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Practical hearing aid skills test: results at the time of fitting and comparison of inter-rater reliability

Teste prático das habilidades de manuseio do aparelho de amplificação sonora individual (PHAST): resultados na adaptação e comparação da confiabilidade entre avaliadores

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ABSTRACT

Purpose: To evaluate the results of the "Practical Hearing Aid Skills Test (PHAST)" in new HA users. To assess the inter-rater reliability of the PHAST. **Methods:** Descriptive, longitudinal analysis of data from a randomized controlled trial. The PHAST was administered to 60 new users of behind-the-ear and in-the-ear instruments, immediately and 10 days after the hearing aid fitting. The assessments were recorded and later analyzed and scored by one or two independent evaluators. **Results:** About 55% of the participants showed fair and poor performance on the PHAST. Battery replacement and hearing aid insertion tasks were the most difficult to complete. Total scores as well as "opening battery compartment" and "hearing aid insertion" tasks scores, improved significantly between the first and second administration of the PHAST. The PHAST performance was correlated with the participant's age. Inter-rater reliability was high and significant concerning the total score and for six PHAST individual tasks. **Conclusion:** New hearing aid users have different hearing aid handling skills that increase in the initial periods of HA use. The PHAST can be used in the audiology clinic, allowing for a more systematic record of such skills.

Keywords: Hearing loss; Hearing aids; Hearing; Orientation; Hearing disorders

RESUMO

Objetivo: Avaliar os resultados do "Teste Prático de Habilidade de manuseio do aparelho de amplificação sonora individual AASI (PHAST)" em novos usuários deste dispositivo. Verificar a confiabilidade interavaliadores para o teste PHAST. **Métodos:** Análise descritiva, longitudinal de dados de um estudo clínico randomizado controlado. O PHAST foi aplicado em 60 novos usuários de AASI retroauriculares e intra-aurais, imediatamente e cerca de dez dias após a concessão do dispositivo. As avaliações foram filmadas e, posteriormente, analisadas e pontuadas por um ou dois juízes independentes. **Resultados:** Aproximadamente 55% dos participantes obtiveram desempenho variando de razoável a ruim. A troca da pilha e inserção do AASI foram as tarefas de maior dificuldade. A pontuação total e das tarefas de "abertura do compartimento de pilha" e "inserção do AASI" aumentaram significativamente entre as aplicações do PHAST, indicando melhora do manuseio ao longo do tempo. O desempenho no PHAST foi correlacionado com a idade dos participantes. A confiabilidade entre avaliadores foi alta e significativa para a pontuação total e para seis tarefas individuais do PHAST. **Conclusão:** Novos usuários exibem diferentes dificuldades no manuseio do AASI, que são maiores nos períodos iniciais de uso. O PHAST pode ser utilizado na clínica audiológica a fim de propiciar um registro mais sistemático de tais habilidades.

Descritores: Perda auditiva; Auxiliares de audição; Audição; Orientação; Transtornos da audição

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INTRODUCTION

Individuals with sensorineural hearing loss usually require treatment based on self-care skills, such as the effective use of hearing aids (HA). Achieving success in this treatment depends on different factors, including the provision of information and training regarding the handling of hearing aids, thus ensuring their proper use and functioning[1]. The patient's inability to keep the hearing aids working properly makes necessary consultations with an audiologist to carry out review and likely repairs, requiring time, financial and psychological investments from the user. The patient´s difficulties with hearing aid handling may also affect the satisfaction with the device use as well as with the service provided by the professional[2].

Generally, professionals provide information and demonstrations on the handling of hearing aids during the informational counseling, at the day of the fitting, in a session that lasts approximately 45 minutes[3]. In these sessions it is necessary to find ways to ensure that hearing aid orientations are understood and retained by the patient and that hearing aid handling skills are acquired.

The performance of experienced hearing aid users to manipulate and take care of your devices has been reported in the literature[4,5]. However, to date, no studies were found that have evaluated such skills in the early periods of hearing aid use. This information is important for the informational counseling process to be analyzed and, if necessary, optimized.

Researches also show that the patients´ report or self-perception about their hearing aid handling performance overestimates their real skills[6,7], indicating the need for more detailed and systematic evaluations. The Practical Hearing Aid Skills Test (PHAST)[6] was developed to measure the performance of hearing aid users. Although it has been reported that the PHAST has excellent inter-rater reliability, this result was based on the analysis of a sample comprising only three patients[6], thus further assessments are necessary to support the test application in clinical practice.

This study aimed to evaluate the hearing aid handling skills of new users and to analyze the inter-rater reliability for the PHAST.

METHODS

This descriptive, longitudinal analysis, is part of a randomized controlled trial, conducted at the Speech Language Pathology and Audiology Clinic, Dental School of Bauru, *Universidade de São Paulo* (USP), accredited by the Ministry of Health for the concession of hearing aids. This study was approved by the USP´s Research Ethics Committee (Protocol Number 135/2010).

Participants

A total of 60 individuals, 34 males and 26 females, aged between 29 and 94 years (mean 69.7 years) participated as volunteers, after signing the Informed Consent. The participants met the following inclusion criteria: to be enrolled in the SLP-Audiology Clinic, to be 18 years or older, to be literate, to present mild to severe sensorineural hearing loss, not have previous hearing aid experience, not present cognitive impairment according to the Mini-Mental State Examination (MMSE) translated into Brazilian Portuguese[8] and not present associated deficiencies, with exception of visual impairment which could be corrected with lenses. Demographic data of the participants were drawn from their records (Table 1).

Table 1. Demographic characteristics of the participants (n=60)

Demographic characteristics of the participants		n (%)
Gender	Female	26 (43.4%)
	Male	34 (56.6%)
Age	Below or equal to 60	11 (18.3%)
	Between 61-70	19 (31.7%)
	Between 71-80	21 (35%)
	Between 81-90	8 (13.3%)
	Above 90	1 (1.7%)
Socioeconomic status (Graciano et al., 1999)[9]	Lower inferior	4 (6.6%)
	Lower superior	41 (68.3%)
	Medium inferior	13 (21.6%)
	Medium superior	2 (3.3%)
Educational status	Fundamental incomplete	33 (55.0%)
	Fundamental complete	8 (13.3%)
	High School incomplete	9 (15.0%)
	High School complete	1 (1.7%)
	Superior	9 (15%)

It is noteworthy that individuals had varying degrees of hearing loss, and the average of the hearing thresholds at frequencies from 500 to 4000 Hz, in the better ear, ranged from 30 to 65.7 dB HL (average 46.97 ± 9.1). The majority (n=50) of the participants comprised elderly people (over 60 years). All the participants were fitted with programmable multichannel WDRC digital hearing aids, being CIC (n=8), in-the-canal (n=29) and mini-BTE (n=23).

Procedures

For each participant, the hearing aid selection was made from their acoustical, aesthetic and physical comfort needs and verification was performed with probe microphone measures. Then, informational counseling was carried out. Only one audiologist performed all the procedures and the informational counseling session was timed, so as not to exceed 45 minutes - average time reported in the literature for such procedure[3].

During the informational counseling the following information and demonstrations were addressed: hearing aid batteries

type, size, acquisition and replacement, identification of hearing aid and earmold for the right and left ears, hearing aid/earmold insertion, removal and cleaning, volume control usage, telephone usage and hearing aid/earmold troubleshooting.

A sequence was followed in order to ensure that the information was offered to all the participants in the same order. Communication strategies as well as other strategies that facilitated the understanding and retention of information by the participants were employed, including training for performing the hearing aid use and care. The participants´ doubts regarding the information presented or questions about the hearing aid use and care were also clarified. At the end of the session, all participants received the HA instruction manual, provided by the manufacturer.

Hearing aid handling skills was assessed by means Practical Hearing Aid Skill Test - PHAST[6], adapted to Brazilian Portuguese[10]. The PHAST contains eight tasks:

1. Remove your hearing aid(s): (a) grasping aid/dexterity, (b) removal of aid from ear.
2. Open the battery door: (a) locate the door, (b) open the door.
3. Change your hearing aid battery: (a) remove old battery, (b) insert new battery.
4. Show me how you clean your hearing aid: (a) sound bore, (b) microphone, (c) vent.
5. Put your hearing aid(s) back in your ear(s): (a) grasping aid/dexterity, (b) placement in ear.
6. Turn up the volume of your hearing aid(s).
7. Show me how you use the telephone with your hearing aid(s): (a) correct use of program/t-coil switch, (b) placement of phone in relation to hearing aid
8. Show me how you use your noise program/directional microphone.

The participants were asked to perform the PHAST tasks, without assistance of the professional or companion. Such procedures were filmed with a digital camera (Sony® Cybershot DSC-W220), positioned so as to allow viewing of the tasks performed by the participant. They were later analyzed by one (n=60) previously trained independent evaluator and each task was scored according to a 5-point Likert scale, as shown in Chart 1. The higher the score, the better the hearing aid handling skill.

The scores of each individual task are added, in order to obtain the total PHAST score - when all tasks are applied, the total score ranges from 0 to 32 points. However, some tasks may not be applicable to certain HA types. For example, in this study, task eight (use of directional microphone or noise program) was excluded, as the manual control of such resources was not available to the participants. In addition, some hearing aids had automatic volume control, so this task was not scored to these participants. For this reason, the number of possible points varied for each individual, in particular.

In order to normalize the results, the PHAST analysis is performed by percentage. This percentage is calculated by the number of points obtained, divided by the maximum score that the individual could reach in the test. This result is then multiplied by 100. Based on this, the performance of the participant in handling the hearing aid is classified as follows: excellent (90-100%), good (80-89%), fair (65-79%), or poor (below 65%)[6].

A revised version of the PHAST (PHAST-R) was published. In this test, a 3-point Likert scale is used in order to facilitate clinical administration[1]. The PHAST-R was not used in this study, because data collection was already under way when the publication became available. However, the literature states that there is no significant difference between the scores obtained by using the original PHAST[6] and PHAST-R[1].

For all the participants, the PHAST was applied at two different times during the study: at the day of hearing aid fitting, shortly after the informational counseling session, and at and follow-up visit, held seven to ten days after the fitting.

For 32 participants chosen at random, a second independent evaluator analyzed the PHAST administration on the day of fitting, so the inter-rater reliability was assessed.

The PHAST total scores and individual tasks scores obtained at fitting and follow up were compared (Wilcoxon´s test). Differences between PHAST tasks were also verified (Friedman´s test). The Spearman correlation coefficient was used in order to verify relationships between age, hearing threshold of the better ear and HA type with the PHAST percentage at the day of the fitting. The intra-class correlation coefficient was used in order to verify the inter-rater reliability. The closer the correlation coefficient values are to "1", the higher the reliability. Therefore, in this study, value 0.75 was adopted as a good agreement between evaluators[11]. For all inferential statistics, it was adopted a significance level of 5%.

Chart 1. Scores adopted on the PHAST test

Concept of PHAST	Scores	Skill description
Excellent	4	Participant completes the task without error
More than satisfactory	3	Participant makes a mistake, however, still succeeds in the task
Satisfactory	2	Participant makes more than a mistake, still succeeds in the task
Below satisfactory	1	Participant tries to complete the task, but does not complete the task, or else requires other means to complete it
Could not perform	0	Participant could not perform the task, even after several attempts

RESULTS

The PHAST total percentage ranged from 53.6 to 100% (mean=77.7, SD=12.4) on the day of fitting, and 60.7 to 100% (mean=82.8, SD=11.4) on the follow-up. The Wilcoxon test demonstrated statistically significant difference between the two PHAST applications, with respect to total score mean (p=0.000) and for some individual tasks (Figure 1).

Either for the date of fitting (p=0.000), as for the follow-up visit (p<0.001), it was observed significant difference (Friedman´s test) between the PHAST tasks. The results of individual comparisons showed that on the day of hearing aid fitting, the performance of the participants on the tasks "battery change" and "hearing aid insertion" was significantly worse than on the tasks "Hearing aid removal", "opening the battery compartment" and "using the telephone." Also, at follow-up the performance on the tasks "battery change" and "hearing aid insertion" was significantly worse than in tasks "hearing aid removal" and "battery compartment opening". In addition, participants had significantly worse performance on the task "hearing aid cleaning" than for "hearing aid removal". There was greater difficulty for the task "using the telephone" than for "opening battery compartment."

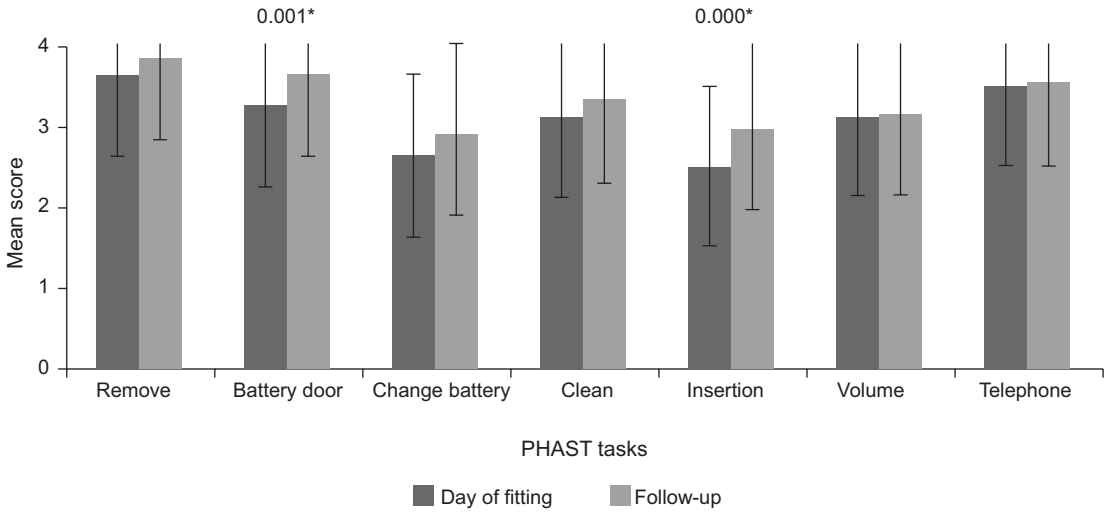
It was observed that on the day of fitting and at the follow-up, respectively, 55% and 39% of the participants presented fair and poor hearing aid handling skills (Figure 2).

There was a weak but significant negative correlation between PHAST total score and age of participants (Table 2).

The inter-rater reliability for the PHAST score is displayed in Table 3.

DISCUSSION

The range in PHAST total scores at the day of the fitting showed a great variability of HA handling skills among participants (Figure 1). It is noteworthy that most participants



*Significant values (p≤0.005) - Wilcoxon test

Figure 1. Comparison of mean score in the individual tasks of PHAST on the concession of hearing aids and follow-up visit

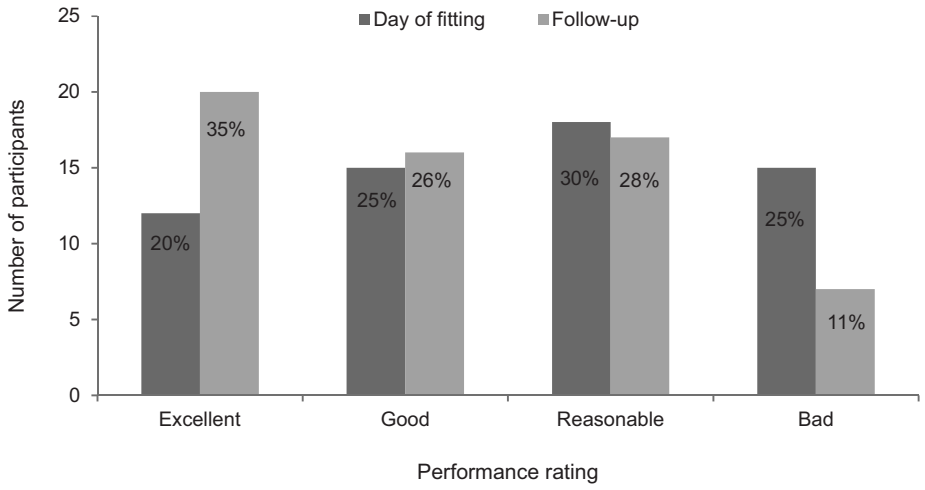


Figure 2. Classification obtained from the PHAST scores in two evaluation ranges (n=60)

Table 2. Pearson correlation (rho) between the total percentage of PHAST, age and auditory thresholds of the best ear at the time of granting the hearing aid

	PHAST (%) – grant	
	Rho	p-value
Age	-0.418	0.001*
Auditory thresholds of the best ear	0.00	0.998
Type of hearing aid	-0.13	0.316

*Significant values (p≤0.005) – Pearson's correlation test

Table 3. Inter-rater reliability (n=32)

PHAST	Coeficiente de correlação intraclasse
Remove hearing aid(s)	0.47
Open the battery door	0.86*
Change hearing aid battery	0.93*
Clean hearing aid(s)	0.77*
Put hearing aid(s)	0.91*
Turn up the volume of hearing aid(s)	0.72*
Use telephone with hearing aid(s)	0.48
Total porcentage	0.77*

*Significant values (p≤0.005) – Intraclass correlation test

presented "fair" or "poor" handling skills, after receiving hearing aid orientations (Figure 2).

Until the completion of this research, studies evaluating the hearing aid handling skills at the time of fitting were not found. However, given the lack of previous experience, it should be expected that new users would not be able to adequately perform all the PHAST proposed tasks.

The greater difficulties on the "battery replacement" and "HA insertion" tasks may have occurred due to participants´ manual dexterity skills and visual acuity, since they were predominantly elderly. These data suggest that professionals need to adopt different strategies to train patients to insert hearing aids and replace batteries at the day of the fitting.

Audiologists often report that learning how to use the telephone constitutes a difficult task, considering that new hearing aid users must properly position the handset in relation to the HA microphone (without, however, generating feedback) or t-coil. In the latter case, individuals must also master how to activate the t-coil to capture the electromagnetic signal from the telephone and, if necessary, adjust the HA volume to increase such capture. However, Figure 1 shows that the best performance was obtained for task "telephone usage." This may have occurred because most participants were using CIC or in-the-canal devices (Table 1) for which a more natural telephone handset position is allowed, due to the position of the HA microphone in the ear canal.

At the follow-up some improvement in the PHAST total score was observed for the tasks "opening battery compartment" and "hearing aid insertion". This performance improvement can be attributed mainly to the fact that individuals needed to practice these skills, in order to use the hearing aid on a daily basis. Another study[12] also found a natural improvement of 9.6% in HA use and handling for elderly people in a two-week period, attributing that fact to an expected "learning curve"

It is worth noting that, at follow up visit, participants´ hearing aid skills still varied as evidenced by the total PHAST scores. Moreover, 39% of the participants still exhibited poor or fair handling skills (Figure 2). In 2014, a study[10] evaluated individuals with up to six months of hearing aid experience, observing that 43% of those presented fair or poor handling skills in the PHAST.

Other studies have also shown that individuals with up to three months of hearing aid experience presented some difficulty in handling this device, such as hearing aid insertion and removal[4,7], handling batteries and earmolds[13], t-coil and volume control[14]. It is also worth noting that the results of this study were similar to other researches which applied the PHAST in experienced HA users and found total scores equal to 71%[10] - variation from 32% to 100%, 78.6% - variation from 48% to 100%[6] and 88.4% - variation from 61.2% to 100%[1]. At this point, it is not possible to determine whether the HA handling skills of the participants in this study would increase, decrease or remain stable over the years. Other researches comprising new hearing aid user exposed to subsequent training or orientation, have shown increased handling skills, use and benefit derived from these devices[4,12,15].

In this sense, follow-up visits are suggested in order to, among other things, reinforce orientation concerning hearing aid use and care[5]. In addition, multimedia instructional materials can be effective tools to supplement hearing aid orientation[16].

The correlation between the PHAST scores and age of the participants (Table 2), is in line with another study[6] which found that, for population aged over 65 years, younger individuals presented better performance on the PHAST. This result was attributed, in part, to the working memory deficit related to the age, hindering processing and storage of the orientations provided at the day of hearing aid fitting.

The age may also have influenced the manual dexterity skills, which, consequently, may have affected hearing aid handling skills. Studies have found that fine dexterity of hands was associated with better HA handling skills and elderly people presented worse results[17].

As observed in the literature[10,13], the present study did not found any relationship between the degree of hearing loss, hearing aid type and hearing aid handling skills.

The inter-rater reliability was very high and significant for the PHAST total score and for individual PHAST tasks, except for "hearing aid removal" and "telephone usage" (Table 3). An intraclass correlation coefficient of 1.0 was reported for

the PHAST[6]. However, this analysis was based in just three patients.

In this study, filming was employed for scoring the PHAST, so as to limit the intra-subject variability. However, the static positioning of the camera may have hampered the observation of the tasks "hearing aid removal" and "telephone usage," perhaps justifying lower inter-rater reliability. The analysis of individual data showed greater discrepancy for scoring of the task "telephone usage". In any case, this emphasizes the importance of using strategies which allow the training of evaluators when the PHAST is applied in clinical practice. The 3-point Likert scale proposed at PHAST-R[1] can be useful in this situation.

CONCLUSION

New users exhibit different hearing aid handling skills, which increase in the initial period of use of such device. The PHAST can be used in audiology clinics in order to provide a more systematic recording of such skills, since it showed a high inter-rater reliability.

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