Original Article

https://doi.org/10.1590/2317-6431-2025-3056en

Audiology Communication Research
ISSN 2317-6431

Handling of hearing aids by older adults: the gap between knowing and doing

Manuseio do dispositivo eletrônico de amplificação sonora por idosos: a lacuna entre o saber e o fazer

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ABSTRACT

Purpose: To assess the knowledge and skills of older adults regarding the use and handling of the Hearing Aids. **Methods:** The study included 30 individuals aged 60 years and older, diagnosed with hearing loss and users of Hearing Aids. The Brazilian Portuguese version of the Hearing Aid Skills and Knowledge Test was applied. **Results:** No correlation was observed between the length of Hearing Aid use and the scores obtained on the test applied. The lowest-scoring topics were related to cleaning the microphone and the device body, using the telephone, resolving issues with feedback, checking for microphone blockage, and adjusting the earmold. **Conclusion:** The older adults evaluated demonstrated adequate knowledge and handling skills in routine situations but had difficulties in several other areas, highlighting the need for additional support to ensure proper device use. A positive correlation was observed between greater knowledge about the hearing aids and better handling skills.

Keywords: Hearing loss; Hearing aids; Aged; Surveys and questionnaires; Aptitude

RESUMO

Objetivo: Avaliar o conhecimento e as habilidades de idosos quanto ao uso e manuseio do dispositivo eletrônico de amplificação sonora. **Métodos:** Participaram do estudo 30 indivíduos com idade a partir de 60 anos, diagnosticados com perda auditiva e usuários do dispositivo. Foi aplicada a versão no português brasileiro do protocolo *Hearing Aid Skills and Knowledge Test*. **Resultados:** Não foi observada correlação entre o tempo de uso do dispositivo e os escores obtidos no teste. Os tópicos com menor pontuação referiram-se à limpeza do microfone e do corpo do dispositivo, uso do telefone, resolução de problemas relacionados à microfonia, verificação de obstrução do microfone e ajuste do molde. **Conclusão:** Os idosos avaliados demonstraram conhecimento e habilidade de manuseio em situações cotidianas, mas apresentaram dificuldades em diversos outros aspectos, evidenciando a necessidade de suporte adicional para o uso adequado do dispositivo. Observou-se que o maior conhecimento sobre o dispositivo eletrônico de amplificação sonora correlacionou-se à maior habilidade no seu manuseio.

Palavras-chave: Perda auditiva; Auxiliares de audição; Idoso; Inquéritos

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Conflict of interests: No.
Authors' contribution: TFA acquired, analyzed, and interpreted the data and drafted the manuscript; GFV interpreted the data and drafted the manuscript; DL wrote the manuscript and approved the final version to be submitted for publication; CCC analyzed and interpreted the data and drafted the manuscript; CMA analyzed the data and drafted the manuscript; VLDF conceived and designed the study, analyzed and interpreted the data, drafted the manuscript, approved the final version to be submitted for publication, and provided scientific supervision for the work.
Data Availability Statement
Research data is not available.
Funding: None.
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Received: April 24, 2025; **Accepted:** August 04, 2025
Editor-in-Chief: Renata Mota Mamede Carvallo.
Associate Editor: Isabela Hoffmeister Menegotto.

e questionários; Aptidão

INTRODUCTION

Human aging process is extremely heterogeneous and associated to multiple interdisciplinary viewpoints and subjective aspects. Socioeconomic, educational conditions, environmental factors, among other aspects, have significant impact and must be considered as they influence the aging process in varied ways[1]. Additionally, age-related hearing loss is one of the common diseases among the elders due to the natural and gradual aging process of the hearing system structures[2].

Comparing with the scientific advancement on the congenital hearing loss, age-related hearing loss has still been challenging[3]. However, in addition to hearing impairment, when not treated, this condition is related to clinically relevant depression symptoms[4] and higher cognitive impairment, affecting the quality of life and other related well-being aspects[5].

One of the treatment options for age-related hearing loss is the use of hearing aids. However, even with good-practice based adjustment, some users do not make effective use of the device. Studies report that one of the reasons for not wearing them is the difficulty in handling the device[6,7], including battery change and cleaning[6]. Concomitantly, handling skills and knowledge on hearing aids are associated with better results of the device[8].

In order to help users' guidance and advisory, and thinking of fostering the use of hearing aids, a study[9] proposed the development of online pages with tips regarding the use and maintenance of such devices. Despite the efficacy of the strategy having been proved to increase their time wearing the device, self-efficacy and users' satisfaction, the authors reported that further strategies should be elaborated and developed considering the needs and possibilities of the target population, as not all users adhered or showed satisfaction with the proposed strategies.

Researchers[10] elaborated guides on how to handle hearing aids, and concluded that such an strategy contributed to participants' self-efficacy. However, they pointed significant limitations, including the fact that data collection had been held in a controlled laboratory with individuals who did not make use of the device. In that sense, they suggested that populations from diverse geographical regions, who experience actual conditions by making use of hearing aids, should be assessed, so that the elaboration of further strategies aims at each population.

Therefore, elderly users of hearing aids are assumed to come up with difficulties in handling the device, even after months of adjustment, which may affect the use of the device.

In view of the aforementioned, the current study aims to assess the knowledge and skills of elderly users of hearing aids regarding the use and handling of the device.

METHODS

This study was approved by the Research Ethics Committee of the Tuiuti University of Paraná (Universidade Tuiuti do Paraná - CEP/UTP), opinion number 6.100.550, and Certificate of Ethical Assessment Presentation (CAAE – Certificado de Apresentação de Apreciação Ética), under number 68849323.5.0000.8040. Data collection was conducted between July and November 2023.

It is a quantitative cross-sectional study with the application of a questionnaire. Participants confirmed their participation by signing the Free Informed Consent Form.

The following criteria were adopted for the participants' inclusion: to be 60 years or older; reported hearing loss of any kind, unilateral or bilateral; to be hearing aids' user. The following exclusion criterion was adopted: presence of self-reported cognitive impairments.

Individuals who attended the Hearing Health Service of the Speech Language Therapy Clinic-Teaching School, Tuiuti University of Paraná in the city of Curitiba (Paraná State – Brazil), were invited to participate in the study, service connected with the Brazilian Unified Health System (Sistema Único de Saúde - SUS).

Although no formal cognitive assessment had been adopted, by means of standardized instruments, all participants showed capacity to understand and carry out the proposed tasks, compatible with the study objectives. The exclusion criterion related to cognitive impairment was not objectively applied, once it would demand the use of specific instruments for its confirmation. However, during the triage, no other associated clinical conditions were observed, rather than hearing loss, and all participants showed proper performance during the assessment steps of their skill evaluation with the hearing aids.

It should be pointed out that the study participants attended the follow-up appointment in the use of the hearing aids at the research place. However, the device adjustment had been held at the partner laboratories in all the cases. Therefore, all adjustments were held at different places, depending on the device manufacturer selected by each user. Thus, it was not possible to collect data on how and what device handling instructions were provided at the moment of its adjustment.

Initially, participants' data on gender, birth date, type, degree and laterality of the hearing loss, date of the hearing-aid adjustment, physical and technological features of the used device were collected from their clinical records.

Subsequently, the application of the Hearing Aid Skills and Knowledge Test - HASK[7], Brazilian Portuguese version, was conducted.

The HASK protocol objectifies to assess the knowledge and management capacity in the use of hearing aids by their users[7,11]. It comprises 12 categories of tasks, as follows: device removal, opening of the battery compartment, battery management, device cleaning, distinction between left and right devices, device insertion, volume adjustment, telephone use, program use, feedback management, problem solving and device storage.

Scoring for each task is held by knowledge and/or skill. The questions comprising the knowledge domain of the HASK were applied in the form of an interview by the same speech therapist and researcher. Regarding the knowledge items, 1 point is assigned if the individual answers the question correctly, and 0 points if the individual it incorrectly. For the skill items, 2 points are assigned if the individual completes the task without any difficulties in the first attempt; 1 point is assigned if the individual completes the task with some difficulties (if more than one attempt was made, a deviant method was used), and 0 points if the individual cannot perform the task. Thus, for skill assessment, the participant should perform the tasks proposed by the instrument. Not all topics score for knowledge and skill. To some topics, only knowledge assessment is conducted; to others, only skill assessment, and still to others, assessment is performed for

both[11]. The percentage of knowledge is obtained by adding the total scoring in the scale, dividing by the total number of items and multiplying by 100[7].

Data analysis

Jamovi program, 1.2.25 version, was used for the statistical analysis. Inferential statistical analysis was held by means of the analysis result with the Shapiro Wilk test, $p<0.05$, that is, non-parametric tests were used. Thus, for gender comparison and HASK results, Mann-Whitney test was used. As for the correlation between age, time length of the hearing aid adjustment variables and the obtained results, Spearman correlation was used. For the comparison, considering the time length of the hearing aid adjustment period, the sample was divided in two groups: Group A – time length of the hearing aid adjustment period between one and 29 months; Group B – time length of the hearing aid adjustment period between 29 and 180 months. The significance level considered was $p<0.05$.

RESULTS

The sample comprised 30 participants (15 females and 15 males), ages between 60 and 89 years, median of 75 years and 6 months, with 50% of the sample (n=15) entailing participants aged between 60 and 75 years, 26.7% (n=8) ages between 76 and 80 years, and 23.3% (n=7) with ages over 80 years. All participants were able to answer the applied instrument.

Most participants (80.01%) suffered from sensorineural hearing loss in both ears, followed by those who featured sensorineural hearing loss in one ear, and mixed type in the other ear (13.33%), and mixed-type hearing loss in both ears (6.66%).

Time length of the hearing-aid adjustment period varied from 1 to 180 months, median of 27 months, with 20% of the participants using the device between 1 and 6 months, 26.66% between 1 and 2 years, 30% between 2 and 5 years, and 23.33% for over 5 years.

All participants made use of behind-the-ear hearing aids, being 70% users of conventional ear mold fitting, 14% with microtube and olive fitting or open fit, and 16% with receiver-in-canal hearing aids. No participants made use of other assistive technology devices, such as remote microphone systems or the likes.

Table 1 shows the data related to participants' age and their scoring in the different HASK domains, according to the time length of their hearing aid adjustment period.

Association with statistical significance between time length of the hearing-aid adjustment period and HASK knowledge and skills domains was observed, with the group with longer period of device adjustment (Group B) obtaining better results.

There was no statistical difference when results were compared according to the participants' gender (Table 2)

Table 3 shows the variable correlations between age, time length of device adjustment period and HASK scoring.

Table 1. Descriptive analysis of the age variable and scoring in the Hearing-Aid Skills and Knowledge Test according to the time length of the adjustment period to the hearing aid

Varables		Median (Q25 - Q75)	Minimum	Maximum	p value*
Age	Group A	79.5 (73.0 - 81.3)	62	89	0.104
	Group B	74.0 (69.3 - 77.0)	60	83	
	Total	75.5 (70.5 - 80.0)	60	89	-
HASK (K)	Group A	32.2 (22.5 - 36.5)	3.30	50.0	0.013
	Group B	41.6 (33.8 - 50.0)	23.3	58.6	
	Total	34.9 (30.0 - 44.1)	3.30	58.6	-
HASK (S)	Group A	31.7 (23.7 - 37.3)	3.20	41.9	0.044
	Group B	39.3 (32.3 - 42.2)	14.7	50.8	
	Total	36.0 (27.0 - 39.5)	3.20	50.8	-

*Mann-Whitney Test, considering $p<0.05$

Subtitle: HASK = *Hearing Aid Skills and Knowledge Test*; K = Knowledge; S = Skill; Q = Quartile; Group A = time length of the adjustment period to the device between one and 29 months. Group B = time length of the adjustment period to the device between 29 and 180 months

Table 2. Comparison of the results in the Hearing-aid Skills and Knowledge Test considering participants' gender

		Gender	Median (Q25 - Q75)	Minimum	Maximum	p value*
HASK	Knowledge	Female	40.0 (30.5 - 49.0)	20	56.6	0.158
		Male	33.3 (23.3 - 37.7)	3.30	58.6	
	Skill	Female	36.0 (28.1 - 39.3)	11.4	50.8	0.950
		Male	36.0 (25.9 - 40.8)	3.20	43.3	

*Mann-Whitney Test, considering $p<0.05$

Subtitle: HASK = Hearing Aid Skills and Knowledge Test; Q = Quartil

There was no correlation between time length of hearing aid adjustment period and the HASK scoring. No correlation between the instrument results and participants' ages was observed, either.

There was a correlation between HASK knowledge and skill domains pointing that the higher scoring in one of them, the higher scoring in the other as well.

It was observed that 76.6% of the participants reported unknowing the need to let the battery ventilate for at least one minute before exchanging it; 96.6% reported not knowing how to clean the microphone; 70% reported not knowing whether the hearing aid cleaning should be done daily or weekly; 100% did not know the "programs" resource in the device; 90% reported unknowing how to verify the microphone obstruction, and 73.3% reported that they did not know how to verify the obstruction of the hook, tube or sound release.

Topics with scoring over 70% were as follows: hearing aid removal and insertion, opening of the battery compartment and battery change. Topics with scoring under 20% were: cleaning of the microphone and hearing-aid body, telephone use, problem solving of microphone feedback and skills to verify microphone obstruction or mold or olive fitting.

Table 4 displays results regarding number of participants who could complete the task without any difficulties, the ones who completed it with difficulties and those who could not complete the task for the different assessment topics of hearing-aid handling skills in the HASK.

Table 3. Correlation between variables age, time length of the adjustment period to the hearing aid and results in the Hearing Aid Skills and Knowledge Test

Variables	1	2	3
01. Age	-	-	-
02. Time length of the adjustment period	-0.114	-	-
03. HASK (K)	-0.359	0.319	-
04. HASK (S)	-0.128	0.215	0.710

Inferential analysis by means of the Spearman correlation, statistical difference for $p<0.05$

Subtitle: HASK = Hearing-Aid Skills and Knowledge Test; K = Knowledge; S = Skill

DISCUSSION

The greatest part of the assessed individuals in the current study reported sensorineural hearing loss, which can be justified by the population age of the sample and its relation to cochlear degeneration[12].

It should be pointed out that the use of hearing aids may contribute not only to hearing quality, but also to better cognition, perception of the quality of life[13,14], and even postural stability in elderly subjects[15].

Higher satisfaction in the use of hearing aids, perception of their benefit and general adjustment result are also related to the capacity of use and management of the device[5], and problems in handling the device may hinder its use[16]. Therefore, after proper audiological diagnosis and hearing aid selection/adjustment supported by good practices, mastery in handling the device is the first step for efficient hearing rehabilitation, as it is the starting point for its effective use.

In the current study, it was observed that the higher the scoring in the HASK knowledge domain, the higher the scoring in the skill domain. However, during the protocol application, some participants reported knowing a certain aspect, but in practice, they did not show the corresponding skill. Thus, the

Table 4. Sample amount of the individuals who could or could not complete the tasks in the skill scale of the *Hearing Aid Skills and Knowledge Test*, by sub-item

Topic	Sub-item	Complete the task		
		No	With difficulty	Yes
Hearing-aid removal	Remove from the ear	0%	20%	80%
Battery compartment opening	Open the battery compartment	10%	6.6%	83.3%
Hearing- aid battery change	Remove the old battery	10%	33.3%	56.6%
	Remove the battery sticky label	20%	10%	70%
	Insert the battery in the hearing aid	10%	16.6%	73.3%
Hearing-aid cleaning	Olive or mold/capsule opening (with accessory or washing)	40%	13.3%	46.6%
	Microphone (with brush)	96.6%	0%	3.3%
	Device body (with cloth)	66.6%	16.6%	16.6%
Left vs Right	Know L from R	20%	20%	60%
Hearing-aid fitting	Insert the hearing aid in the RE	11.5%	15.3%	73%
	Capsule or mold are correctly fitted in the RE	11.5%	11.5%	77%
	Insert the hearing aid in the LE	6.8%	20.6%	72.4%
	Capsule or mold are correctly fitted in the LE	10.3%	10.3%	79.3%
Volume change	Turn up or turn down the volume	23.3%	10%	66.6%
Telephone use	Place the telephone in the correct position with the hearing aid	64.2%	21.4%	14.2%
Feedback problem solving	Verify if the olive/mold/capsule is properly fitted	71.4%	14.2%	14.2%
Problem solving	Verify microphone obstruction	90%	0%	10%
Problem solving	Change wax filter	80%	0%	20%

Subtitle: % = Percentage of assessed participants; vs = *Versus*; R = Right; L = Left; RE = Right ear; LE = Left ear

Source: the author

importance of effectively training the device handling with users during their appointment is pointed out, not only informing them about. A study[17] assessed elders between 65 and 93 years old, hearing-aid users, and reported that they were able to inform their difficulties in handling the device with precision when they received a detailed list of skills. In that sense, the skill list assessed by HASK is believed to be a starting point for that investigation and training.

There was no correlation between knowledge and hearing-aid handling skill and the elder's age, nor between the time length of the device adjustment period. In view of that result, elders, who make use of hearing aids longer, cannot necessarily handle them better than the ones who wear them less time. It is essential that speech therapists consider that in the users' follow-up appointments. A study[18] evidenced that the skill in the hearing-aid use by experienced users may vary from poor to excellent, and such variability points out the importance to assess each user's skill, individually.

The aspects, in which greater handling skill was observed, were concerned with hearing-aid removal and insertion, and battery change. These data corroborate finding in another study[17], in which authors also reported that elderly hearing-aid users showed fewer difficulties in the same skills, that is, the basic, frequently performed tasks.

Elderly population knowingly may suffer from memory deficits[19], and hearing loss in aged individuals is associated to cognitive impairment[20]. Concomitantly, memory is significantly related to capacity for an individual to wear and take care of his/her hearing aid correctly, whether he/she is a recent or experienced user[21]. Moreover, hearing-aid users' preferences on the amount of information and level of details or technicality that they wish to receive may vary, directly interferring in their capacity to acquire skills in order to handle their device[6]. In that sense, it is necessary to use the person-centered care approach. Improvement in the skill of hearing-aid handling is noticed when professionals individualize care and ask each patient about the amount of information he/she would like to receive, and the explanatory way (e.g.: use of written support, images or just verbally)[22].

Aiming at reducing return rates of users and assuring them an even assessment, the use of questionnaires, scales and protocols standardizes the process of hearing-aid adjustment, benefitting patients and helping the clinical practice[23]. Thus, self-report measures are feasible in order to identify difficulties in hearing-aid handling, as a triage tool. For example, carrying out research on knowledge and self-reported skills in handling the device during the months following the adjustment may identify gaps which were not formerly detected[17].

In a study[6], hearing-aid users reported 29 different problems regarding its use, handling and continuous care of the device, being the items with the greatest amount of complaints. In addition, participants reported that scarce or non-existent information had affected their capacity to acquire the necessary skills for its management. Another study[16] found that the most frequently reported problems by elderly hearing-aid users were regarding its handling and ear mold, and in a follow-up visit, six months after its adjustment, 72.9% of the participants reported at least one complaint about the use of the device.

The results found in the current study corroborate former studies, pointing out that the hearing-aid adjustment should not be a single event, once the possibility of problems which may arise along the time is high, and users may take time to manage all the aspects related to use of the device[16]. Considering that the difficulty in caring and handling hearing aids is frequently reported by users, and it is a problem which can be solved, guidance is a good starting point to try and reduce problems to the population who makes use of the device[6].

In the current study, it was not possible to compare knowledge and hearing-aid management skill between the different types of hearing aid fitting, such as the conventional mold, microtube with olive, or receiver-in-canal. However, it is assumed that those different types of fitting may influence the way patients handle their devices. For example, in the case of devices with receiver-in-canal (RIC), the frequent removal of the wire from the connection, and the moisture or residue accumulation may hinder the electrical contact, causing intermittent failures and distortions. Thus, users of RIC devices with thin wire should be cautious with their handling and maintenance[24]. Therefore, it is arguable whether or not those singularities between the different types of fitting affect handling in a distinctive way.

Hearing-aid training and handling practice are important to set skills. Apart from that, follow-up support provides the opportunity to refine essential skills, as they are not always completely set, and knowledge can be forgotten[16]. It should be pointed out that, in the current study, after the application of the proposed instruments, and by means of the raised doubts, all participants were guided by the speech therapist/researcher on the proper handling of their devices, with practical explanation following verbal instructions.

It is necessary that speech therapists rethink the strategies used to guide elders on hearing-aid use and handling, specifically investigating which ones are more effective for each population in order to foster the use of the device.

Study limitations and further research studies

The current study showed several limitations. One of them was the fact that the initial adjustment instructions were not conducted by the researcher, as the participants were recruited during their follow-up appointments. It is suggested that further studies adopt a longitudinal design, controlling guidance along the different steps in order to establish an effective protocol, even with intervening variables.

Another limitation refers to the way participants were divided for the statistical analysis of the time length of the hearing-aid adjustment period. The division of the A and B groups did not follow specific criteria, being only determined by the number of participants included in the different data collection moments. That strategy was adopted in order to enable the comparative analysis, in view of the sample heterogeneity, which included individuals with diverse adjustment time length. A categorization based on more homogeneous criteria could acknowledgedly generate more robust comparisons, and such an aspect must be taken into consideration for the result interpretation as well as for further investigations.

Additionally, data on socioeconomic status and schooling were not collected, which may influence hearing-aid use, and the acquisition of knowledge and skills on its handling. Thus, further studies may also consider sociodemographic data for comparison.

In the current study, the amount of daily hours of hearing-aid use was not assessed. Further research may assess and correlate handling skills of the device not only to the time length of the

adjustment period, but also to the data obtained in the data logging. In addition, investigation is suggested with other populations from other regions, other age ranges and users of other types of hearing-aid fitting.

Implications for the clinical practice.

Despite the limitations, the current study contributed on the performance of elderly Brazilian individuals in the assessed aspects, by means of the recently translated instrument into Brazilian Portuguese. Additionally, although some analyses were not possible to be carried out, significant results were found, fundamentally regarding the lack of ability on the part of participants in hearing-aid handling, even those who made use of the device longer.

It should be pointed out that the participants in the current study probably lived different experiences during the adjustment. Still, most of them evidenced difficulties in the investigated aspects. A reflection on better structuring of the diverse services should also be conducted. In services connected with SUS, what would be the best way to favor hearing-aid management by users: after the test and selection of the device manufacturer and model, assign the adjustment and first guidance on its use, care and handling to the partner manufacturing companies, or assign the adjustment and initial guidance to the same team from the service itself, disregarding the manufacturer of the selected device?

Finally, the direction of the efforts in hearing rehabilitation of elderly hearing-aid users should be thought over. It should be pointed out that, apart from following the good practices of programming and verification of the device, speech therapists must focus on guidance of its use and handling, so that those individuals can handle their hearing aids with autonomy, fostering their effective use and, consequently, obtaining benefit and satisfaction.

CONCLUSION

The assessed elderly hearing-aid users showed knowledge and skill to handle the device in frequent situations. However, they still evidenced difficulties in other aspects, requiring help for the effective handling of the device. The greatest knowledge on hearing aids was correlated to the greatest handling skill.

REFERENCES

1. Behr LC, Simm A, Kluttig A, Großkopf A. 60 years of healthy aging: on definitions, biomarkers, scores and challenges. Ageing Res Rev. 2023;88:101934. http://doi.org/10.1016/j.arr.2023.101934. PMid:37059401.
2. Purnami N, Mulyaningsih EF, Ahadiah TH, Utomo B, Smith A. Score of Hearing Handicap Inventory for the Elderly (HHIE) compared to whisper test on presbycusis. Indian J Otolaryngol Head Neck Surg. 2022;74(1, Suppl 1):311-5. http://doi.org/10.1007/s12070-020-01997-5. PMid:36032827.
3. Bowl MR, Dawson SJ. Age-related hearing loss. Cold Spring Harb Perspect Med. 2019;9(8):a033217. http://doi.org/10.1101/cshperspect.a033217. PMid:30291149.
4. Cosh S, Helmer C, Delcourt C, Robins TG, Tully PJ. Depression in elderly patients with hearing loss: current perspectives. Clin Interv Aging. 2019;14:1471-80. http://doi.org/10.2147/CIA.S195824. PMid:31616138.
5. Völter C, Götze L, Dazert S, Wirth R, Thomas JP. Impact of hearing loss on geriatric assessment. Clin Interv Aging. 2020;15:2453-67. http://doi.org/10.2147/CIA.S281627. PMid:33408469.
6. Bennett RJ, Laplante-Lévesque A, Meyer CJ, Eikelboom RH. Exploring hearing aid problems: perspectives of hearing aid owners and clinicians. Ear Hear. 2018;39(1):172-87. http://doi.org/10.1097/AUD.0000000000000477. PMid:28787315.
7. Melo M, Catalani B, Oliveira JRM, Mondelli MFCG. Translation and cultural adaptation of Hearing Aid Skills and Knowledge Test into Brazilian Portuguese. Audiol Commun Res. 2022;27:e2589. http://doi.org/10.1590/2317-6431-2021-2589en.
8. Bennet RJ, Meyer CJ, Eikelboom RH, Atlas JD, Atlas MD. Factos associated with self-reported hearing aid management skills and knowledge. Am J Audiol. 2018;27(4):604-13. http://doi.org/10.1044/2018_AJA-18-0053. PMid:30286248.
9. Gomes LS, Menezes PL, Peixoto GO, Pinheiro NS, Marques MCS, Carnaúba ATL, et al. Satisfaction of users of hearing aids after using a responsive website in the adaptation process. Audiol Commun Res. 2021;26:e2360. http://doi.org/10.1590/2317-6431-2020-2360.
10. McMullan A, Kelly-Campbell RJ, Wise K. Improving hearing aid self-efficacy and utility through revising a hearing aid user guide: a pilot study. Am J Audiol. 2018;27(1):45-56. http://doi.org/10.1044/2017_AJA-17-0035. PMid:29222574.
11. Saunders GH, Morse-Fortier C, McDermott DJ, Vachhani JJ, Grush LD, Griest S, et al. Description, normative data and utility of the Hearing Aid Skills and Knowledge Test. J Am Acad Audiol. 2018;29(3):233-42. http://doi.org/10.3766/jaaa.16153. PMid:29488873.
12. Keithley EM. Pathology and mechanisms of cochlear aging. J Neurosci Res. 2020;98(9):1674-84. http://doi.org/10.1002/jnr.24439. PMid:31066107.
13. Ribeiro UASL, Souza VC, Lemos SMA. Quality of life and social determinants in individual hearing aids users. CoDAS. 2019;31(2):e20170287. http://doi.org/10.1590/2317-1782/20182017287. PMid:30942286.
14. Rocha LV, Martinelli MC. Cognition and benefit obtained with hearing aids: a study in elderly people. CoDAS. 2020;32(2):e20180259. http://doi.org/10.1590/2317-1782/20192018259. PMid:32022100.
15. Ernst A, Basta D, Mittmann P, Seidl RO. Can hearing amplification improve presbyvestibulopathy and/ or the risk-to-fall? Eur Arch Otorhinolaryngol. 2021;278(8):2689-94. http://doi.org/10.1007/s00405-020-06414-9. PMid:33034732.
16. Solheim J, Gay C, Hickson L. Older adults' experiences and issues with hearing aids in the first six months after hearing aid fitting. Int J Audiol. 2018;57(1):31-9. http://doi.org/10.1080/14992027.2017.1380849. PMid:28952841.
17. Bennett RJ, Meyer C, Olaithe M, Schmulian D, Eikelboom RH. Are hearing aid owners able to identify and self-report handling difficulties? A pilot study. Int J Audiol. 2017;56(11):887-93. http://doi.org/10.1080/14992027.2017.1347289. PMid:28708437.
18. Desjardins JL, Doherty KA. Do experienced hearing aid users know how to use their hearing aids correctly? Am J Audiol. 2009;18(1):69-76. http://doi.org/10.1044/1059-0889(2009/08-0022). PMid:19380509.

19. Ward EV, Berry CJ, Shanks DR, Moller PL, Czsiser E. Aging predicts decline in explicit and implicit memory: a life-span study. Psychol Sci. 2020;31(9):1071-83. http://doi.org/10.1177/0956797620927648. PMid:32735485.

20. Fortunato S, Forli F, Guglielmi V,De Corso E, Paludetti G, Berrettini S, et al. A review of new insights on the association between hearing loss and cognitive decline in ageing. Acta Otorhinolaryngol Ital. 2016;36(3):155-66. http://doi.org/10.14639/0392-100X-993. PMid:27214827.

21. Desjardins JL, Alicea CA, Doherty KA. The effect of memory span and manual dexterity on hearing aid handling skills in new and experienced hearing aid users. Am J Audiol. 2019;28(1):37-47. http://doi.org/10.1044/2018_AJA-17-0118. PMid:30535129.

22. Bennett RJ, Meyer CJ, Eikelboom RH. How do hearing aid owners acquire hearing aid management skills? J Am Acad Audiol. 2019;30(6):516-32. http://doi.org/10.3766/jaaa.17129. PMid:30969909.

23. Rodrigues-Sato LCCB, Almeida K. Clinical protocol for Hearing Health Services for the care of adults and elderly. CoDAS. 2018;30(6):e20170280. http://doi.org/10.1590/2317-1782/20182017280. PMid:30427378.

24. Kuk F, Baekgaard L. Hearing aid selection and BTEs: choosing among various "open-ear" and "receiver-in-canal" options. Hear Rev. [Internet]. 2008 Mar [citado em 2025 Abr 24];15(3):22-36. Disponível em: https://hearingreview.com/practice-building/practice-management/hearing-aid-selection-and-btes-choosing-among-various-open-ear-and-receiver-in-canal-options