Original Article

https://doi.org/10.1590/2317-6431-2021-2597

Audiology Communication Research
ISSN 2317-6431

Association between linguistic-cognitive performance and auditory self-perception of elderly

Associação entre o desempenho linguístico-cognitivo e a autopercepção auditiva de idosos

Joceli Duarte Fiamoncini[1], *Andressa Oliveira Silva*[1], *Thaís Ribeiro de Sousa*[1], *Corina Elizabeth Satler*[1], *Isabella Monteiro de Castro Silva*[1], *Maysa Luchesi Cera*[1]

ABSTRACT

Purpose: To analyze the linguistic and cognitive performance, the presence of reports of changes in hearing, the complaint and the auditory self-perception of elderly people who attend a Brazilian community center, and to verify the relationship between these variables. **Methods:** Demographic data of 61 subjects were analyzed; the presence of reports of changes in hearing in the last five years and hearing complaints; linguistic performance through the Montreal-Toulouse Battery; the results of the cognitive screening test through the Mini-Mental State Examination; and auditory self-perception by the short version of the self-assessment questionnaire on auditory participation restriction for the elderly. **Results:** The mean age was 71 years and schooling was six years. The scores of the tests applied indicated the presence of cognitive decline and alteration in some language task, especially in the narrative speech. With regard to reports about the auditory condition, 38 elderly people reported hearing change in the last five years. There was a statistically significant association between the presence of hearing changes and complaints and changes in cognitive screening and verbal fluency tests. The scores of the self-perception of auditory participation restriction test were associated with the scores of the repetition linguistic subtest. **Conclusion:** The elderly in a Brazilian community center showed a high prevalence of hearing changes in the last five years and hearing complaints related to aging, which were associated with linguistic-cognitive performance, which highlights the relevance of longitudinal monitoring of the communicative and cognitive performance of the elderly

Keywords: Aged; Cognition; Language; Hearing; Communication

RESUMO

Objetivo: analisar os desempenhos linguístico e cognitivo, a presença de relato de mudança na audição, a queixa e a autopercepção auditiva de idosos frequentadores de um centro comunitário brasileiro e verificar a associação entre essas variáveis. **Métodos:** foram analisados os dados demográficos de 61 indivíduos; a presença de relato de mudança na audição nos últimos cinco anos e de queixa auditiva; o desempenho linguístico, por meio da Bateria Montreal-Toulouse; os resultados do teste de rastreio cognitivo, por meio do Miniexame do Estado Mental e a autopercepção auditiva, por meio da versão reduzida do questionário de autoavaliação de restrição de participação auditiva para idosos. **Resultados:** a média de idade foi de 71 anos e de escolaridade foi de seis anos. Os escores dos testes aplicados indicaram a presença de declínio cognitivo e de alteração em alguma tarefa de linguagem, especialmente do discurso narrativo. Quanto aos relatos sobre o quadro auditivo, 38 idosos referiram mudança auditiva nos últimos cinco anos. Houve associação estatisticamente significativa entre a presença de mudança e queixa auditiva e a alteração nos testes de rastreio cognitivo e de fluência verbal. Os escores do teste de autopercepção de restrição de participação auditiva estiveram associados aos escores do subteste linguístico de repetição. **Conclusão:** os idosos de um centro comunitário brasileiro apresentaram alta prevalência de mudanças auditivas nos últimos cinco anos e queixas auditivas relacionadas ao envelhecimento, associadas ao desempenho linguístico-cognitivo, o que evidencia a relevância do acompanhamento longitudinal do desempenho comunicativo e cognitivo de idosos.

Descritores: Idosos; Cognição; Linguagem; Audição; Comunicação

Study carried out at Universidade de Brasília – UnB – Brasília (DF), Brasil.
[1]Faculdade de Ceilândia – FCE, Universidade de Brasília – UnB – Brasília, (DF), Brasil.
Conflict of interests: No.
Authors' contriburtion: JDF, AOS TRS and MLC were responsible for data collection, tabulation, analysis, and interpretation; JDF, CES, IMCS and MLC were responsible for writing and reviewing the article; JDF, AOS, TRS, CES, IMCS and MLC were responsible for final approval of the version to be published; MLC was responsible for the design and design of the study.
Funding: None.
Corresponding author: Maysa Luchesi Cera. E-mail: maysa@unb.br
Received: November 16, 2021; **Accepted:** March 01, 2022

INTRODUCTION

Currently, there are approximately 29 million people in Brazil aged 60 years or older[1]. According to the country population projection, by 2050, this number will have reached almost 62 million individuals[1]. Prolonging life can only be considered a real achievement as quality is added to the additional years[2]. In this sense, policies aimed at the elderly must consider the need for autonomy, participation, care, and self-satisfaction[2].

Aging brings restrictions in social participation due to impairment of some physiological functions, such as lower sensory inputs[3]. Presbycusis causes the elderly to experience decreased hearing sensitivity and speech intelligibility, which compromises their verbal communication process[4]. A study has shown that older elderly people have worse results in hearing screenings. In turn, those with suggestive signs of hearing impairment, when responding to the reduced version of the Hearing Handicap Inventory for the Elderly – Screening Version self-assessment questionnaire on auditory participation restriction for the elderly (HHIE-S), have a greater perception of participation restriction[5]. In addition, the effects of age on the peripheral and central auditory system interfere with sound localization and the perception of rapid speech changes, reduce speech understanding in noise, and may impair cognitive support[6].

For the communication process to be successful, it is necessary for the listener to accumulate, throughout life, information based on sensory input (bottom-up) and cognitively interpret the speaker's intention (top-down)[7]. There is a great brain activation when it is necessary to listen in difficult listening environments[7]. A deficiency in any sensory input or the cognitive processes necessary for the interpretation of speech sounds causes obstacles to communication and, when the input is compromised, further cognitive resources are needed to understand speech[7]. The aging process brings along a decline in specific cognitive functions, such as memory, language, and executive functions[3]. In this sense, some studies have shown that, for example, age influences the performance of pragmatic-inferential, discursive, and prosodic tasks, since the elderly group had a lower score than the other groups in these tasks[8], as well as in tasks of orientation, episodic memory, and working memory[9].

Studies on hearing and cognition of the elderly commonly address better performance in cognitive assessment of elderly people with better speech recognition in noise[10] and with normal hearing thresholds[11,12], or with mild hearing loss[11]. A nine-year longitudinal follow-up with the elderly found that moderate or severe hearing loss is associated with a 55% increase in the risk of dementia[13]. In addition, hearing impairments were associated with language performance[9,14] along with hearing loss that impairs the understanding of oral language, thus interfering with the communicative performance of the elderly[14].

Studies predominantly approach the assessment of auditory acuity, however, no studies were found associating self-perception of hearing difficulties with linguistic-cognitive functions. Auditory self-perception screening can be applied by any health professional or anyone who develops actions with the elderly. In addition, it is a way of identifying hearing risk and referring to specific, pertinent assessments.

With the increase in the elderly population and the need for health promotion strategies to favor the functionality and independence of the elderly for as long as possible, it is essential to understand their auditory self-perception regarding social participation and the association of this variable with their linguistic performance- cognitive.

Thus, our objectives were the following: to analyze linguistic and cognitive performance, presence hearing changes reports over the last five years, complaint and auditory self-perception of elderly people attending a Brazilian community center, and to verify whether these variables are associated. As they are socially, physically and spiritually active elderly, we assumed that complaints related to self-perception of hearing would be found, with language and cognition scores within the parameters considered typical. In addition, it was expected that the self-perception of social participation of the elderly, related to hearing, was associated with linguistic and cognitive scores.

METHODS

The approach of the study is observational, cross-sectional, and qualitative-quantitative. The research was carried out in accordance with Report No. 466/2012, of the Ministry of Health, National Health Council, with approval by the Research Ethics Committee of "Faculdade de Ceilândia", University of Brasília – CEP/FCE/UnB, under CAAE number 31236620.6.0000.8093, opinion number 4,546,703. All participants waived an Informed Consent Form (ICF) since, due to the consequent needs of social isolation and reduction of health risks caused by the Coronavirus pandemic, contacts with the elderly were carried out by telephone. However, were not able to obtain access to all.

The database collected in 2019 was analyzed in actions carried out with elderly people who attended a community center for physical, cognitive, spiritual, and socialization activities. The database of this study consisted of characterization and hearing health data from the sample and results of the assessment protocols, all applied in the same session, which took place in 2019. The following sample inclusion criteria were applied: elderly persons who attended the community center; aged over 60 years of age; understanding simple instructions; availability to participate in cognitive and socialization activities developed at the center, in which they were interested. In turn, the following exclusion criterion was applied: presence of severe sensory or cognitive alteration, observed or reported during the interview, which made it impossible to respond to the applied protocols.

The protocols were applied by three students of the Speech-Language Pathology and Audiology course, members of the Fortaleçamente Extension Project of "Faculdade de Ceilândia, University of Brasília. The students underwent training for the standardized application of brief assessment of hearing, language, and cognition. The participants were evaluated under the supervision of the speech-language pathologist in a silent environment with two chairs and a table.

The instruments and procedures for data collection were based on the following steps for all participants:

Step 1

– Anamnesis: sample characterization and hearing health data. Questions were asked to record the participants' sociodemographic data, such as name, gender, age, birthplace, laterality, education, profession, and whether

they were accompanied to the community center. Regarding hearing health, they were asked if they had observed hearing changes over the last five years, also about their hearing complaints, if they used hearing aids and if they used them frequently (Appendix 1).

Step 2

– Assessment protocols: 1) Hearing Handicap Inventory for the Elderly – Screening Version (HHIE-S), self-assessment questionnaire on auditory participation restriction for the elderly, short version[15]; 2) Cognitive screening test, through the Mini-Mental State Examination (MMSE)[16]; 3) Brief language assessment, through subtests of the Montreal-Toulouse MTL Battery – Brazil[17].

The HHIE-S[15] contains ten questions about individual perception regarding participation restriction in their psychosocial function, resulting from hearing loss or incapacity, which affects their lifestyle, their family, their social situation, and their job. It is divided into two scales (social/situational scale and emotional scale), with five items each. To answer the questionnaire, the questions were read to the participants, who had to choose only one answer for each item: yes (4 points), sometimes (2 points) and no (0 points). The total score ranged from 0 to 40, divided into three categories: 0-8 points (no perception of participation restriction); 10-23 points (mild to moderate perceived participation restriction), and 24-40 (significant perceived participation restriction). They were indicative of self-perception of participation restriction due to auditory performance 10 points or more.

The MMSE[16] is a quick test, easy to apply, covering seven cognitive functions: temporal orientation (5 points), spatial orientation (5 points), immediate memory (3 points), attention/calculus (5 points), memory evocation skills (3 points), language (8 points), and visuoconstructive skills (1 point). The MMSE total score ranges from 0 to 30 points and the level of education of the elderly must be taken into account. The normative values for schooling are: for illiterates, 20 points; from 1 to 4 years of study, 25 points; from 5 to 8 years of study, 26.5 points; from 9 to 11 years old, 28 points; for individuals with more than 11 years of schooling, 29 points. Scores below these values were considered indicative of cognitive impairment[16].

The subtests of the Montreal-Toulouse MTL Battery – Brazil[17] constitute a clinical tool that helps in the diagnosis of language disorders and contributes to the survey of the linguistic neurocognitive profile. The applied tasks were: oral narrative speech, repetition, semantic verbal fluency, oral naming, and manipulation of objects under verbal order. The selection of these subtests considered the need for assessment, especially of narrative, phonetic-phonological, semantic, and comprehension skills. The MTL Battery – Brazil presents the normative data for each subtest according to the subject's age group and level of education. For individually analyzing the presence of signs suggestive of alteration, the z score was calculated, as proposed in the instrument, that is, the gross result of the participant was subtracted from the average of the normative group corresponding to their age and schooling, a value that was divided by the standard deviation (SD) of the normative group[17]. The instrument proposes the use of a cut-off point of z less than or equal to -1.5, a representative index of neuropsychological impairment[17].

Statistical analysis

Initially, we performed a descriptive statistical analysis of demographic data, self-perception of hearing, cognition, and language. The contingency coefficient was used to analyze the association between auditory variables and other cognitive and linguistic variables, according to the presence or absence of alteration. To verify the association between the scores obtained in the self-perception of hearing, language, and cognition tests, an inferential statistical analysis was performed using the Spearman Correlation test on the IBM SPSS Statistics 22 software. The Kolmogorov-Smirnov test verified the data distribution and defined the selection of the statistical test. A p-value of 0.05 was considered to indicate statistical significance.

RESULTS

Out of the total number of elderly people who regularly attended the community center, 76 were invited to participate in the evaluation described in this study. Out of these, 15 individuals were not interested in participating in cognitive and socialization activities and, consequently, did not respond to this assessment. No participant was excluded from the research due to the presence of severe cognitive or sensory impairment. Thus, 61 elderly people participated in the study.

The participants were aged 70.8 years in average (SD: 7.7 years) with an average of 6.2 years of schooling (SD: 4.2 years).

Table 1 shows the sample characterization data, such as gender, birthplace, laterality, profession, and whether the elderly person had a companion to reach the community center. For the variables

Table 1. Sample characterization data

Variables	N (%)
Genre	
Female	53 (87)
Male	8 (13)
Place of birth*	
North East	38 (62)
Southeast	11 (18)
Others	12 (20)
Laterality*	
Right-handed	57 (93)
Left-handed	3 (5)
Others	1 (2)
Profession*	
Homemaker	30 (49)
Retired	13 (21)
Others	18 (30)
How to go to the community center	
Alone	41 (67)
Accompanied	20 (33)

Source: Elaborated by the authors

*For sociodemographic variables with several possible answers, only the two most frequent answers were presented

Subtitle: N = Number of elderly people; % = percentage

birthplace, laterality, and profession, with several possibilities of answers, the two most frequent answers are presented.

Regarding the reports about the auditory condition, although initially 38 (62%) elderly people reported hearing changes, that is, there was a difference in performance over the last 5 years, only 29 (47%) mentioned having hearing difficulties. Among the elderly with hearing difficulties, only three reported having hearing aids (10%), however, only two confirmed the frequent use of the sound amplification device. As for the self-perceived auditory self-perception when answering the HHIE-S questionnaire, 17 (28%) presented a perception of mild to moderate auditory participation restriction, including the two elderly people who used hearing aids frequently; 3 (5%) presented a perception of significant restriction due to hearing difficulties. It is important to report that, of the 20 elderly people who presented a self-perception of restriction, 4 did not report hearing complaints when answering the anamnesis. All remaining participants, 67%, denied any difficulty in participating due to hearing difficulties.

The average performance on the MMSE was 23.1 (SD: 4.0). When comparing the individual total score in the cognitive screening test with the normative data[16], 49 (80%) visitors of the community center presented a performance suggestive of cognitive alteration, most with scores close to the normative data. In addition, the tasks of this instrument in which the participants had difficulties showed to be related to attention/calculus, recall memory, and language. Table 2 shows the average scores obtained in the MMSE for the participants of this research, divided into groups according to education.

Table 2. Performance on the Mini-Mental State Examination by schooling subgroup of the elderly at a community center

	N (%)	Mean Mini-Mental State Examination Score
Total Sample	61 (100%)	23.1
Illiterate	2 (3%)	19.0
1 to 4 years of education	28 (46%)	21.4
5 to 8 years of study	14 (23%)	24.8
9 to 11 years of education	14 (23%)	24.8
12 years or more of study	3 (45%)	26.3

Source: Elaborated by the authors
Subtitle: N = Number of elderly people; % = percentage

Table 3. Mean and standard deviation of scores in the language subtests of the elderly at a community center

Language subtests		Mean score in the subtest (Standard Deviation)
Oral Narrative Speech	**Number of Words**	81.8 (50.2)
	Information Units	3.6 (2.2)
	Scenes	0.4 (0.8)
Repetition		31.3 (1.5)
Semantic Verbal Fluency		13.7 (4.3)
Oral Naming		23.5 (5.8)
Manipulation of Objects under Verbal Order		15.2 (1.6)

Source: Own elaboration

Regarding language performance, the individual z-score analysis showed that 54 (88%) elderly people had a score suggestive of alteration in some subtests of the MTL battery. There was a score indicative of alteration in the oral narrative speech subtests for 46 (75%) elderly people; repetition for 40 (66%); semantic verbal fluency for 12 (20%); oral naming for 28 (46%), and manipulation of objects under verbal order for 17 (28%) participants.

Table 3 presents the mean scores and standard deviations of the language subtests applied in this study.

When analyzing the association of nominal auditory variables (presence of hearing change; auditory complaint and presence of self-perception of restriction) with the presence of alteration in each linguistic and cognitive subtest (Table 4), a statistically significant association was observed between the report regarding the auditory change and the presence of alteration in the semantic verbal fluency tests and the MMSE; the presence of auditory complaints and of alterations in the semantic verbal fluency tests and the MMSE; the presence of self-perception of auditory participation restriction and the alteration in the repetition linguistic subtest (Table 4).

As for the correlation of scores in the assessments of auditory self-perception and of language and cognition performance, a statistically significant association was observed only between the scores obtained in the cognitive screening and auditory self-perception tests (Table 5). As for the repetition subtest of the MTL Battery – Brazil, the association analysis was also performed according to the scores obtained in the repetition of pseudowords, words, and phrases. When subdividing the scores of the repetition task, the results remained without statistical significance ($p>0.286$). For this reason, only the results referring to the total score of the repetition task are presented in Table 5.

DISCUSSION

This research studied the linguistic-cognitive performance, the presence of reports of changes in hearing in the last five years, the complaint and the auditory self-perception of elderly people from a community center, and verified the association between these variables. In the studied sample, 62% (38 elderly people) confirmed hearing changes in the last five years; However, even though, 47% (29 elderly people) reported hearing complaints and 33% (20 elderly people) reported restriction in participation due to some hearing impairment. Alarmingly, 80% had a score suggestive of cognitive decline on the screening test and 88% had a score indicative of language impairment. Furthermore, there was a statistically significant association between the presence of hearing change and complaint and the occurrence of performance suggestive of alteration in the MMSE and the semantic verbal fluency test; between self-perception of participation hearing restriction and performance indicative of alteration in the repetition linguistic subtest (Table 4). As for the scores, a statistically significant association was observed only between the results of the cognitive screening and auditory self-perception tests (Table 5).

Firstly, it is evident that 29 elderly people had a hearing complaint, and most of them perceived that this difficulty restricted social participation. The high prevalence, 33%, in this study group, of participation restriction due to hearing

Table 4. Association between auditory and linguistic-cognitive variables of the elderly in a community center

		Oral Narrative Speech (Number of Words)	Oral Narrative Speech (Scenes)	Repetition (Total)	Semantic Verbal Fluency	Oral Naming	Manipulation of Objects under Verbal Order	MMSE
Hearing complaint	**Coefficient.**	0.122	0.141	0.086	0.293	0.111	0.067	0.334
	p-value	0.337	0.266	0.500	0.017*	0.385	0.600	0.006*
Hearing change	**Coefficient.**	0.164	0.027	0.097	0.284	0.038	0.044	0.287
	p-value	0.195	0.833	0.444	0.021*	0.768	0.728	0.019*
Self-perception of participation hearing restriction	**Coefficient.**	0.182	0.087	0.341	0.168	0.057	0.197	0.093
	p-value	0.149	0.493	0.005*	0.184	0.654	0.117	0.465

Source: Own elaboration
*Statistically significant value (p<0.05); Contingency coefficient
Subtitle: MMSE: Mini-Mental State Examination

Table 5. Association between auditory self-perception and the score on the language and cognitive screening subtests of the elderly in a community center

Linguistic-cognitive test or subtest	Spearman's Correlation Coefficient	p-value
Oral Narrative Speech (Number of Words)	-0.017	0.895
Oral Narrative Speech (Information Units)	-0.014	0.917
Oral Narrative Speech (Scenes)	0.021	0.870
Total Repetition	-0.167	0.198
Semantic Verbal Fluency	0.107	0.411
Oral Naming	0.033	0.802
Manipulation of Objects under Verbal Order	0.183	0.159
Mini-Mental State Exam	0.287	0.025*

Source: Own elaboration
*Statistically significant value (p<0.05); Spearman's Correlation Coefficient

condition can be justified by the characteristics of the sample, composed of elderly people with less access to education and health, for having an average of six years of schooling and for being residents of a region with predominantly low-income population and without health insurance[18]. In addition, most of the elderly attended the community center with some objective related to physical improvement, since it is an alert for the presence of comorbidities in the aging process. Several diseases and disorders, such as heart disease, diabetes and arterial hypertension are more common in the elderly[19] and are also auditory and cognitive risk factors[20]. Still, it is known that many elderly people involved in socialization activities have complaints that motivate them to seek such community initiatives. Being socially active in a community group composed of many people may also have contributed to facilitating the perception of participation restrictions. As it is a group with greater chances of comorbidities, with a high prevalence of hearing complaints and signs suggestive of linguistic-cognitive alterations, the relevance of screening for the early identification of these signs that require health promotion and prevention measures, especially in environments with health care proposals and not disease care.

Conversely, it was identified that the hearing complaint did not necessarily lead to participation restriction, since 13 of the 29 elderly people with complaints did not present participation restriction in their responses to the HHIE-S questionnaire. Similarly to this study, the findings of another study showed that not all individuals with hearing problems presented a perception of participation restriction[21]. However, the aforementioned research sample consisted of individuals aged between 18 and 88 years and only 39% of the participants were 60 years of age or older[21]. In the current research, the perception of auditory performance may have been influenced by cognitive performance suggestive of alteration in most of the sample (80%).

As for the association of auditory and linguistic-cognitive variables, the presence of change and auditory complaint and MMSE alteration were associated (Table 4). Furthermore, when correlating the HHIE-S score and the linguistic-cognitive test scores, we found that greater hearing restriction was associated with worse cognitive performance (Table 5). A study with the elderly showed a self-perception of participation restriction and, with the use of a prosthesis, improvement in the cognitive processes of orientation, immediate memory, attention and calculation, recall and language memory after auditory rehabilitation[22]. Herein, among the elderly with participation restriction due to hearing complaints, only two made regular use of hearing aids. In view of this, the importance of auditory assessment and intervention is highlighted, especially for those who claim participation restriction, but also for those who perceive hearing change. The relevance of using amplification should occur in case of hearing loss and hearing rehabilitation aims to reduce or eliminate the limitations caused by this loss and, consequently, provide better conditions for the individual's social involvement[23]. In addition to amplification, adequate adaptation is essential, a process that leads individuals to incorporate the device into their daily lives[23].

A poor quality acoustic signal, which requires greater hearing effort, demands using further cognitive resources for speech understanding[22]. It is worth noting that it is likely that the elderly in this research used compensatory cognitive resources in carrying out activities of daily living, since they were active in the community center and hearing and cognitive impairments did not interfere with the complex activity of leaving home alone. The use of compensatory cognitive resources by the majority of the studied group may suggest that the observed cognitive decline is within the typical aging process. However, it is reiterated that cognitive performance can interfere in the lower perception of hearing difficulties. Cognitive decline involves cognitive changes that can be considered typical of

normal aging when they do not interfere with activities of daily living[24].

As for the linguistic-cognitive performance, differently from what is expected for these socially active elderly, most of the elderly in this research presented scores suggestive of cognitive decline in the applied screening test, the MMSE (Table 2) and scores indicative of alteration in some subtest of language (Table 3). It is emphasized that the greatest difficulties in responding to the MMSE were related to the tasks of attention/calculus, recall memory, and language. These results are consistent with another study that showed a statistically significant difference in this instrument performance among the participants in some tasks, such as calculation and language[9]. In that study, the more severe the degree of hearing loss, the lower the score of the elderly in the MMSE language tasks[9].

The presence of alterations in the semantic verbal fluency test was associated with the report of changes and auditory complaints (Table 4), a finding that agrees with the results of the study with hearing-impaired people, which showed a worse performance of this group in the semantic and phonological verbal fluency tests[25]. Interesting data, since the verbal fluency test is referred to as sensitive and specific in studies on cognitive decline, cognitive impairment, dementia, and other neurological diseases[26].

Regarding the presence of self-perception of restriction in participation and language performance suggestive of alteration, the results of this study showed that this restriction was specifically associated with performance in the repetition linguistic subtest (Table 4), precisely the task that most depends on hearing performance. To respond to the repetition task, the elderly person has to hear the stimulus before repeating. In contrast, the same sensory input, the auditory one, is used in the object manipulation task, which was not associated with the auditory results of this study. It is believed that the word repetition task requires more listening than the object manipulation task, since, in the latter, there are clues that can favor linguistic performance, both by the visual presentation of the object (closed set) and for other linguistic stimuli exposed in the auditory command, that is, with semantic-pragmatic and morphosyntactic supports that favor auditory closure.

Given this context, it is interesting to note that this research was composed of a sample of elderly people. Despite being socially and physically active, it is known that there is a strong association between self-reported hearing loss and age[27], a variable that increases the risk for cognitive alterations[28]. The occurrence of cognitive deficit is significantly higher for older individuals[4,29], illiterate[29], with low education[4]. Furthermore, older adults in older age groups are more likely to have hearing loss[28].

Specifically, regarding linguistic performance, the task that presented results most frequently suggestive of alteration was oral narrative speech, followed by repetition and oral naming. The aging process interferes with the performance in language tasks, as presented in a study[30] on the performance in the tasks of the MTL Battery – Brazil, in which the results of the subtests of repetition, oral naming and oral narrative speech were negatively correlated with the age.

Finally, the assessment of self-perception of hearing difficulties proved to be useful for early identification of auditory and cognitive risk groups. Promotion and prevention initiatives must be adopted to maintain auditory and linguistic-cognitive performance[4]. The results of this study encourage the use of collective auditory and linguistic-cognitive screening resources.

The analysis of the results of this research must consider some limitations: the participation of elderly women from a certain region predominated and the projection for people from other regions must consider contextual factors. It should also be noted that this study did not assess dependence on activities of daily living, which is relevant complementary data in the screening of the elderly. Furthermore, the results showed no statistically significant difference when subdividing repetition scores into words, pseudowords, and phrases. Possibly, a sample with a greater number of participants could identify whether any of these repetition stimuli would be more associated with auditory performance, which could help in the interpretation regarding the processing steps most involved in auditory perception, such as phonetic-phonological, semantic, or memory of work.

CONCLUSION

More than half of the sample presented perception of hearing change in the last five years and signs suggestive of cognitive and language alteration. There was a statistically significant association between auditory self-perception and linguistic-cognitive performance, with the presence of mild to significant participation restriction due to hearing difficulties. Therefore, regular screening and monitoring of the performance of these skills are essential for planning actions to promote and prevent hearing and linguistic-cognitive health in the elderly.

REFERENCES

1. IBGE: Instituto Brasileiro de Geografia e Estatistica. Projeção da População do Brasil por Sexo e Idade - 2010-2060. Rio de Janeiro: IBGE; 2018.
2. Veras R. Envelhecimento populacional contemporâneo: demandas, desafios e inovações. Rev Saude Publica. 2009 Jun;43(3):548-54. http://dx.doi.org/10.1590/S0034-89102009000300020. PMid:19377752.
3. Borges MGS, Labanca L, Couto EAB, Guarisco LPC. Correlações entre a avaliação audiológica e a triagem cognitiva em idosos. Rev CEFAC. 2016 Dez;18(6):1285-93. http://dx.doi.org/10.1590/1982-021620161865616.
4. Martínez-Sanguinetti MA, Leiva AM, Petermann-Rocha F, Troncoso-Pantoja C, Villagrán M, Lanuza-Rilling F, et al. Factores asociados al deterioro cognitivo en personas mayores en Chile. Rev Med Chil. 2019;147(8):1013-23. http://dx.doi.org/10.4067/S0034-98872019000801013. PMid:31859966.
5. Xavier IL, Teixeira AR, Olchik MR, Gonçalves AK, Lessa AH. Triagem auditiva e percepção da restrição de participação social em idosos. Audiol Commun Res. 2018;23:e1867. http://dx.doi.org/10.1590/2317-6431-2017-1867.
6. Baraldi GS, Almeida LC, Borges ACC. Evolução da perda auditiva no decorrer do envelhecimento. Rev Bras Otorrinolaringol. 2007 Fev;73(1):64-70. http://dx.doi.org/10.1590/S0034-72992007000100010.
7. Magalhães R, Iório MCM. Avaliação da restrição de participação e de processos cognitivos em idosos antes e após intervenção fonoaudiológica. J Soc Bras Fonoaudiol. 2011 Mar;23(1):51-6. http://dx.doi.org/10.1590/S2179-64912011000100012. PMid:21552733.

8. Kerr MS, Pagliarin KC, Mineiro A, Ferré P, Joanette Y, Fonseca RP. Bateria Montreal de Avaliação da Comunicação – versão portuguesa: efeito da idade e escolaridade. CoDAS. 2015 Nov-Dez;27(6):550-6. http://dx.doi.org/10.1590/2317-1782/20152015029. PMid:26691619.

9. Mattiazzi AL, Gresele ADP, Hennig TR, Costa MJ. Resultados do Miniexame do Estado Mental em idosos com perda auditiva. Estud Interdiscipl Envelhec. 2016;21(3):9-22.

10. Lessa AH, Dos Santos SN, Costa MJ. Desempenho cognitivo e percepção de fala no ruído de idosos com perda auditiva. Estud Interdiscipl Envelhec. 2016;21(3):43-53. http://dx.doi.org/10.22456/2316-2171.80733.

11. Kopper H, Teixeira AR, Dorneles S. Desempenho cognitivo em um grupo de idosos: influência de audição, idade, sexo e escolaridade. Arq Int Otorrinolaringol. 2009;13(1):39-43.

12. McCoy SL, Tun PA, Cox LC, Colangelo M, Stewart RA, Wingfield A. Hearing loss and perceptual effort: downstream effects on older adults' memory for speech. Q J Exp Psychol A. 2005 Jan;58(1):22-33. http://dx.doi.org/10.1080/02724980443000151. PMid:15881289.

13. Deal JA, Betz J, Yaffe K, Harris T, Purchase-Helzner E, Satterfield S, et al. Hearing impairment and incident dementia and cognitive decline in older adults: the Health ABC study. J Gerontol A Biol Sci Med Sci. 2017 Maio;72(5):703-9. PMid:27071780.

14. Golinelli RT, Massi G, Kruger S, Santos IB, Paisca AB, Berberian AP, et al. Autopercepção de idosos a respeito de suas condições auditivas, de sua escuta e de suas estratégias de comunicação. Distúrb Comun. 2019;31(2):317-27. http://dx.doi.org/10.23925/2176-2724.2019v31i2p317-327.

15. Rosis ACA, Souza MRF, Iório MCM. Questionário Hearing Handicap Inventory for the Elderly – Screening version (HHIE-S): estudo da sensibilidade e especificidade. Rev Soc Bras Fonoaudiol. 2009;14(3):339-45. http://dx.doi.org/10.1590/S1516-80342009000300009.

16. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do Mini-Exame do Estado Mental no Brasil. Arq Neuropsiquiatr. 2003 Set;61(3B):777-81. http://dx.doi.org/10.1590/S0004-282X2003000500014. PMid:14595482.

17. Parente MAMP, Fonseca RP, Pagliarin KC, Barreto SS, Soares-Ishigaki ECS, Hubner LC, et al. Bateria Montreal-Toulouse de avaliação da linguagem – MTL Brasil. São Paulo: Vetor; 2016.

18. CODEPLAN: Companhia de Planejamento do Distrito Federal. Pesquisa Distrital por Amostra de Domicílios 2018. Ceilândia [citado em 2021 Nov 16]. Brasília: CODEPLAN; 2019 [citado em 2021 Nov 16]. 124 p. Disponível em: http://www.codeplan.df.gov.br/wp-content/uploads/2020/06/Ceil%C3%A2ndia.pdf

19. IBGE: Instituto Brasileiro de Geografia e Estatistica. Pesquisa nacional de saúde: percepção do estado de saúde, estilos de vida, doenças crônicas e saúde bucal 2019 [Internet]. Rio de Janeiro: IBGE; 2020 [citado em 2021 Nov 16]. 117 p. Disponível em: https://biblioteca.ibge.gov.br/visualizacao/livros/liv101764.pdf

20. Cruz MS, Oliveira LR, Carandina L, Lima MCP, César CLG, Barros MBA, et al. Prevalência de deficiência auditiva referida e causa atribuídas: um estudo de base populacional. Cad Saude Publica. 2009;25(5):1123-31. http://dx.doi.org/10.1590/S0102-311X2009000500019. PMid:19488497.

21. Menegotto IH, Soldera CLC, Anderle P, Anhaia TC. Correlação entre perda auditiva e resultados dos questionários Hearing Handicap Inventory for the Adults - Screening Version HHIA-S e Hearing Handicap Inventory for the Elderly - Screening Version - HHIE-S. Arq Int Otorrinolaringol. 2011;15(3):319-26. http://dx.doi.org/10.1590/S1809-48722011000300009.

22. Luz VB, Ghiringhelli R, Iório MCM. Restrições de participação e estado mental: estudo em novos usuários de próteses auditivas. Audiol Commun Res. 2018;23(0):e1884. http://dx.doi.org/10.1590/2317-6431-2017-1884.

23. Pereira RC. Prótese auditiva. Rio de Janeiro: Revinter; 2015. p. 47-54.

24. Plassman BL, Williams JW Jr, Burke JR, Holsinger T, Benjamin S. Systematic review: factors associated with risk for and possible prevention of cognitive decline in later life. Ann Intern Med. 2010;153(3):182-93. http://dx.doi.org/10.7326/0003-4819-153-3-201008030-00258. PMid:20547887.

25. Santos IMM, Chiossi JSC, Soares AD, Oliveira LN, Chiari BM. Fluência verbal semântica e fonológica: estudo comparativo em deficientes auditivos e ouvintes. CoDAS. 2014 Nov-Dez;26(6):434-8. http://dx.doi.org/10.1590/2317-1782/20142014050. PMid:25590903.

26. Teldeschi ALG, Perez M, Sanchez MA, Lourenço RA. O uso de testes de fluência verbal como ferramenta de rastreio cognitivo em idosos. Revista HUPE. 2017;16(1):56-60.

27. Caruso MFB, Mármora CHC, Delgado FEF. Prevalência de perda auditiva autorrelatada em idosos e fatores associados em Juiz de Fora. Revista HUPE. 2018;17(2):35-42. https://doi.org/10.12957/rhupe.2018.40809.

28. Livingston G, Sommerlad A, Orgeta V, Costafreda SG, Huntley J, Ames D, et al. Dementia prevention, intervention, and care. Lancet. 2017 Dez 16;390(10113):2673-734. http://dx.doi.org/10.1016/S0140-6736(17)31363-6. PMid:28735855.

29. Pereira XBF, Araújo FLC, Leite TIA, Araújo FAC, Bonfada D, Lucena EES. Prevalência e fatores associados ao déficit cognitivo em idosos na comunidade. Rev Bras Geriatr Gerontol. 2020;23(2):e200012. http://dx.doi.org/10.1590/1981-22562020023.200012.

30. Pagliarin KC, Gindri G, Ortiz KZ, Parente MAMP, Joanette Y, Nespoulous J-L, et al. Relationship between the Brazilian version of the Montreal – Toulouse language assessment battery and education, age and reading and writing characteristics. A cross-sectional study. Sao Paulo Med J. 2015 Ago;133(4):298-306. http://dx.doi.org/10.1590/1516-3180.2014.8461610. PMid:25789778.

Appendix 1. Anamnesis: characterization and hearing health data of the sample

Name:_____

Gender: M ( ) F ( )

Date of birth: _____/_____/_____ Age:_____

Place of birth: _____

Laterality: ( ) Right-handed ( ) Left-handed ( ) Unknown

Education: ( ) illiterate ( ) up to 4 years ( ) 4 - 9 years ( ) 9 -12 years ( ) + 12 years ( ) licensed

( ) unknown

Profession: _____

How do you come to the CCI? _____

With whom?_____

Have you noticed if your hearing is different compared to the last five years?

( ) Yes ( ) No What differences/changes were noticed?

Do you have any complaints of hearing difficulties?

( ) Yes ( ) No Which one(s)?_____

Use of hearing aids: ( ) Yes ( ) No Do you always use it?