 1, which showed

Table 4 – Distribution of the hearing aids molds in type, material and modifications

		Right Ear	Left Ear
		n (%)	n (%)
Type	Skeleton molds	48 (82.76)	49 (83.05)
	Shell molds	7 (12.07)	7 (11.86)
	Non-occluding	3 (5.17)	2 (3.39)
	No Data (number of ear)	1	-
Material	Rigid Acrylic	55 (93.22)	
	Silicone	4 (6.78)	
Acoustic Modification (ventilation)	Yes	26 (44.07)	
	No	33 (55.93)	

better performance in detecting ability, degree of difficulty in discrimination skills and orofacial reading (OFR), and greater difficulty in identifying skills and understanding, and understanding was the skill most affected. These data were extracted from

medical records of patients whose information were arranged in a descriptive look. The authors classified the opinion of satisfactory performance, reasonable, and struggling with great difficulty

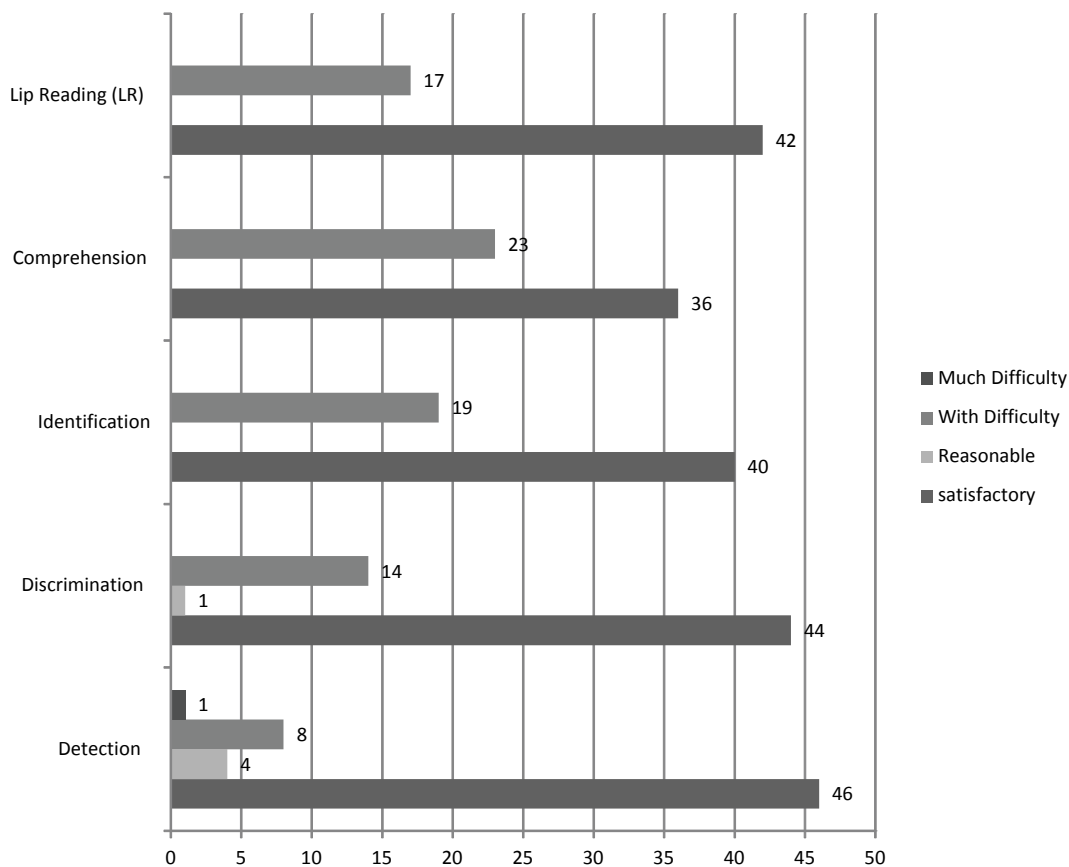


Figure 1 – Performance of speech therapy for auditory training

For tests of AP, DD test was conducted only on condition binaural integration. In this condition, for the OD, the score ranged from 10% accuracy and 97.50%, whose average was 59.52% (± 24.38). As for the OE, the percentage of correct answers ranged from 17.50% to 100% with an average of 66.54% (± 21.94). The same occurred in TPF for the naming condition, showing minimum percentages

of 10% and maximum of 100%, with an average of 68.71% (± 21.70).

The results found in the ADAS-Cog, which evaluates the representative aspects of cognitive dysfunction, the subtests that showed the greatest change were raised floor test, word recognition and comprehension. Table 5 presents the scores obtained in the test battery ADAS-cog.

Table 5 – Scores in ADAS-Cog tests

Test	Average	D.P	Minimum	Maximum
Evoked Word	4.39	1.28	2.33	7.33
Naming Objects and Fingers	0.62	0.82	0	3
Commands	0.06	0.32	0	2
Constrictive Praxis	0.83	0.71	0	3
Ideational Praxis	0.11	0.37	0	2
Orientation	0.75	0.75	0	3
Word Recognition Test	3.27	3.27	0	12.6
Test of Recall/Reminder	0.85	0.85	0	5
Ability in Spoken Language	1.02	1.02	0	5
Difficulty in Finding Words in Spontaneous Speech	1.06	1.06	0	5
Comprehension	1.12	1.12	1	5

Regarding EDG it was found that 27 (57.45%) had a lower index of 5, ie without overt depression, 18 patients (38.30%) had a rate of 5 to 10 being suspected of depression and only 2 (4.26%) had an index equal to or greater than 11, which featured major depression, according to the cutoff point adopted by the scale.

■ DISCUSSION

In this study, it was found that most individuals studied are over 60 years of age, appearance due to the increase in life expectancy of the population. Thus, the hearing loss that accompanies aging presbycusis is characterized by the outcome of various types of physiological degeneration that can be found associated with the effects of noise exposure, health problems and side effects resulting from different types of treatments, and susceptibility genetics. This hearing deterioration affects both the communication, and social and emotional domains, as they entail a significant reduction in interaction and personal contacts¹².

Table 1 depicts the high prevalence reported in the history of aspects, such as tinnitus and dizziness, symptoms that can be found in presbycusis. These factors associated with exposure to noise

and low use of Personal Protective Equipment (PPE) to corroborate the characterization of the frame. The evolutionary course of presbycusis may be changed, and even enhanced as a result of noise exposure and the clinical and metabolic conditions of the elderly, and the habits practiced¹³. Moreover, other studies show that men are often more exposed to noise compared to women^{4,14}.

The National Health Policy of Persons with Disabilities states that the second leading cause of hearing loss in the population is Noise-induced hearing loss – NIHL¹. Another study highlights that presbycusis can be considered as an outcome of a multifactorial etiology².

From the audiometric evaluation, it is possible to identify the auditory threshold, audiometric configuration and type of hearing loss. Injuries to the ear structures, as well as its extension, will directly influence the degree of hearing impairment, generating effects on communication¹³.

The findings in Tables 2 and 3 confirm the results mentioned above, since type A tympanometric curve and acoustic reflexes absent, coupled with sensorineural hearing loss of mild to moderate can characterize both presbycusis and NIHL¹⁵. The results also showed an increased occurrence of sloping audiometric configuration in patients over 60 years, indicative of presbycusis^{2,13,15}.

Regarding the speech recognition threshold (SRT), we observe that it corresponds to the average frequency of 500 Hz, 1000 Hz and 2000 Hz, indicating the confirmation of audiological diagnosis¹⁶. This correspondence can be seen in the results obtained, since the difference between the SRT and the tritone mean is 3.46 dB HL for the right ear and 2.20 dB HL for the left. In clinical practice, the difference is expected to 10 dBHL above said average.

In the same vein, the speech recognition index (SRI) also provides relevant information on the audiological diagnosis, becoming a key measure for programming the hearing aid¹⁵. This study showed values ranging from 40% to 100% for the right ear and 52% to 100% to the left, ie indicative of discrimination is impaired as much as possible find retro-cochlear hearing loss (less than 60%) discrimination impaired as is found in sensory hearing loss (60% and 90%) and discrimination normal (90% to 100%)¹⁶. Furthermore, this study showed higher levels of speech recognition in patients younger than 60 years suggesting that the elderly have greater difficulty in speech recognition. This finding may be related both to find hearing loss as the difficulties in processing auditory temporal^{2,3,5,6}.

All devices adapted were of the retroauricular type requiring the use of ear molds. The invisible mold was the most simple request for the patients in this study and therefore the hard acrylic material was further required for making them. This combination is used to hearing loss of varying degrees and types. Furthermore, acoustic accepts modifications as ventilation, used to minimize the effect of occlusion, or the attenuation of frequencies¹⁷.

All appliances have adapted digital technology and prescribing following the determination of Ordinance 587, the Ministry of Health, which provides for the division into three classes, and the distribution of 50% of HA type A, 35% for type B and 15% for type C. The Class A devices have fewer technological resources compared to Class B devices that have intermediate technology. Already, the equipment belonging to the class C have high technology.

Digital technology has enabled numerous features to improve the adaptation to HA, as the existence of programming channels that allow adjustment for frequency bands; directional microphones that pick up sounds in different ways from different angles, improving the audibility of the signal in relation noise and allowing a good speech recognition, and other resources, such as noise reduction and feedback manager containing the appropriate equipment¹⁸. As a result of technological resources employed, the study participants had a mean speech recognition with hearing aids satisfactory (94.10%), but this

performance also depends on other variables such as type and degree of hearing loss, duration of auditory deprivation and other factors¹⁹.

When thinking about the success of adaptation, some issues must be taken into consideration. It is known that the impact on the individual with hearing loss is very large and remains until the rehabilitative phase, but the individual's perception regarding the disability as well as the predisposition of the patient for rehabilitation are relevant⁸. Thus, the auditory rehabilitation programs include guidance and counseling for the use of hearing aids, and auditory skills training and lip reading²⁰.

Based on this assumption, the guidelines for the handling and use of HA and advice are critical to successful adaptation. In this study, almost half of the participants had difficulties in handling and cleaning of equipment, improving its performance until the end of the therapeutic process.

Regarding the therapy sessions, recent research has shown evidence that auditory training can improve the hearing processes, reorganizing the neural substrate, due to changes in morphology and performance after sound stimulation auditory²¹. The ability to detect, for example, requires little neural substrate of the auditory system, and therefore the performance of most of the participants was satisfactory (77.97%). Thus, increasing the complexity of the task requires more demanding of the brain²². In this study, the performance of participants in the skills recognition and discrimination presented with a greater degree of difficulty when compared to detection performance.

In addition to hearing loss, it is possible to observe changes in cognitive functions that, in the elderly, is characterized by slow, suggesting a deficit in temporal processing transmission^{5,23} that can be defined as the perception of sound or amendment thereto within a domain time²⁴. Thus, it is important to note that the skills of recognition and identification of auditory sequential patterns involving perceptual and cognitive processes type, which may find themselves compromised due to aging and auditory deprivation, confirming the understanding as the skill most affected in this study.

Changes in neural activity in the auditory system resulting from the combination of age and hearing loss, and loss of ability to perform temporal processing of sounds associated with aging, generates one of the main complaints reported by the elderly: difficulty of perceiving speech in competitive environments or listen but not understand²⁵. Aging decline can occur in temporal ordering ability that can be found related to the reduction of the effectiveness of communication²⁶.

Obviously, the number of sessions could be increased to promote greater acclimatization, ie, auditory recovery in new hearing aid users in the context of deprivation hearing was interrupted and thus promote significant improvement in speech skills after a period of six to 12 weeks of amplification^{26,27}.

In seeking answers to questions related to the difficulties in the counseling and therapy sessions, some tests (AP) were performed, as well as cognitive appraisal and GDS-15 to then, determine the association between the data.

Regarding the AP, the DD test, which assesses the ability to process auditory message, presented in both ears, and requires the integrity of the corpus callosum, providing inter-hemispheric integration²⁸, the results ($59.52\% \pm 24.38$) for the right ear and ($66.54 \pm 21.94\%$) to the left are outside the normal range (93%) used in clinical practice for adults with hearing loss. In addition, the standard deviation on both is indicative of variability of the percentage of correct answers, suggesting modification of inter-hemispheric skills, in some cases expected in elderly subjects²⁹.

In the FPT test, which evaluates the perception of tonal patterns and the appointment (ability inter-hemispheric), the results obtained ($68.51 \pm 21.70\%$) are also outside the normal range (76%). Thus, the results show a shift in the ability of temporal sequencing³⁰, which involves short-term memory, also altered in the elderly.

Regarding the results of both tests, it should be noted the paucity of references to standardize tests of AP in elderly patients with hearing loss. On the other hand, when using such references to relevant changes with aging such as decreased performance skills and inter-hemispheric sequential memory would not be considered in the selection process, display and hearing aid fitting Furthermore, the association of test results of AP with ADAS-Cog and GDS offer more information to the clinician.

In cognitive assessment – ADAS-Cog, the tests that had higher scores, characterizing changes were: evoked word (4.39 ± 1.28) and word recognition (4.34 ± 3.27). These results also refer to an impairment in short-term memory that corroborates

the findings of the FPT, which evaluates temporal sequencing. This ability refers to the processing of two or more auditory stimuli in the order in which they occur in time. This aspect is much investigated due to its importance in speech perception⁸. Another test which showed significant change was the understanding of (2.15 ± 1.12) in accordance with the results obtained in therapy in the ability to understand.

Of the 47 patients, 20 (42.56%) show any indication of depression. Studies show that this is one of the most common diagnoses in the elderly, and yet, it is not diagnosed on the basis of clinical diseases and particularities of the social context that contribute to the difficulties encountered in diagnosing^{31,34}.

To establish the relationship between AP, depression and cognition, comparative analyzes were performed and the association that will be operated in a second study, therefore, it is believed that such variables must be considered throughout the adaptation process. Other studies with similar design are needed to elucidate this relationship. Moreover, it is suggested that the inclusion of routine audiological procedures, in order to facilitate the process of selection and fitting of HA offered to this population.

■ CONCLUSION

Assuming that this study aimed to establish the profile of users of HA, assisted at the Health Center Clelia Spinato Manfro, Nossa Senhora de Fatima College, with a view to the relationship between amplification, cognition, and PA, our results confirm that most patients are elderly, and male prevails. The most cited in the interview were tinnitus, dizziness and noise exposure.

In regards to counseling, most patients presented difficulties, this being an important factor for successful adaptation. The testing results in AP and ADAS-Cog confirm the findings of altered temporal sequencing and comprehension, implying the difficulties encountered in rehabilitation. In addition, a large number of participants showed signs of depression.

RESUMO

Objetivo: estabelecer o perfil dos usuários de AASI atendidos no Centro de Saúde Auditiva com vistas à amplificação, cognição e processamento auditivo (PA). **Método:** participaram do estudo 59 sujeitos com idades entre 41 e 92 anos. Na primeira etapa, realizou-se a coleta dos dados dos prontuários: dados das avaliações audiológica e otorrinolaringológica, anamnese, teste de fala com o AASI em uso, dados do molde e do AASI, orientações recebidas e resultados do treinamento auditivo. Na segunda etapa, foram realizados os testes de Dicótico de Dígitos (DD) e Teste de Padrão de Frequência (TPF), Avaliação da Doença de Alzheimer-Cognitiva (ADAS-Cog) e a Escala de Depressão Geriátrica (EDG-15). Nessa etapa, participaram 47 sujeitos. **Resultados:** em relação à idade, 67,80% tem 60 anos ou mais. Os aspectos mais relatados na anamnese foram tontura e zumbido e exposição ao ruído. Na avaliação audiológica, identificou-se perda auditiva neurossensorial de grau moderado e curva descendente como os mais frequentes, coincidindo com os achados imitanciométricos: curva tipo A com reflexos ausentes. No treinamento auditivo, as habilidades que mais apresentaram alterações foram identificação e compreensão. Nos testes DD e TPF, as médias de acertos ficaram abaixo dos padrões de normalidade. No ADAS-Cog, os maiores escores foram palavra evocada, reconhecimento de palavra e compreensão. No EDG, 20 sujeitos apresentam características sugestivas de depressão. **Conclusão:** foi possível estabelecer o perfil dos usuários de AASI com vistas à amplificação, cognição e ao PA.

DESCRIPTORIOS: Perda Auditiva; Auxiliares de Audição; Cognição; Perda Auditiva Central; Envelhecimento; Reabilitação de Deficientes Auditivos

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