

Use of Hearing Aids and Functional Capacity in Middle-Aged and Elderly Individuals

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Int Arch Otorhinolaryngol 2014;18:249–254.

Abstract

Introduction Hearing loss is among the sensory changes strongly associated with loss of functional capacity.

Objective It aims to determine whether the use of hearing aid contributes to the improvement of instrumental activities of daily living (IADL) for middle aged and elderly hearing-impaired individuals.

Methods This is a descriptive, longitudinal, and interventional study. We evaluated 17 subjects, 13 (76.5%) female, aged between 58 and 96 years old (mean 77.1 ± 10.4 years). All were new users of hearing aids. Evaluation included social history, pure tone audiometry, and scale of IADL developed by Lawton and Brody. The subjects were presented daily life situations and were expected to respond if they could do them without assistance (3 points), partially assisted (2 points) or if they were unable to perform them (1 point). IADL was applied before the use of hearing aids adaptation and after a three- and six-month period of use.

Results Data analysis revealed that before the use of hearing aids the average score obtained by the subjects was 22.94 ± 4.04 points. Three months after beginning the use the average score was 23.29 ± 4.12 and after six months the average score was 23.71 ± 3.69 points. Statistical analysis revealed a significant difference between scores obtained before the use of hearing aids and six months post-fitting ($p = 0.015^*$)

Conclusion The use of hearing aids among the subjects evaluated promoted positive changes in performing IADL, especially to using the telephone.

Keywords

- ▶ elderly
- ▶ hearing loss
- ▶ hearing aids

Introduction

Advances in health care, such as the discovery of diagnostic techniques and therapeutic methods effective in curing or controlling disease, can lead to increasing life expectancy. With these advances, elderly people are expected to maintain their functional capacity so that they remain autonomous and independent as long as possible. For such, it is of great importance to introduce health programs aimed at the pre-

vention, early diagnosis, and treatment of chronic diseases and disabilities that arise over the years.^{1–6}

As we age, there is a tendency toward chronic degenerative diseases that compromise the physical and mental functions of the individuals and ultimately lead to difficulties in daily activities or disability of the elderly to perform them.^{1–6}

Currently it is said that health is measured through the ability of the individual to remain functionally independent and not due to the presence or absence of disease; the

received
September 15, 2013
accepted
November 26, 2013
published online
February 28, 2014

DOI <http://dx.doi.org/10.1055/s-0034-1368136>.
ISSN 1809-9777.

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constraints brought by disability can cause more significant problems than the disease itself, as it can make patients dependent on their family and caregivers and can compromise their well-being and quality of life.⁷⁻¹⁰

The concepts for functional capacity are very similar. It is related to the degree of preservation of the individual to perform activities of daily living (ADL) and instrumental activities of daily living (IADL), so they can live independently.^{11,12}

Functional capacity is evaluated in two aspects: basic ADL (i.e., the individual's ability to feed, bathe, and dress without help) and IADL, which evaluate more complex tasks, often related to individuals' social engagement, such as shopping, answering the telephone, and using means of transportation.¹³

Hearing loss is one of the most frequent and disabling sensory changes, not only negatively affecting the elderly socially and emotionally but also affecting their quality of life.¹⁴⁻¹⁷ It is believed that hearing loss is strongly associated with loss of functional capacity,^{18,19} which explains the importance of this study.

Thus, the present study aimed to examine whether the use of hearing aids improves functional capacity for IADL for hearing-impaired middle-aged and elderly individuals.

Methods

The research is a descriptive, longitudinal, and interventional study. The population comprised 17 individuals, of both genders, between 58 and 96 years old (mean 77.1 ± 10.4 years).

Inclusion criteria were: individuals from 40 years old (which is considered the beginning of middle age),²⁰ new users of hearing aids with bilateral hearing loss, and participation in all phases of the research. Exclusion criteria were: not signing the informed consent form (ICF) and history of cognitive, neurologic, and/or psychiatric disorders. For participants who met the inclusion criteria, we presented the objectives of the research, and all participants signed ICF.

First, the individuals were submitted to audiological evaluation, with pure tone audiometry performed in a sound-proof booth and with tone thresholds by air (from 250 to 8,000 Hz) and bone (500 to 4,000 Hz) measured using an Interacoustics audiometer model AD-229, Denmark.

To classify the degree of hearing loss, we used the average of the hearing thresholds by air at 500, 1,000, 2,000, and 4,000 Hz, according to the World Health Organization.²¹ Mean values between -10 dBHL (decibel hearing level) and 25 dBHL indicate that the person has normal hearing thresholds; between 26 and 40 dBHL, mild hearing loss; between 41 and 60 dBHL, moderate hearing loss; between 61 and 80 dBHL, severe hearing loss; above 81 dBHL, profound hearing loss. For this study we considered the mean of the better ear.

This study was developed in three stages. In the first stage of evaluation, the procedures were as follows: we applied social history developed (anamnesis) especially for this study, containing demographic and hearing history. Furthermore, we used a questionnaire created by Lawton and Brody (1969),²² which measured the ability of the individual to develop IADL. Through this, we evaluated the functional capacity (i.e., the degree of independence of these individuals

in everyday activities, such as using the telephone, preparing meals, managing finances, commuting by means of public transportation, cleaning the house, going shopping, among others).

These issues were assessed using nine items where the patient had three response options: "able without assistance" (score 3), "able with partial assistance" (score 2), and "unable" (score 1). The maximum achievable score in the evaluation was 27 points, which corresponds to maximum independence, and the minimum achievable score was 9 points, meaning maximum dependency.

After completing the questionnaire, hearing aid(s) indicated for each subject were selected and tested. All subjects were fitted with hearing aid(s) with digital technology, with non-linear amplification. Nine (52.9%) participants used bilateral hearing aids and 8 (47.1%) used a single one.

The second stage of the research was initiated 3 months after beginning usage of hearing aid(s); the patient was contacted by telephone and asked to attend a meeting reviewing their hearing aid(s). At the hearing center, the patient answered a questionnaire evaluating functional capacity.

In the third stage, which began 6 months after beginning usage of hearing aid(s), patients again answered the questionnaire for assessing functional capacity.

The project was submitted to and approved by the Research and Ethics Committee of the institution (no. 212439). The rights regarding confidentiality, anonymity, and withdrawal of participation without prejudice to any treatments that were being performed were assured.

Data were both quantitative and descriptive statistically analyzed. To evaluate the performance of individuals for the task at each stage, descriptive statistical analysis was performed and then the nonparametric Friedman test was used. The total score was used to assess the overall performance of the individual (considering performance on all tasks). To compare the total score between steps and descriptive statistics, analysis of variance for repeated measures was performed.

Results

The sample consisted of 17 subjects, 13 women (76.5%) and 4 men (23.5%). Although the inclusion criteria defined that the minimum age would be 40 years, the sample consisted of subjects aged between 58 and 96 years (mean 77.1 ± 10.4 years). The other characteristics are shown in ►Table 1. With regard to education, most individuals had incomplete primary education (76.5%). Of the population, 76.4% had moderate hearing loss, 11.8% presented mild hearing loss, and 11.8% severe hearing loss. For this classification, we took into account the best ear. All subjects were fitted with hearing aids with digital technology, with nonlinear amplification. Nine (52.9%) participants use bilateral hearing aids and 8 (47.1%), monoaural aids.

Data on the ability of the elderly to perform IADL for the three stages of the research are described in ►Table 2.

►Table 3 shows the total score obtained by participants in the three stages of the research; a significant increase in the

Table 1 Characteristics of the sample regarding demographic, social, and audiological variables

Variables	n	%
Gender		
Male	4	23.5
Female	13	76.5
Education		
Illiterate	1	5.9
Primary school	2	11.8
Incomplete primary school	13	76.5
Higher education	1	5.9
Degree of hearing loss		
Mild	2	11.8
Moderate	13	76.4
Severe	2	11.8
Hearing aid fitting		
Monoaural	8	47.1
Binaural	9	52.9

degree of independence of individuals was found comparing the first and third stages ($p = 0.015$).

► **Table 4** shows the evolution in the use of the telephone in the three stages of the research. There was a significant difference ($p = 0.011$) between at least two of the three stages in the degree of independence in using the telephone. Although it was not possible to identify the difference in multiple comparison tests, the lowest observed p value ($p = 0.123$) indicates that this difference is probably between the level of independence of the first and third stage, with the third stage being the higher level of independence.

Discussion

We observed among the participants of the study a higher ratio of women (76.5%), which did not differ from other studies.^{6,23} Although the scientific literature shows that men are more affected by hearing loss,²⁴ data show that women seek more health services.²⁵ In addition, data from the 2010 population census in the country and the literature in the field of gerontology show that the majority of Brazilian individuals in the age range studied are women.^{26–28} This fact is known as “feminization of aging” and is corroborated by previous studies,^{6,23} and it should be taken into consideration for appraisal, diagnosis, and treatment of hearing services, which should be prepared to meet, in most cases, female subjects with specific characteristics, needs, and requirements.

A low level of education was expected by the researchers because many participants were elderly. This population, according to the 2010 census, has low levels of education because it had no opportunity to attend school in the life stage considered appropriate.^{26,29,30} Furthermore, it should be stressed again that many of the sample were women. Thus,

until a few years ago, few women attended schools, and many who abandoned their studies as they finished the initial grades to devote themselves to learning housework.

The degree of hearing loss observed in most cases is compatible with that caused by aging. Previous studies indicate that the majority of the elderly had mild to moderate hearing loss, which corroborates the results of this research and was expected by researchers due to the age range of the sample components.^{31,32} Although all subjects presented bilateral hearing loss, approximately half of the individuals (47.1%) acquired only one hearing aid. This could be explained by the fact that the purchase was made by the subjects of research, using their own financial resources. Thus, in many cases, although there was an indication of binaural fitting of hearing aids, financial issues, aesthetics, manual dexterity, auditory processing, or asymmetrical hearing loss led to monaural fitting.³³ This is quite common when analyzing the purchase of hearing aids in private hearing centers, which has been reported in other studies.^{34,35}

As previously described, the functional capacity is strongly related to the presence of some diseases and disabilities. Studies demonstrate that there is an association between hearing loss and the lack of autonomy of patients.^{1,10,36} Thus, we expected a low autonomy of the individuals to perform IADL in the first stage of the study, an evolution occurring after fitting (steps 2 and 3). The analysis of data contained in ► **Table 2**, however, showed that compared with the ability to carry out IADL between the three stages, the only task in which there was significant change was the ability to use the telephone ($p = 0.011$). The change was so evident that it was able to give a significant difference in scores between the three stages of the study (► **Table 3**).

Most individuals could perform adequately and effectively the investigated IADL, contrary to what was expected by the evaluators because most of the subjects had hearing loss and low levels of education. This finding contradicts other studies, whose results indicated that the low level of education and hearing loss negatively influenced the autonomy of the elderly.^{1,6,10,37}

Most of the subjects had hearing loss from mild to moderate in the better ear, which can make communication difficult through the use of the phone. To carry out the other activities, however, the individual may resort to communication strategies, such as lipreading and requesting repetition of phrases. In addition, some activities investigated by the instrument, such as shopping, ironing, controlling remedies and finance, for example, are more closely related to cognitive and motor activity and may not be influenced by the presence of mild to moderate hearing loss.

Data in ► **Table 4** confirm the change observed between the three evaluations with regard to the use of the phone. The analysis suggests that the change in the behavior of the subjects occurred between steps 1 and 3 of the research. The greater autonomy in the use of the telephone does not confirm previous studies that reported on new hearing aid users whose main complaint was difficulty using the telephone.^{38–40} The studies cited, however, are prior to 2010, before hearing aid resources facilitating the use of

Table 2 Ability to perform instrumental activities of daily living during the three stages of the research

Task	Stage 1		Stage 2		Stage 3		p value
	n	%	n	%	n	%	
Use the telephone:							0.011
Unable	8	47.1	5	29.4	2	11.8	
Able without assistance	9	52.9	12	70.6	15	88.2	
Commute to distant sites:							>0.999
Unable	3	17.6	3	17.6	3	17.6	
Able with partial assistance	5	29.4	5	29.4	5	29.4	
Able without assistance	9	52.9	9	52.9	9	52.9	
Shop:							>0.999
Able with partial assistance	4	23.5	4	23.5	4	23.5	
Able without assistance	13	76.5	13	76.5	13	76.5	
Prepare meals:							>0.999
Unable	1	5.9	1	5.9	1	5.9	
Able with partial assistance	1	5.9	1	5.9	1	5.9	
Able without assistance	15	88.2	15	88.2	15	88.2	
Clean the house:							>0.999
Unable	2	11.8	2	11.8	2	11.8	
Able without assistance	15	88.2	15	88.2	15	88.2	
Handicraft:							>0.999
Unable	4	23.5	4	23.5	4	23.5	
Able with partial assistance	3	17.6	3	17.6	3	17.6	
Able without assistance	10	58.8	10	58.8	10	58.8	
Wash and iron clothes:							>0.999
Unable	3	17.6	3	17.6	2	11.8	
Able with partial assistance					1	5.9	
Able without assistance	14	82.4	14	82.4	14	82.4	
Take medicines:							>0.999
Able with partial assistance	4	23.5	4	23.5	4	23.5	
Able without assistance	13	76.5	13	76.5	13	76.5	
Manage finances:							>0.999
Able with partial assistance	10	58.8	10	58.8	10	58.8	
Able without assistance	7	41.2	7	41.2	7	41.2	

telephone were available. Moreover, it should be pointed out that in addition to these resources, all subjects in the research sample received specific guidelines from the pathologist responsible for selecting and fitting hearing aids. In the fitting process, individuals and their families should

be targeted, and the use of telephone and other auxiliary equipment should be one of the items addressed.⁴¹

Thus, considering the test scores (especially with regard to the use of the telephone) and the time of use of hearing aids by the subjects, it appears that there was a gradual improvement

Table 3 Overall score per assessment stage

	n	Mean	Standard deviation	Median	Minimum	Maximum
Overall score (stage 1)	17	22.94	4.04	24	12	27
Overall score (stage 2)	17	23.29	4.12	25	12	27
Overall score (stage 3)	17	23.71	3.64	25	14	27

Note: $p = 0.015$ from stage 1 to stage 3.

Table 4 Changes in use of the telephone in the three stages of the research

	Stage 1 (%)	Stage 2 (%)	Stage 3 (%)
Unable	47.1	29.4	11.8
Able without assistance	52.9	70.6	88.2

Note: $p = 0.011$ from stage 1 to stage 3.

in auditory skills and speech recognition due to the new use of amplification.⁴² These findings corroborate other studies describing the acclimatization period starting from week 6 of amplification.^{43,44} In 2002, 134 elderly in the first year of adjustment of hearing prosthesis showed more significant changes between the first and sixth months of use.⁴⁴ Thus, we can confirm the importance of the intervention with the use of hearing aids in middle-aged adults and seniors.

Conclusion

The analysis of the results showed that the use of hearing aid (s) improved functional capacity for IADL in the individuals evaluated, especially in using the telephone.

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