

Applicability of the speech-language and hearing pathologist orientation associated with the use of amplification in the reduction of tinnitus

Aplicabilidade da orientação fonoaudiológica associada ao uso de aparelho de amplificação sonora individual na redução do zumbido

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ABSTRACT

Introduction: Tinnitus has often been reported associated with auditory complaints. **Purpose:** To verify the applicability of the speech-language and hearing pathologist orientation associated with the use of hearing aids (HAs) in the reduction of the tinnitus sensation. **Methods:** Patients with tinnitus associated with hearing loss were selected. The study was developed in two stages: initial evaluation - after patient referral for HA adaptation and final evaluation - after three months of effective use of HAs. The groups were divided into three groups: Group A (8 individuals adapted to HA without orientation for tinnitus), Group B (8 individuals adapted with HA with verbal orientation for tinnitus), and Group C (8 individuals adapted to HA with verbal orientation associated with tinnitus support material). The sample responded to the Tinnitus Handicap Inventory (THI) at the first moment and after three months of effective use of the HA to measure a handicap modification for symptoms in its total score and in the three domains. For statistical analysis, applied tests were performed, adopting a level of significance less than 5%. **Results:** All groups presented improvement in tinnitus, and better results were observed when the patient received guidance regarding tinnitus. In addition, it was observed that there was significant difference between the groups for only one emotional domain of the THI, in which group C presented better results than groups A and B ($p < 0.05$). **Conclusion:** The speech-language and hearing therapist orientation associated with the use of hearing aids may favor the reduction of tinnitus sensation.

Keywords: Hearing loss; Tinnitus; Hearing aids; Counseling; Audiology

Clinical trials: 4939

RESUMO

Introdução: Com frequência, o zumbido tem sido relatado associado às queixas auditivas. **Objetivo:** Verificar a aplicabilidade da orientação fonoaudiológica associada ao uso de aparelho de amplificação sonora individual (AASI), na redução da sensação do zumbido. **Métodos:** Foram selecionados pacientes com queixa de zumbido associado à perda auditiva. O estudo foi desenvolvido em duas etapas: Avaliação inicial - após o encaminhamento do paciente para adaptação de AASI e Avaliação final - após três meses de uso efetivo do AASI. Os participantes foram divididos em três grupos: Grupo A (oito indivíduos adaptados com AASI, sem orientação referente ao zumbido), Grupo B (oito indivíduos adaptados com AASI, com orientação verbal referente ao zumbido) e Grupo C (oito indivíduos adaptados com AASI, com orientação verbal sobre o material de apoio referente ao zumbido). Os participantes responderam ao questionário *Tinnitus Handicap Inventory* (THI) no primeiro momento e após três meses de uso efetivo do AASI, para mensurar a modificação do incômodo do sintoma em seu escore total e nos três domínios. Para análise estatística, foram utilizados testes, adotando-se nível de significância inferior a 5%. **Resultados:** Todos os grupos apresentaram redução da sensação de incômodo do zumbido, sendo que melhores resultados foram observados quando o paciente recebeu algum tipo de orientação a respeito. Além disso, observou-se que houve diferença significativa entre os grupos apenas no domínio “emocional” do questionário THI, em que o grupo C apresentou melhor resultado na diminuição da sensação do incômodo do zumbido, do que os grupos A e B ($p < 0,05$). **Conclusão:** A orientação fonoaudiológica associada ao uso do AASI pode favorecer a redução da sensação do zumbido.

Palavras-chave: Perda auditiva; Zumbido; Auxiliares de Audição; Aconselhamento; Audiologia

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INTRODUCTION

Tinnitus has often been reported associated with hearing complaints. Epidemiological studies have indicated that approximately 20% of individuals with tinnitus suffer from changes in sleep quality and concentration, causing negative emotional reactions^(1,2).

The same was observed by other researchers⁽³⁾, who reported the prevalence of 7% to 19% of adult individuals with tinnitus as an otological symptom, as well as important associated complaints, such as insomnia, problems in social interaction, life, emotional difficulties, health changes in general; and problems at work.

Among the various causes that can cause tinnitus, excessive exposure to noise, middle ear infections, wax stopper, head and neck injuries, psychiatric diseases, neuropathies, changes in blood pressure or metabolic system and the use of substances such as antibiotics, caffeine, alcohol, nicotine and drugs. However, the great majority of cases of tinnitus are of auditory origin, and there are, in these cases, greater difficulties in attendance^(4,5).

Intervention for tinnitus has been actively investigated, however, there is still no proven means to guarantee the elimination of this symptom⁽⁶⁾. Its clinical evaluation mainly depends on the self-report of the individual, which may hinder objective interpretations and definition of a better intervention⁽⁷⁾.

Currently, there is no universal therapy model that greatly alleviates the effects of tinnitus. However, some available treatments rely on counseling procedures, along with auditory stimulation to provide relief⁽⁸⁾.

Among the available treatment options, there is the use of hearing aids (HAs), the sound generator (SG) for sound therapy and habituation, cognitive therapy, counseling, diet, medication intervention and the use of a material of support - guidance booklet - about the symptom⁽⁹⁾.

Sound therapy has been established in clinical practice and can be applied in several therapeutic approaches, such as: Tinnitus Retraining Therapy - TRT and Tinnitus Activities Treatment - TAT^(10,11,12). These approaches associate sound therapy with counseling, which consists of basic information about tinnitus, hearing loss, attention and habituation. Combined with sound therapy, counseling helps to break the vicious circle of stress caused by tinnitus and helps the patient to change their thinking and even behavior⁽¹¹⁾.

Counseling consists of guidelines aimed at eliminating the negative associations of tinnitus⁽¹³⁾. The guidelines should present simple discussions regarding tinnitus, as well as coping strategies⁽¹⁴⁾. Thus, researchers⁽¹⁵⁾ verified in their study that all patients with tinnitus benefited from counseling.

In addition, educational materials have become an important tool in the aspect of resources in health education, assuming a valuable role in the teaching-learning process, mainly in the therapeutic intervention of chronic diseases^(16,17). This

type of material is especially useful in the tinnitus symptom, since its annoyance is directly related to the importance that it is conferred. The educational material will help increase confidence in the proposed treatment, as well as the satisfaction of the individual, developing their attitudes and abilities, promoting treatment adherence and making them able to understand their own actions that influence their health pattern⁽¹⁸⁾.

Due to the intense demand of individuals with tinnitus in search of intervention in public and private services, research that guides the conduct of health professionals is necessary. Thus, this study aimed to verify the applicability of the speech-language and hearing pathologist orientation associated with the use of hearing aids for the reduction of tinnitus.

METHODS

A study developed at the Speech and Hearing Clinic of the Bauru School of Dentistry, *Universidade de São Paulo* (USP), after approval by the Research Ethics Committee (CAAE: 44953315.0.0000.5417) and patient consent for voluntary participation in work and publication of the data, confirmed by signing the Free and Informed Consent Form.

Casuistry

Pre-selections were made from the patients enrolled at the Speech and Hearing Clinic of the Bauru School of Dentistry, *Universidade de São Paulo* with complaints of tinnitus associated with hearing loss. In this way, 24 individuals were evaluated, which included the following inclusion criteria:

- Continuous complaint of tinnitus - continuous tinnitus is the perception of the sound throughout the period in which the patient is awake;
- Diagnosis of mild to moderate symmetric bilateral sensorineural hearing loss;
- Referral for adaptation of HA, performed by the otorhinolaryngologist;
- Age range from 18 years;
- Both sexes;
- No prior intervention regarding tinnitus;
- No previous experience with HA use;
- Effective use of HA during the study - considered a period of use equal to or greater than eight hours per day;
- Attending the expected returns - two being: the first one month after the adaptation of the hearing aids, fine tuning if necessary, resuming the guidelines on the use and handling of the devices, resumption of tinnitus guidelines (only in groups B and C) and the second return after three months of the adaptation of the hearing aids for a new measurement of the annoyance of tinnitus.

Exclusion criteria:

- Hearing loss and / or unilateral tinnitus;

- Previous experience using hearing aids or any sound intervention;
- Cognitive and / or motor inability to adapt to hearing aids;
- Do not accept to participate in the research.

The participants were divided into three groups so that it was possible to visualize how the tinnitus sensation changed since different interventions were applied:

- Group A (Gr A): eight individuals adapted with HAs, without speech-language and hearing pathologist orientation related to tinnitus,
- Group B (Gr B): eight individuals adapted with HAs, with verbal orientation in which the researcher exposed in simple form, through informal conversation, aspects related to tinnitus,
- Group C (Gr C): eight individuals adapted with HAs, with verbal orientation associated with the support material (primer) referring to tinnitus, delivered at the time of adaptation of the hearing aid and resumed in the return session after one month of adaptation of the auditory device.

The study was developed in two stages: Initial Assessment (IA) - after patient referral for HA adaptation and Final Evaluation (FA) - performed after three months of effective use of HAs (Figure 1).

The procedures were performed on the same day of care in the following order:

1. Tinnitus Handicap Inventory (THI)

The THI was translated and validated for Brazilian

Portuguese⁽¹⁹⁾. The questionnaire consists of 25 questions, which should be answered with “yes” (4 points), “sometimes” (2 points) and “no” (0 points). The higher the score, the greater the impact of tinnitus on the patient’s quality of life.

The THI measures the annoyance of tinnitus, measuring in general and in the “emotional” domains (questions 1, 2, 4, 7, 9, 12, 13, 15, 18, 20 and 24) 6, 10, 14, 16, 17, 21, 22 and 25) and “catastrophic” (questions 5, 8, 11, 19 and 23). Thus, the total score for each aspect analyzed will be 36 points for the emotional aspect, 44 points for the functional aspect and 20 points for the catastrophic aspect. The total test score ranges from 0 to 100 points, which can be classified as follows:

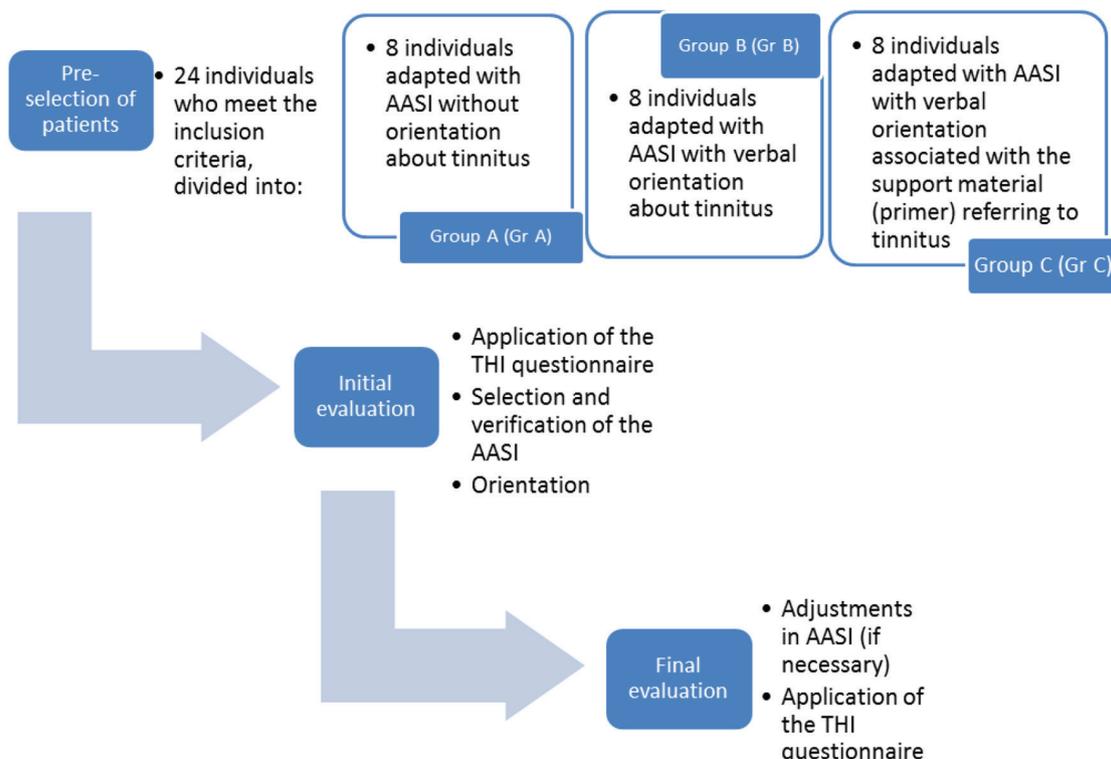
- 0 to 16 points: disgusting / discreet degree of annoyance;
- 18 to 36 points: degree of mild discomfort;
- 38 to 56 points: degree of moderate discomfort;
- 58 to 76 points: degree of severe discomfort;
- 78 to 100 points: degree of catastrophic discomfort.

The highest possible total score corresponds to 100 points and reveals a maximum loss of quality of life because of tinnitus. The lowest possible score corresponds to 0 and does not indicate any impairment in the individual’s daily life⁽¹⁹⁾.

The participants responded to the THI at the first moment (Initial Evaluation) and after three months of effective use of the HA (Final Evaluation).

2. Selection and verification of the hearing

For the selection of the type and model of hearing aids, the audiological characteristics, communicative and aesthetic



Subtitle: AASI = Individual Sound Amplification Apparatus; THI = Tinnitus Handicap Inventory

Figure 1. Study flowchart

needs of the participants were analyzed. In addition, because of the collection and the fact that all procedures are performed in a public service, according to the clinical demand and the availability of devices, the adapted HAs were carefully selected considering the factors mentioned above.

Digital and programmed HAs were adapted through software installed on a desktop computer with the Windows XP operating system after connection via HI-Pro. Participant identification data such as name, date of birth, sex, and audiometric thresholds were entered on the NOAH v4.0 (HIMSA) platform. In programming, the nonlinear prescriptive method (NAL-NL1) was used to calculate and adjust the electroacoustic characteristics based on previously entered tonal thresholds.

After the adaptation, the groups returned after one month and three months to follow up on the use of hearing aids - confirmed through datalogging, being considered a minimum use of eight hours daily. Adjustments were made to the device settings in case of patient complaint, according to their individual needs.

3. Orientation

At the initial evaluation stage, all participants received guidance regarding hearing loss and the use of hearing aids. Associated with them, groups B and C, experienced different forms of orientation regarding tinnitus. Already in the stage of the final evaluation, group A also received this orientation.

Regarding the differences between the two groups that received guidance (Gr B and Gr C), it is important to note that both received guidance on tinnitus in the hearing aid adaptation session and on the first return - one month after device adaptation - totaling two orientation sessions. However, these instructions occurred differently between the groups, being:

- Group B: In addition to guidelines regarding hearing loss and the use of hearing aids, guidance on tinnitus was received, given verbally, through informal conversation, addressing aspects to promote understanding of the definition, pathophysiology - in a simple way - and what can be done to lessen the discomfort caused by the symptom.
- Group C: In addition to guidance on hearing loss and the use of hearing aids, verbal guidance regarding tinnitus was received, following the support material (booklet) which was delivered at the HA adaptation session to all participants to contribute to the understanding of the symptom.

The "Knowing the Tinnitus" booklet was developed in the Research and Communication Disorders research line, in the Post-Graduation Program in Speech-Language and Hearing Pathology - USP, through a bibliographical survey of different approaches for tinnitus treatment, along with the treatments offered by health professionals. In addition, the preparation of the material counted on field research, through technical visits to private companies of HAs, which had the HA associated with the SG.

The starting point for the preparation of the material was based on the proposal of a study⁽¹¹⁾ which used sound therapy in addition to counseling to help break the vicious circle of stress caused by tinnitus and help the patient to change their thinking and even behavior.

The material was organized according to the theoretical / practical basis, considering the topics necessary to compose the orientation content with adequate language, addressing the following subjects:

- What is tinnitus?
- Types of tinnitus.
- What causes tinnitus?
- The emergence of focus.
- Breaking the tinnitus. What is wrong with me?
- Does my tinnitus cure?
- What can be done and who should I look for?
- What are the treatments available for symptom relief?
- How is the sound generator for tinnitus?
- Some tips to relieve tinnitus.
- Balancing expectations.
- Report your experience.

The topic "Report your experience" provides the patient with a field of notes about the process of tinnitus, allowing them to make reminders about doubts, changes in the degree of discomfort, among others and discuss them later with the speech-language pathologist.

The delivery of the primer to Gr C was performed according to the initial arrangement of the groups, pre-established between members with tinnitus and hearing loss. With the support material, the information content was exposed and discussed, adding suggestions to improve the treatment of the individuals which facilitated their understanding on the subject and subsidized a positive prognosis for the treatment.

At the end of the three-month period, the patients in Groups A and B were also instructed and received the manual, assuring at the end of the study, that both groups received knowledge regarding tinnitus.

4. Form of analysis

The data were recorded in Microsoft Office Excel®, tabulated and described according to the statistical analysis of nominal and ordinal quantitative and qualitative variables. The analysis of the final results was performed based on the inductive or inferential statistics. The Shapiro-Wilks test was used to verify the normality of the data, in which there was no normality between the values of the total THI and the "emotional" domain, therefore, median values were used in these cases, and functional domains were normal "and catastrophic", using the mean. The results were compared using the Kruskal-Wallis and Jonckheere-Terpstra tests. All statistical procedures were performed in specific software, adopting a level of significance of less than 5%.

RESULTS

Pre-selection, initial evaluation and final evaluation of 24 individuals (Figure 1) were performed, with a mean age of 59 years. The sample consisted of 56% males and 44% females. All participants had sensorineural hearing loss, being 88.5% moderate and 11.5% mild. Regarding the types of HA adapted, 61% were in the ear, 27% behind the ear and 12% in the canal.

The hearing aids of the three types followed the clinic adaptation criteria, considering the audiometric characteristics and aesthetic factors mentioned by the participants at the time of the indication for testing and adaptation of the devices. Both the behind the ear hearing aids, as well as the in the ear and in the canal adapted, had ventilation of 2 mm.

The degree of nuisance of tinnitus measured by THI, at the time of the initial evaluation, after the intervention and in the final evaluation is presented in Figure 2.

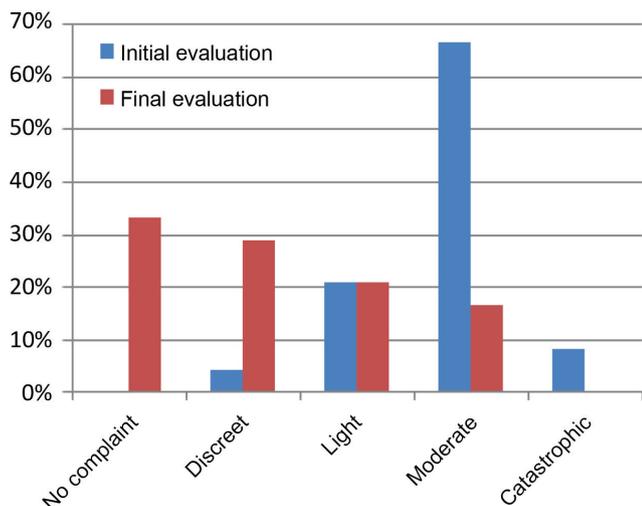


Figure 2. Degree of annoyance of tinnitus in initial assessment and final evaluation

The comparison of the nuisance in the total THI obtained between the initial evaluation and the final evaluation is shown in Table 1.

Table 1. Median, 25% and 75% values of the nuisance in the Tinnitus Handicap Inventory total, obtained between the initial evaluation and the final evaluation of the groups studied

Group	n	25%	Median	75%	p-value
(1)A	8	2	17	73.5	0.368
(2)B	8	7.5	19	34	
(3)C	8	26	36	49	

Kruskal-Wallis test (p<0.05)

The comparison of the nuisance in the “functional” domain of the THI obtained between the initial evaluation and final evaluation is described in Table 2.

Table 2. Mean and standard deviation values of the nuisance in the “functional” domain in the Tinnitus Handicap Inventory obtained between the initial evaluation and the final evaluation of the studied groups

Group	n	Mean	Standard deviation	p-value
(1)A	8	17.75	19.95	0.595
(2)B	8	10.5	14.37	
(3)C	8	17	10.58	

Kruskal-Wallis test (p<0.05)

The comparison of the discomfort in the “catastrophic” domain of the THI obtained between the initial evaluation and the final evaluation is presented in Table 3.

Table 3. Mean and standard deviation values of the nuisance in the “catastrophic” domain in the Tinnitus Handicap Inventory, obtained between the initial evaluation and the final evaluation of the groups studied

Group	N	Mean	Standard deviation	p-value
(1)A	8	5.75	4.83	0.202
(2)B	8	9	4.14	
(3)C	8	9.25	3.53	

Kruskal-Wallis test (p<0.05)

The comparison of the nuisance in the “emotional” domain of the THI obtained between the initial evaluation and the final evaluation is demonstrated in Table 4.

DISCUSSION

There are no defined protocols for tinnitus intervention in Brazil. Due to the intense demand in public and private services, it is extremely necessary that research be done to guide professionals working in Audiology.

In this study, the sample consisted of 56% female subjects and 44% of males. Regarding the incidence of tinnitus according to sex, there is no consensus in the literature. There are studies that showed a slight increase in the number of female subjects, justified by the greater availability and concern to seek medical assistance^(20,21,22); however, other studies have suggested a prevalence in males due to excessive exposure to noise^(23,24), agreeing with the findings of this research.

Commonly, this population is received in several hearing health services. The clinical practice allows us to have contact with the difficulties presented by the patient, their complaints and anguishes demonstrated at the initial moment, help in the selection of the best intervention. Thus, it is emphasized that the practice based on scientific evidence is fundamental to guide the decisions of the professionals involved.

Although there is no consensus on the treatment of tinnitus, the use of HAs is embedded in different therapeutic approaches, such as masking therapy (stable sound stimulus emission); TRT (tinnitus habituation therapy, based on the neurophysiological

Table 4. Median, minimum and maximum values of the nuisance in the Tinnitus Handicap Inventory in the “emotional” domain, obtained between the initial evaluation and the final evaluation of the groups studied

Group	n	Minimum	Median	Maximum	p-value*	Mean classification	p-value**
(1)A	8	-6	2	17		11.12	
(2)B	8	0	2	3	0.049	9.06 (3)	0.044
(3)C	8	4	10	15		17.31 (2)	

*Significant values ($p < 0.05$) – Kruskal-Wallis test

**Significant values ($p < 0.05$) – Jonckheere-Terpstra test

model); TAT (counseling, considering differences and individual needs)^(10,11,12), which act on habituation, partial or total masking of tinnitus and help decrease symptom perception⁽¹⁴⁾.

After amplification intervention, this study verified that all groups showed improvement in tinnitus nuisance sensation after the final evaluation (Table 1), and the analysis was made based on the difference obtained in the THI between the initial evaluation (without the use of HAs) and final evaluation (after three months of effective use of HAs), ratifying the therapeutic approaches mentioned above, which use HA associated with different forms of orientation.

In this context, both the orientation and the application of questionnaires are of great importance at this moment, since they make possible the knowledge of patients’ fragilities, as well as the effects of tinnitus on their social activities, their emotions, their work performance and their communicative abilities⁽²⁵⁾.

Although some authors have linked increased tinnitus perception to external acoustic meatus occlusion, one study⁽²⁶⁾ evaluated 50 individuals with bilateral hearing loss and tinnitus, who were fitted with HAs with open cast and cast with relief ventilation (1 mm) and observed that in only 24% of the cases, there was a difference in performance between the two molds, with 12% improved only with the open mold and 12% improved with the mold with relief ventilation.

This study used three types of HAs: 27% of the sample was behind the ear, 61% in the ear, and 12% in the canal. Bilateral ventilation of 2 mm was used for all study participants. In the end, it was found that regardless of the type of HA adapted, all of them obtained an improvement in the sensation of annoyance of tinnitus (Table 1). These findings agree with the study⁽²⁷⁾ which reported that certain characteristics of HAs, such as type of technology, model, presence and size of ventilation, do not influence the improvement of tinnitus.

The choice of THI during this study was based on its ability to help improve self-perception of patients and to quantify the tinnitus symptom in relation to the emotional, functional and catastrophic aspects, as observed in other studies^(28,29).

The different forms of orientation brought benefits for intervention of individuals of the sample. The total THI score, after final evaluation, presented data indicating that the groups that were adapted with HAs and received different orientation approaches (groups B and C) presented more satisfactory results in relation to group A, where there were only the HA adaptation, with group B, presenting median 19 and group C,

median 36 (Table 1). These results agree with a study⁽¹⁵⁾ which found that 74% of the study participants reported treatment using HAs associated with guidance as being very effective.

As for the “catastrophic” domain, groups B and C (means 9 and 9.25, respectively) also presented more satisfactory results than group A (mean 5) during the comparison of the difference between the initial and final evaluation, even if such values were not significant (Table 3). However, no studies were found in the literature that specifically evaluated the “catastrophic” domain, and it was not possible to compare it with the present study.

The functional domain of THI assesses functional aspects of tinnitus, such as mental, social / occupational, and physical functioning⁽²⁸⁾. In this study, after comparison between the initial evaluation and the final evaluation, it was observed that there was no difference between the groups (Table 2) with averages of 17,75, 10,5 and 17 being found for groups A, B and C, respectively. In the current literature, only data that evaluate the THI in its total score are found, so it is not possible to make a comparison between studies.

The affective responses for tinnitus are verified through the THI’s “emotional” domain⁽²⁸⁾. In the present study, it was observed that the adaptation of hearing loss associated with verbal guidance and delivery of supportive material on tinnitus was beneficial for individuals in group C, since after a comparison between the initial evaluation and the final evaluation, a significant difference in the “emotional” domain was observed in relation to the other groups (Table 4). This fact confirms the study of other authors, who could verify that the amplification associated with the orientation presented more satisfactory results for the patients, besides observing, through a scale, that they responded that the treatment was “very effective” when orientation was associated⁽¹⁵⁾.

Better results were observed in the total THI and in the “catastrophic” and “emotional” domains in individuals in group C (individuals with HA adaptation, verbal guidance and support material on tinnitus); a difference was found when compared to individuals in the other groups. With this, it can be inferred that the guidelines associated with tinnitus support material are beneficial in reducing the negative associations of this symptom.

The objective of the present study was to verify the applicability of speech-language and hearing pathologist guidance associated with the use of hearing aids in tinnitus

reduction, and the results indicated beneficial effects - even without statistical confirmation to improve the symptom. The absence of a statistical difference between the groups in total THI, “functional” and “catastrophic” domains may have occurred due to the patients’ non-attendance in the expected returns, the lack of effective use of the HA and the death of the study participants. However, regardless of the frailties found, the study could indicate the real need for the use of speech-language and hearing pathologist guidance associated with amplification.

CONCLUSION

Speech-language and hearing pathologist associated with the use of hearing aids may favor tinnitus reduction.

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