Original Article

Artigo Original

The influence of cognitive aspects and auditory processes on the hearing aid acclimatization in the elderly

A influência dos aspectos cognitivos e dos processos auditivos na aclimatização das próteses auditivas em idosos

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Keywords

Hearing
Cognition
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ABSTRACT

Purpose: To verify the speech recognition processes in a monoaural task and in a binaural integration task with dichotic listening, and to compare them to the cognitive processing in elderly subjects pre and post hearing aid acclimatization. **Methods:** Participants were 60 elderly subjects of both genders, ranging in age from 61 to 85 years. They were evaluated for cognitive aspects by means of the Mini-Mental State Examination (MMSE) and the Alzheimer's Disease Assessment Scale (ADAS-Cog). To evaluate speech processes in a monoaural task and in a binaural integration task with dichotic listening, the Percentage Index of Speech Recognition Test (PISR) and the Dichotic Digits Test (DDT) were completed before and after using the hearing aid. Data was descriptively presented and compared with non-parametric tests. **Results:** Speech recognition at the PISR was low (mean 69.6%) and the DDT presented better digit recognition on the right ear (mean 74.1%) than on the left ear (mean 61.1%). The sample presented improved performance on speech tests after the use of hearing aids, with relevant difference between the means of the first and the second evaluations. The PISR was not correlated with cognitive aspects. The DDT was associated with both cognitive tests, especially for the left ear. **Conclusion:** All subjects were acclimatized, because there was improvement in speech recognition following the use of hearing aids. Subjects with cognitive problems present poorer performance in speech recognition processes with dichotic listening.

Descritores

Audição
Cognição
Percepção auditiva
Idoso
Testes auditivos

RESUMO

Objetivo: Verificar os processos de reconhecimento de fala em tarefa monoaural e de escuta dicótica em tarefa de integração binaural, e compará-los com o processamento cognitivo em idosos antes e após o uso de próteses auditivas. **Métodos:** Participaram 60 idosos, de ambos os gêneros, com faixa etária entre 61 e 85 anos. Os aspectos cognitivos foram avaliados por meio do Mini-Exame do Estado Mental (MEEM) e Escala de Avaliação da Doença de Alzheimer (ADAS-Cog). Para avaliar o reconhecimento de fala em tarefa monoaural e a escuta dicótica em tarefa de integração binaural, foi utilizado o Índice Percentual de Reconhecimento de Fala (IPRF) e o Teste Dicótico de Dígitos (TDD), antes e após o uso da prótese auditiva. Os dados foram apresentados por meio da estatística descritiva e comparados por meio de testes não paramétricos. **Resultados:** O reconhecimento de fala no IPRF foi baixo (média de 69,6%), e o TDD apresentou melhor reconhecimento de dígitos à orelha direita (média 74,1%) do que à orelha esquerda (média 61,1%). Nos testes de reconhecimento de fala, houve diferença entre as médias da primeira avaliação e da reavaliação após o uso das próteses auditivas. Não houve associação do IPRF com os aspectos cognitivos. Ocorreu associação do TDD com os dois testes cognitivos, especialmente à orelha esquerda. **Conclusão:** Todos os indivíduos estavam aclimatizados, pois houve melhora do reconhecimento de fala após o uso das próteses auditivas. Os indivíduos com alteração cognitiva apresentam pior desempenho no processo de reconhecimento da fala em escuta dicótica.

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INTRODUCTION

Hearing difficulties are among the most frequent chronic problems affecting the quality of life of the elderly. Presbycusis, that features a recruiting sensorineural hearing loss, shows poor frequency and duration resolution that impair speech comprehension[1].

During the aging process besides the decrease of hearing function there is also the decrease of memory and other superior cognitive functions such as language, executive functions and sequencing. Such aspects bring about a functional decrease in the geriatric population[2-4]. Hearing difficulties in the elderly are a consequence of dysfunctions in structures involved in the neurological processing of auditory information that also negatively impair language comprehension and synthesis.

For the rehabilitation of the elderly with presbycusis it is recommended the use of hearing aids[5]. With the technological advances, hearing aids are becoming increasingly more sophisticated and aim to address the needs of the hearing impaired.

The study of the cognitive function in individuals with hearing loss has become the focus of various studies that attempt to relate the use of hearing aids to the changes in attention and memory abilities[6]. Accordingly, auditory processing behavioral tests present a great contribution to the analysis of the effects of age in hearing abilities. Among behavioral tests the Dichotic Digits Test (DDT) has been widely applied in many researches that analyze problems in the inter hemispheric communication in the elderly[7-9].

It is believed that elderly hearing aid users can improve speech comprehension with the use of the hearing aid. In the literature this is referred to as acclimatization. The benefit with the use of amplification cannot be immediately perceived what occurs over a period that varies from six to twelve weeks of use[10]. However, even though an increase of signal audibility occurs many elderly remain with difficulties to process syntactic speech changes that are performed by cognitive functions[11,12].

With the present study it is expected to contribute with the knowledge that the use of cognitive scales and auditory processing behavioral tests allow the comprehension of the effects of acclimatization in the neurological processing of hearing in elderly candidates and users of hearing aids. For characterization of the cognitive aspects the application of the Assessment Scale of Alzheimer's Disease (ADAS-Cog) and the Mini Mental State Exam (MMSE) have been recommended. The ADAS-Cog scale is a neuropsychological battery that assesses key signals of dementia characteristic of Alzheimer's Disease. On the other hand MMSE, is a trace test that has been used in researches with elderly that are outpatients and institutionalized to assess global cognitive function [3,8,13].

Thus, the objective of this study was to verify speech recognition processes in a monoaural task, and dichotic listening in a task of binaural integration, and to compare them to the cognitive processing of elderly subjects before and after the use of hearing aids.

METHODS

This research was approved by the Committee of Research Ethics of the Universidade Federal de São Paulo (1953/08), and it was conducted at the reference center for Hearing Health Care with elderly candidates to the selection and adaptation of hearing aids, according to criteria of the guidelines of Hearing Health Care - nº 587, of 10/07/2004[14], for a two year period.

Selected subjects were informed regarding the procedures that were included in the study and signed a free and informed term of agreement authorizing their voluntary participation in the study.

The sample was composed of 60 elderly of both genders – 20 male and 40 female –, with a mean of 5.4 years of formal education and ages ranging from 61 to 85 years (mean of 71.7 years). All subjects were new users of hearing aids, with bilateral, symmetrical moderate to moderate-to-severe sensorineural hearing losses. The mean audibility thresholds for the frequencies of 500 Hz to 4 kHz was of 50.4 dBNA for both the right and left ears.

For the selection of the fore mentioned groups, the following criteria of eligibility were established: the absence of evidences of neurological changes, have the Brazilian Portuguese as the first language, present a bilateral moderate to moderate-to--severe sensorineural hearing losses in the frequency range of 500 Hz to 4 kHz, bilateral type A tympanometry curves and be a new user of intra aural hearing aids without any previous audibility experience.

All the elderly participants in this research received intra aural hearing aids. From the total, 55 received the micro canal type hearing aids and five the intra canal type. It is worth mentioning that during the period of subject selection there were difficulties in finding the elderly that had the time to attend the follow up periodic sessions and without previous experience with acoustical stimulation.

The selected procedures were conducted in two sessions. In the first one, the cognitive tests were applied and in the second one the behavioral (Central) auditory processing tests. Each session lasted an average of 90 minutes.

To characterize cognition the following procedures were used: Mini Mental State Examination (MMSE) and Assessment Scale of Alzheimer's Disease (ADAS-Cog). The Mini Mental State Examination (MMSE) assesses eight cognitive parameters divided in seven categories. Scoring on this test varies from 0 to 30 points. The lower the score the higher were the chances that the subject presented an altered cognitive capacity. As long as formal education influences in the tests performance, this study used the following point classification[13]: analphabets – 20 points; 1 to 4 years of formal education – 25 points; 5 to 8 years of formal education – 26.5 points; 9 to 11 years of formal education – 28 points; and over 12 years – 29 points. Scores below the predicted median for the age range indicate an altered test. The approximated time of application was of ten minutes.

To apply the Assessment Scale of Alzheimer's Disease (ADAS-Cog) an average of forty minutes was necessary. In this study, the subjects did not present Alzheimer's Disease. Hence the scale was used with the goal of assessing the presence of

cognitive alterations. The assessed activities were remembering words, naming pictures, copying images and following orders. The score varied from 70 (the lowest) to zero. The higher the score the bigger the subject's cognitive disturbance. The score was classified according to the subject's length of formal education and following the mean scoring criteria plus two standard deviations[15]: 0 to 4 years of formal education – 10.9 (SD=6.2) – 23.3 points; 5 to 11 years of formal education – 7.8 (SD=2.8) – 13.4 points; over 12 years of formal education – 6.3 (SD=2.4) – 11.1 points.

The MMSE and the ADAS-Cog were analyzed in two manners in this study. They were considered scores and the categories *normal* or *altered* were defined according to the years of formal education.

The tests selected to characterize speech recognition in a monoaural task and of dichotic listening in a of binaural integration task were, respectively the percentage index of speech recognition (PISR) with recording and the Dichotic Digits Test (DDT). For the PISR the presentation of the words was done in an intensity of 30 dBNS starting at the mean of the 500 Hz, 1 and 2 kHz frequencies. For the DDT, only the binaural integration part was applied and it has the objective of assessing the subject's ability in grouping components of acoustic stimuli in figure ground for verbal sounds. The intensity of stimuli presentation was of 40 dBNS based on the mean of hearing thresholds for 500 Hz, 1 and 2 kHz to guarantee subject's audibility and comfort during stimuli presentation.

These tests were conducted before the adaptation of hearing aids (first evaluation) and after a minimum of three months of use (reevaluation) to verify the possible occurrence of acclimatization. The maximum period of reevaluation of the auditory processing behavioral tests was of ten months. All participants completed the first evaluation without the use of hearing aids. However, for reevaluation all of them were using intra aural hearing aids.

In cases that reevaluation was conducted in a period longer than three months possible problems such as technical problems with the hearing aids, presence of wax in the external auditory canal making the use of intra aural hearing aids impossible, besides the difficulty of adaptation or manipulation of the hearing aids. These cases were followed more frequently and reevaluation was conducted only after the solution of these problems, with a minimal period of three months of effective use of the hearing aids. The mean daily use of hearing aids was of 9.1 hours.

The auditory processing special tests were all presented in a Sony® compact disc (CD) portable player, model D-152 K, attached to a two-channel audiometer, Grason-Stadler® Clinical Audiometer, model GSI 61, with TDH 39 P earphones and MX-41 AR cushion , calibrated according to the ANSI 69 guidelines. Both CDs that accompany the Manual of Central Auditory Processing Assessment (Manual de Avaliação do Processamento Auditivo Central) were used[16]. All the auditory processing tests were conducted in a soundproof booth.

From the 60 participants that completed the first evaluation before the adaptation, 57 returned to complete the reevaluation of the (central) auditory processing behavioral tests. One participant did not complete the reevaluation testing due to death and two due to loss of the hearing aids.

The statistical analyses conducted included the test of equality of two proportions to compare the cognitive tests in their classification of Normal or Altered performances. The Kappa concordance index was used to verify the concordance between the MMSE and ADAS-Cog. The analysis of variance technique with repeated measures was applied to compare the mean percentage of recognition in the IPRF and DDT between the first evaluation and reevaluation. The Mann-Whitney test was used to verify the existence of association between de responses of each auditory test to the categories of the ADAS-Cog and MMSE. The Correlation Coefficient was employed and the interclass to verify concordance between the results of both ears on the first evaluation and on the reevaluation. For all the tests the significance level was fixated at 0.05.

RESULTS

The results for the cognitive tests show low variability hence the standard deviation is low in relation to the mean. The variation coefficient is also low, confirming the low variability and homogeneity of the studied sample (Table 1). The third quart shows that 75% of the sample presented 23.3 points on the ADAS-Cog and 25.0 points on the MMSE.

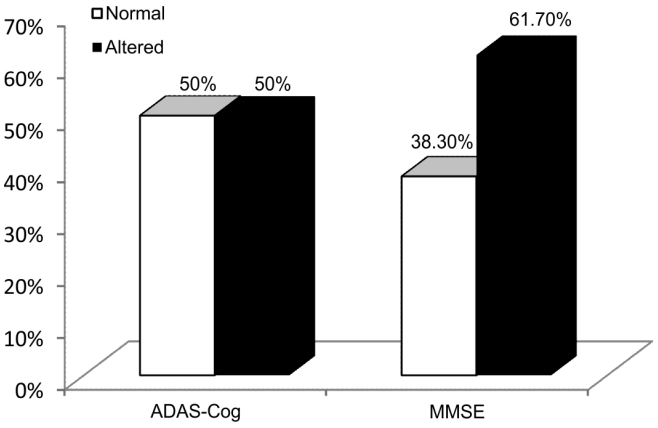
Table 1. Descriptive measures for scoring relative to the performance of the elderly on cognitive measures

Descriptive	ADAS-Cog	MMSE
Mean	19.0	22.3
Median	19.7	23.0
SD	7.3	4.4
CV	38%	20%
Q1	13.4	19.8
Q3	23.7	25.0
Minimum	6.7	12.0
Maximum	40.0	29.0
n	60	60
CI	1.8	1.1

Note: ADAS-Cog = Alzheimer's Disease Assessment Scale; MMSE = Mini Mental State Examination; CV = coefficient of variation; SD = standard deviation; Q1 = first quart, Q3 = third quart, CI =confidence interval

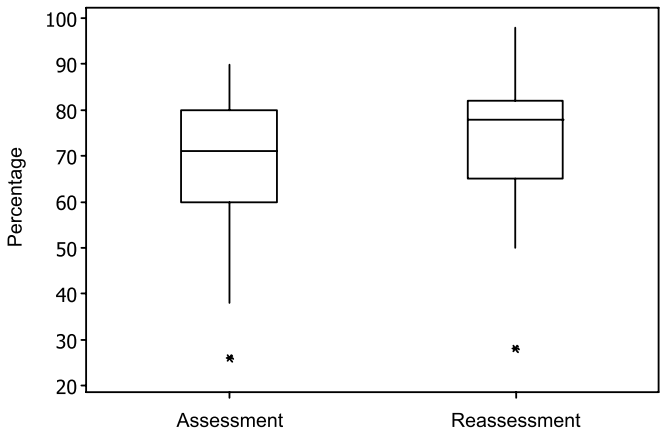
Comparing the results on the cognitive tests to formal years of education it was possible to verify that the most part of the sample presented altered results on the cognitive tests. Even though there are differences between the percentiles of "normal" and "altered" between the two tests it was not a significant one. The Kappa statistics showed that there was regular agreement between the results of both tests (50%).

In relation to the hearing tests, the coefficient of correlation on the PISR showed a strong concordance between the ears on the fist evaluation (0.79) as well as on the reevaluation (0.80). Therefore when further analyses of the PISR were conducted a single percentage analysis of performance between the



Equality Test of Two Proportions (p=0.198)
Kappa Index of Concordance 50.0% (p<0.001*)
Note: ADAS-Cog = Alzheimer's Disease Assessment Scale; MMSE = Mini-Mental State Examination

Figure 1. Subject distribution according to performance on cognitive tests



Analysis of variance with repeated measures – Difference between mean percentage in the first evaluation and reevaluation (p<0.001)
Note: PISR = Percentage Index of Speech Recognition

Figure 2. Distribution of percentage of correct responses on the PISR for the evaluation and reevaluation

evaluations was completed. It was noted that the percentage of speech recognition on the PISR was low, in both situations before (mean 69.6%) and after (mean 73.6%) the use of hearing aids (Figure 2).

Comparing the performance of the elderly on the first evaluation and on the reevaluation it was noted that there was a difference in speech recognition between them (Figure 2). However comparing the performance of the elderly on the cognitive tests to the percentage of speech recognition in a monoaural task no correlation was found (Table 2).

The standard deviation values found for the DDT were high, showing a large variability in the results in both right and left ears in relation to the mean values. Analyzing digits recognition between ears it was noted that the right ear presented a better performance. When comparing the performance between evaluations it was verified an improvement of digit recognition in dichotic listening in the reevaluation, with a more evident improvement on the left ear (Table 3).

The agreement between the measures on both measures on both ears on the DDT was weak on both evaluations (0.10; 0.22). Hence for further analysis the percentages of both ears were not considered separately.

Comparing the performance on the cognitive tests of digits recognition in dichotic listening it was observed that there was a difference. On the ADAS-Cog test, differences were observed between the distribution of percentage of digits recognition in

Table 2. Descriptive measures of the PISR in percentage of correct responses in normal and altered performances on cognitive tests

Variable	Category	n	Mean	SD	Minimum	Median	Maximum	p-value
ADAS-Cog	Altered	30	67.2	13.8	26	66	90	0.185
	Normal	30	72.0	11.7	48	75	90	
	Total	60	69.6	12.9	26	71	90	
MMSE	Altered	37	68.5	13.7	26	70	90	0.542
	Normal	23	71.3	11.5	48	72	90	

Mann-Whitney test (p<0.05)
Note: SD = standard deviation; ADAS-Cog = Alzheimer's Disease Assessment Scale; MMSE = Mental State Mini Exam; PISR = Percentage Index of Speech Recognition

Table 3. Descriptive measures for the DDT findings in correct response percentage for the right and left ears for the evaluation and reevaluation moments

Ear	Moment	n	Mean	SD	Minimum	Median	Maximum	p-value
Right	Evaluation	60	74.1	21.2	8	77.5	100	0.031*
	Re-evaluation	57¥	81.0	20.6	7	90.0	100	
Left	Evaluation	60	61.1	22.6	15	63.8	98	0.002*
	Re-evaluation	57¥	74.9	21.3	15	82.5	100	

¥ - three subjects did not return for reevaluation in the behavioral tests
* Significant values (p<0.05) – Analyses of Variance with Repeated Measures
Note: DDT = dichotic digits test; SD = standard deviation

Table 4. Descriptive measures for the DDT findings in correct response percentage for the right and left ears according to the performance on the ADAS-Cog

Ear	ADAS-Cog	n	Mean	SD	Minimum	Median	Maximum	p-value
Right	Altered	30	68.3	21.4	8	72.5	100	0.013*
	Normal	30	80.0	19.7	25	87.5	100	
	Total	60	74.1	21.2	8	77.5	100	
Left	Altered	30	54.4	22.8	18	57,5	85	0.017*
	Normal	30	67.8	20.7	15	73.8	98	
	Total	60	61.1	22.6	15	63.8	98	

* Significant values (p≤0.05) – Mann-Whitney Test

Note: SD = standard deviation; ADAS-Cog = Assessment Scale for Alzheimer's Disease; DDT = dichotic digits test

Table 5. Descriptive measures for the DDT findings in correct response percentage for the right and left ears according to the performance on the MMSE

Ear	MMSE	n	Mean	SD	Minimum	Median	Maximum	p-value
Right	Altered	37	70.5	21.9	8	75.0	100	0.062
	Normal	23	80.0	19.1	25	87.5	100	
	Total	60	74.1	21.2	8	77.5	100	
Left	Altered	37	56.3	22.1	15	55.0	90	0.028*
	Normal	23	68.8	21.7	18	75.0	98	
	Total	60	61.1	22.6	15	63.8	98	

* Significant values (p≤0.05) – Mann-Whitney Test

Note: SD = standard deviation; MMSE = Mini Mental State Examination; DDT = dichotic digits test

dichotic listening with two performance categories, on both right and left ears (Table 4). Subjects with altered ADAS-Cog presented a worse word recognition in dichotic listening with digits on both right and left ears.

There was a difference between the distribution of the percentage of digits recognition for both categories of MMSE for the left ear (Table 5).

DISCUSSION

Modern hearing aids present various technologies to improve the signal/ noise relation. However, besides the optimization of the signal the audiologist has to attend to the negative impacts that the hearing loss causes in the cognitive functions and in the cognitive resources used to interpret the signal [4,12]. The hearing loss is restored but the individual differences in the performance in comprehending speech may still remain and cannot be attributed solely to hearing thresholds[6,12]. Factors such as auditory processing disorders and cognitive disturbances must also be considered.

The presence of cognitive disturbances associated to hearing loss have been highlighted in various studies on the difficulties in adapting hearing aids in the elderly[4,11,12,17]. Instruments such as the MMSE trace test and the ADAS-Cog neuropsychological scale have been a new tool for the audiologist to use in his or her clinical practice in order to assess the non-hearing disorders that compromise the acclimatization process.

In the present study it was verified that the mean scoring on both cognitive tests was low. Comparing the results presented on Table 1 with the number of years of formal education it was verified that most part of the sample presented cognitive alterations, with more alterations occurring on the MMSE than on the ADAS-Cog. However, on the ADAS-Cog the obtained scoring by 75% of the sample is compatible to a mean number of years of formal education of 5.4 years for the studied sample. On the MMSE, scoring of most of the sample was compatible 1 to 4 years of formal education, below the expected mean number of years of formal education of the elderly in this study[13,15].

Few years of formal education is an aspect that has been much discussed in the specialized literature in relation to its influence on cognitive tests[18]. Authors recommend that the number of years of formal education must always be taken into account when judging if a patient really presents cognitive function alterations[2,13,19,20].

A study with the elderly population[21] found a correlation between the presence of a hearing loss and the results on the MMSE. The subjects with mild and moderate sensorineural hearing loss present a better cognitive performance than subjects with severe to profound sensorineural hearing losses.

In another research with an elderly sample without hearing losses and functional independence[22] the scoring on the MMSE (26.6 points) was higher and on the ADAS-Cog (9.9 points) inferior than the findings in this study. Thus, the elderly without hearing loss and with 7.7 of years of formal education reveal better cognitive aspects than those in this study. It is believed that sensory deprivation caused by the presence of sensorineural hearing loss may be added to the process of ageing and influence the cognitive performance of the elderly.

The high incidence of cognitive alterations in the present study alerts to the importance that the clinician should consider

the non hearing factors during the process of auditory rehabilitation of the elderly. Most part of studies with the elderly point to cognitive symptoms such as attention and memory alterations, occur previously to depression symptoms. The appearance of cognitive alterations in the elderly must serve as an alert for the precocious detection of mood disorders such as depression, that may also compromise the process of hearing aids adaptation[23,24].

At the present study the concordance between results of the MMSE and ADAS-Cog was regular and statistically significant. Therefore it is indicated the use of the MMSE as a routine clinical procedure in the selection and adaptation process of hearing aids. If the elderly present altered test results, they can be sent to complete in another session the ADAS-Cog neuropsychological battery as a complement. This battery is the most complete one and demands a longer time to be applied, however it presents precious information that may contribute to the clinician's understanding of the non auditory aspects responsible for the failure in the hearing rehabilitation of some elderly.

In the last decade there has been a growing interest in verifying the time elapsed between speech recognition and the time of hearing aid use[6]. This phenomenon related to the time of adaptation with the improvement of speech recognition resulting from the amplification of the acoustic signal is known as acclimatization[10].

Researches confirm that presbycusis is one of the main factors responsible for the speech recognition difficulty in the elderly[1,6]. However, another work points out that the very advance in age contributes to the worsening of speech recognition, because there is poor performance of speech recognition in ears with normal hearing thresholds and as well as in ears with higher auditory thresholds[25].

The studies showed the effects of acclimatization in speech recognition after the use of hearing aids[6]. In the present research an acclimatization effect was observed, thus the difference between the means in the first evaluation and reevaluation was significant for both, the PISR and the DDT. Due to the acclimatization process, the sample presented an improvement in the speech recognition considering a monoaural task and a binaural integration task with dichotic listening after a minimum period of three months. These results enable us to infer that the use of sound amplification provided an improvement in the hearing behavior.

The research indicates that recognition of speech in noise requires the demand of the cognitive abilities that are in decline in this population [12,17,26]. In the present study, there was no correlation between the cognitive aspects and the percentage of speech recognition in a monoaural task. It is believed that the result is a consequence of carrying out the speech recognition task just in silence.

The DDT has been largely studied in the elderly to assess verbal sound recognition in dichotic listening. Researches[7-9,27] have indicated a words speech recognition in dichotic listening presented to the left ear. The authors believed that this fact is due to the ageing process that which causes problems of inter-hemispheric transfer of auditory information due to the deterioration of the corpus callosum. In the present study there has been a better digits recognition in dichotic listening in the right ear corroborating literature findings[7-9,27].

Studies compare the recognition of verbal sounds in youngsters and the elderly. Authors refer that youngsters present a better verbal sound recognition in dichotic listening than the elderly, whom in turn present a decrease in cognitive functions with the passing of years[7,27-28].

Studies noted that the elderly that showed difficulties in recognizing verbal stimuli in dichotic listening did also present cognitive alterations specially in working memory and selective attention[6,8,9,28]. Another factor responsible for the worst recognition of verbal stimuli in dichotic listening in the elderly is the presence of hearing loss[28]. Reviewed studies in the literature regarding the elderly without hearing loss revealed that the mean digits recognition in dichotic listening varies from 64% to 95%[9,24]. In the elderly with hearing loss the mean is inferior varying from 36.1% to 82.83%[29,30]. In the present research the mean percentage of digits recognition in the right ear (74.1%) and in the left ear (61.1%) is in agreement with the values stipulated in the specialized literature[9,22,29,30].

The sample in this study presented an increment in the digits recognition in dichotic listening after the effective use of hearing aids, especially in the left ear. These data agree with the findings of another work[27] that identified a correlation between the difficulties of recognizing digits in the left ear with performance on the cognitive tests.

In this study the subjects with cognitive problems presented a worse recognition of digits in dichotic listening than the subjects without cognitive problems in agreement with other studies[6,8,9,28]. The subjects with cognitive problems on the neuropsychological scale ADAS-Cog and on the MMSE presented an inferior performance on the digits recognition in bilateral dichotic listening. On the ADAS-Cog there was a bilateral difference and in the MMSE there was a difference on the left ear and a tendency to a difference on the right ear. Hence, the ADAS-Cog scale revealed itself as an appropriate instrument to relate the cognitive alterations to the process of speech recognition in dichotic listening.

It is believed that the acoustic stimulation has promoted an increment in the transmission of acoustic information to the left ear channel and an improvement of verbal stimuli recognition has occurred in this channel. The subjects without cognitive alterations presented better digit recognition in the reevaluation without any influence of the variable ear.

CONCLUSION

Following a critical analysis of the data it was possible to conclude that cognition can interfere in the process of selection and adaptation of hearing aids in the elderly. Besides that, elderly with presbycusis present poor speech recognition in a monoaural task. However, after the use of hearing aids there is a significant improvement in speech recognition in a monoaural task without the interference of cognitive aspects.

Regarding to dichotic listening in a binaural integration task it is concluded that the left ear presents a worse performance than the right one. However, after the use of hearing aids there

is an improvement in this process for both ears depending on the cognitive aspect. Findings in the present study show the process of acclimatization through the improvement in speech recognition and alert to the importance of the clinician's knowledge of the non auditory aspects in the rehabilitation of the elderly population with hearing loss.

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