

Biological and socio-cultural factors in the assessment of receptive vocabulary in oral Portuguese of post-lingual hearing impaired

Fatores biológicos e socioculturais na avaliação do vocabulário receptivo em português oral de deficientes auditivos pós-linguais

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ABSTRACT

Purpose: Assess the receptive vocabulary in postlingual hearing impaired patients, regarding the influence of biological and sociocultural factors. **Methods:** We conducted a cross-sectional study, with 78 hearing impaired individuals diagnosed with sensorineural, symmetric, postlingual hearing loss; and age between 12 and 70 years (mean=51.3±21.6; median=53), who speak Brazilian Portuguese as first language. We raised data about sociocultural status, hearing loss and hearing aids characteristics. The “Teste de Vocabulário por figura USP–Tvfusp92o”, in Portuguese, was used to evaluate the receptive vocabulary. **Results:** The hearing impaired individuals mean score in the receptive vocabulary test was 82.9 (SD=26.0), showing significant correlation with the educational level, reading habits and the use of a hearing aid. When compared with the test normative data, 51,3% of the hearing impaired scored as having poor or very-poor receptive vocabulary. **Conclusion:** Sociocultural factors, as educational level and reading habit, and the use of a hearing aid have a positive influence on receptive vocabulary. By other side, biological factors as age and hearing loss characteristics did not demonstrate this influence. Mostly of hearing impaired subjects had worst scores in the receptive vocabulary test when compared to normal-hearing individuals, from seven to ten years old.

Keywords: Vocabulary; Language tests; Language; Hearing loss; Deafness; Hearing aids

RESUMO

Objetivo: Avaliar o vocabulário receptivo em deficientes auditivos pós-linguais, analisando a influência de fatores biológicos e socioculturais. **Métodos:** Realizou-se um estudo transversal com 78 indivíduos deficientes auditivos, com perda auditiva pós-lingual, neurossensorial, simétrica e idade entre 12 e 70 anos (média= 51,3 ± 21,6; mediana=53), usuários do português brasileiro como primeira língua. Foram levantados dados socioculturais, incluídos o nível de escolaridade e o hábito de leitura, e as características da perda auditiva e do dispositivo auditivo eletrônico utilizado (AASI ou Implante Coclear). Para a avaliação do vocabulário receptivo, foi utilizado o Teste de Vocabulário por figura, USP–Tvfusp92o. **Resultados:** O desempenho médio dos deficientes auditivos no teste de vocabulário receptivo foi de 82,9 pontos (DP=26,0), apresentando correlação significativa com a escolaridade, hábito de leitura e uso de dispositivos auditivos eletrônicos. Quando comparados aos resultados normativos do teste, 51,8% dos deficientes auditivos demonstraram vocabulário receptivo classificado como rebaixado ou muito rebaixado. **Conclusão:** Os fatores socioculturais, escolaridade e hábito de leitura e o uso de dispositivos eletrônicos influenciam positivamente o vocabulário receptivo oral. Já os fatores biológicos idade, grau da deficiência e tempo de aquisição da deficiência auditiva não tiveram influência sobre o mesmo. A maior parte dos participantes da amostra teve desempenho rebaixado ou muito rebaixado, quando comparados a ouvintes de 7 a 10 anos.

Descritores: Vocabulário; Testes de linguagem; Linguagem; Perda auditiva; Surdez; Auxiliares de audição

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INTRODUCTION

Oral communication is prevalent in interpersonal relationships, mediated by language, an element of exchange for meanings and senses are disseminated to messages, allowing people to understand and be understood⁽¹⁾.

The linguistic heritage represents in the negotiations during the interaction, the “capital” and the available lexicon, while the vocabulary represents the “working capital” that the individual uses to communicate, as updating the conversational demands.

The language as a living organism is dynamic, open to new associations, connections, adaptations that enable troubleshooting and subsidized by learning, cognition and language processes. Its expansion occurs throughout life, developing from the experiences of each individual. We hypothesize that any sensory deficit can affect the experiences that are the raw material for the construction of knowledge.

Learning the language is not restricted to the dominance of words and their meanings, but also learn to use them to communicate events and ideas during the conversation. To understand the words - receptive vocabulary - comes before learning to use them - expressive vocabulary⁽²⁾.

In this context, involving speaking, hearing has an important role. With monitoring of hearing, the equilibrium relationships between form, content and use of the words stabilize, providing the proper functioning of gnosis operations, conversions between external and internal language⁽³⁾. The language under this point is the symbolic process which allows expression of thinking, during communication, language code mediated through speech⁽⁴⁾.

The impact of hearing deficits in oral language will vary according to biological characteristics and compensation developed by the individual.

The age at which hearing loss occurs is crucial in the acquisition and development of oral language, with the worst impact when acquired first years of life. In individuals with post-lingual hearing loss, age may influence the vocabulary expansion, the conditions of school integration and the development of abstract thinking⁽⁵⁾.

In order to reduce the difficulties brought about by hearing loss is the use of electronic devices such as personal sound amplification device (hearing aids) and cochlear implant (CI), which enable the reception of sound stimuli or the use of residual hearing of the individual. The indication of these features is performed according to the type and degree of hearing loss, as well as chronological age that are adapted⁽⁶⁾.

Other forms of compensation of hearing deficits include the development of reading abilities of speech and the wealth of the sociocultural habits (reading, arts, study, etc.).

Reading speech allows understanding is established when there is sensory deprivation. Like any communication situation, it does not discharge with other contextual cues and body, but his focus is on the word and the relationships between them. The

domain vocabulary can be the dividing line for communication to be established⁽⁷⁾.

The educational and cultural habits, such as reading, acting in turn as protective factors that ensure a greater number of experiences and linguistic contexts, allowing the maintenance of lexical and phonological organization before and after the hearing loss.

Due to these facts, in the clinic with people who have lost the ability to hear and/or listen for a traumatic incident, having affected their access to the practice of oral language, the purpose of this research came, in order to assess the receptive vocabulary of oral Portuguese in post-lingual hearing impaired, analyzing the influence of biological and sociocultural factors.

METHODS

The Ethics Committee in Research of the Universidade Federal de São Paulo (UNIFESP) approved this study, under protocol number 1355/11. All participants signed a consent form. For minor, responsible adults, along with a Letter of Consent signed by the participants, signed the term.

This is a cross-sectional research.

The study group consisted of 78 hearing impaired, aged between 12 and 90 years (mean = 51.3; SD = 21.6; median = 53), participants of a center for the diagnosis and monitoring of hearing loss of a public institution in São Paulo. The sessions are scheduled in the service, and from individuals attending the service, a pre-selection, which facilitated the collection of the sample, and all pre-selected individuals participated in this survey was conducted.

Individuals who meet the following criteria were included: bilateral sensorineural hearing loss, from mild to profound and symmetrical, considering the mean of the frequencies 500, 1000, 2000 and 4000, according to World Health Organization⁽⁸⁾; be greater than 12 years at the time of data collection; have acquired hearing loss after 3 years of age (post-lingual); communicate predominantly through oral language code, whose first language Brazilian Portuguese; have at least two years of study in regular schools; accept voluntarily participate in this research.

Exclusion criteria were: having other obvious commitments that might interfere with the development of language and/or speech, such as neurological and/or psychiatric disorders; have severe visual impairment, such as glaucoma and/or low vision and no corrective lenses during the assessment in case of slight visual changes, such as myopia, astigmatism, hyperopia and presbyopia.

To collect the profile of the sample was applied to characterize the sample sheet⁽²⁾, in order to obtain information about the study population, such as age, gender, education, reading habits, type and degree of hearing loss, age of onset of this, time of onset of hearing loss and the use of electronic hearing devices (hearing aids - HA or cochlear implants - CI).

The anamnesis was completed by interview with each individual and by consulting their medical records. When the participant was unable to understand the question only by oral means, facilitation strategies of communication were used, such as repetition and/or graphic support.

In this sample, there was a prevalence of participants were male (51.3%). Regarding age, 10.3% were young adults, 44.9% and 44.9% seniors. Regarding education, 46.8% of subjects had attended only primary school, 24.7% had completed high school and 28.6% have finished higher education/technical (<11 years). Of the total, 75.3% had a habit of reading.

Regarding the characteristics of the hearing loss, mild-moderate loss composed 43.6% of the sample, 16.7% severe hearing loss, and 39.7% profound hearing loss. Almost half of the subjects (48.7%) had lost his hearing than ten years, the mean age experienced hearing loss in 33.5 ± 24.4 years, and 62.8% use electronic hearing devices (AA or CI).

For the assessment of receptive vocabulary, we used the Vocabulary Test through figure, USP-Tvfusp92o⁽⁹⁾.

The test was developed for clinical and educational application for students of early childhood education and elementary education (7-10 years) from public and private schools. This consists of a book of evidence with 92 boards with four pictures each. The individual should select among the figures, one that corresponded to the word spoken by the examiner. To ensure that the participant was able to correctly identification the spoken word, he should repeat this word before point to the figure. The responses of each individual were recorded in the test record sheet for further analysis.

For better understanding the spoken word, the evaluator always positioned in front of the participant, allowing that utilizes visual and/or audio track. When the participant was not able to understand the words, communication strategies, such as repetition and/or graphic support were used.

It is considered as a valid answer correctly repeat the word spoken by the examiner and point the figure corresponding to the given stimulus, with and without the aid of communication strategies. If the participant correctly repeated, but hinted another figure, his answer was considered incorrect.

Similar to that proposed by the instrument, the number of correct responses, errors and omissions were computed, but to facilitate the analysis of this research, we considered only the percentage of correct answers.

For comparison purposes, the age range of the study participants, it was considered that all individuals should obtain a score equal or higher than expected for students in the 4th grade of elementary school, as defined in the instrument manual⁽⁹⁾. We emphasize that for the standardization of the test the authors have applied the instrument of private school students, not differed in this sample, the type of school that, with the premise/assumption that the roof considered for the assessment, this study gives account of routine acquisitions in the surveyed age groups.

For statistical analysis, the parametric ANOVA and Pearson correlation were used. The level of significance was set at 0.05, with confidence intervals of 95%.

RESULTS

The mean performance of the hearing impaired in receptive vocabulary test was 82.9 points ($SD \pm 26,0$). In comparing the average obtained in Tvfusp92o according to biological and sociocultural characteristics of the hearing loss, significant differences were observed in some parameters. The participants who used electronic devices that have the habit of reading and with higher education had higher mean of correct in Tvfusp92o (Table 1).

No correlation was observed between age of onset of hearing loss and performance on receptive vocabulary, as measured by the Tvfusp92o (Table 2).

When we evaluated the correlation of performance in Tvfusp92o with schooling, for each range of onset age of hearing loss, positive correlations were observed when the onset of the hearing loss occurred up to 10 years of age, between 31 and 40 years and older than 51 years. Thus, more education, better test performance was used in this study (Table 3).

In comparing the performance of participating users and nonusers of electronic hearing device in Tvfusp92o test for the group onset of the hearing loss, users performed better in receptive vocabulary in all groups analyzed, but only in the age group in which the onset of the hearing loss occurred after 51 years the difference between users and nonusers was significant (Table 4).

In comparing the findings of this research with post-lingual hearing impaired and the normative test data according to specific manual⁽⁶⁾, the values established for listeners 4th graders, maximum education level presented in the manual were considered. Therefore, we chose to analyze the performance of the participants in this study considering two, three and four or more years of schooling. Most hearing impaired with post-lingual hearing loss presented classified as reduced performance or too recessed (51.3%), according to the criteria of the manual. It is worth mentioning that the most part of the sample (87.17%) had at least four years of education.

DISCUSSION

The main findings of this study indicate a high percentage of post-lingual hearing impaired classified as reduced or a very reduced. This difference can be attributed to various biological and sociocultural factors studied in this research.

The schooling has been identified as a determinant of performance in different cognitive and language tests, developed for the assessment of children, adults as well⁽¹⁰⁻¹²⁾, taking influence described in vocabulary tests^(9,13-15). The material used, although there are different classifications by level of schooling,

Table 1. Comparison between the biological variables, the habit of reading and performance on Vocabulary Test through Figures (Tvfusp92o)

		Tvfusp92o (%)							
		n (%)	Mean	Median	SD	Minimum	Maximum	CI	p-value
Age	12 to 18 years	08 (10.3)	81.11	82.1	7.75	65.2	89.1	5.37	0.832
	19 to 59 years	35 (44.9)	83.74	88	12.98	52.2	98.9	4.3	
	More than 60	35 (44.9)	82.64	83.7	11.56	53.3	100	3.83	
Degree of hearing loss	Mild	02 (2.6)	77.72	77.7	2.31	76.1	79.3	3.2	0.249
	Moderate	32 (41.0)	82.3	82.6	11.1	53.3	100	3.85	
	Severe	13 (16.7)	78.59	83.7	14.22	52.2	96.7	7.73	
	Profound	31 (39.7)	85.85	88	11.42	57.6	98.9	4.02	
Time of onset of hearing loss	1 to 10 years	38 (48.7)	80.17	80.4	11.45	52.2	100	3.64	0.189
	1 to 20 years	15 (19.2)	83.33	85.9	14.44	57.6	97.8	7.31	
	21 to 30 years	12 (15.4)	87.93	90.2	8.31	71.7	97.8	4.7	
	31 to 40 years	5 (6.4)	86.52	92.4	11.79	66.3	94.5	10.34	
	41 to 50 years	6 (7.7)	82.41	85.3	11.14	67.4	95.6	8.91	
	51 to 60 years	2 (2.6)	96.72	96.7	0.03	96.7	96.7	0.04	
HA/CI users	Yes	49 (62.8)	86.21	88	10.25	57.6	100	2.87	0.001*
	No	29 (37.2)	77.51	77.2	12.42	52.2	98.9	4.52	
Reading habit	Yes	58 (75.3)	84.51	85.9	10.68	57.6	100	2.75	0.023*
	No	19 (24.7)	77.51	78.3	13.58	52.2	96.7	6.1	
Schooling	To 4 years	15 (19.5)	74.78	76.1	12.3	52.2	93.5	6.22	<0.001*
	5 to 8 years	21 (27.3)	76.66	78.3	9.55	57.6	91.3	4.09	
	9 to 11 years	19 (24.7)	86.32	89.1	9.50	65.2	97.8	4.27	
	12 to 16 years	18 (23.4)	92.43	94.5	5.98	76.1	98.9	2.76	
	More than 17 years	4 (5.2)	93.18	92.9	6.69	86.9	100	6.56	

*Significant values (p≤0.05) – ANOVA test

Note: Tvfusp92o = Receptive vocabulary test through figures USP; SD = standard deviation; CI = Confidence interval; HA/CI Hearing aids/cochlear implant

Table 2. Correlation of age of onset of hearing loss and performance on the Vocabulary Test through Figures (Tvfusp92o)

Age of loss versus Tvfusp92o	
Corr (r)	-17.9%
p-value	0.116

Note: Tvfusp92o = Receptive vocabulary test through figures USP

it is considered that the population used for standardization in the manual (children 7-10 years) there is also the influence of maturation cognitive processes, so that the schooling cannot be displayed as the only factor in determining the performance tests.

In a population of young people and adults who have acquired hearing loss after the acquisition of vocabulary, the schooling proceeds as a major factor in facing restraint status⁽¹⁶⁾, reflecting the maintenance of diversified experience in the continued development of vocabulary. Schooling is also a protective factor that provides greater cognitive reserve and memory during adulthood^(15,17).

At school, joins the high percentage of subjects with reading habit, higher than the national mean, which is 47.1% of the population with the habit of reading books and 46.1% say

Table 3. Correlation between schooling and performance on the Vocabulary Test through Figures (Tvfusp92o) by installation range of hearing loss

	Corr (r)	p-value
To 10	55.2%	0.008*
11 to 20	21.6%	0.608
21 to 30	57.1%	0.140
31 to 40	94.6%	<0.001*
41 to 50	66.4%	0.072
More than 51	47.5%	0.022*

*Significant values (p≤0.05) – Pearson correlation test

Note: Corr = Correlation

they read newspapers⁽¹⁸⁾. Reading enhances the dynamism of language, the ability to deal with contexts, which can promote associations and adaptations with greater dexterity⁽¹⁵⁾. It comes usually related to larger sociocultural and schooling levels⁽¹⁸⁾, thus influencing the coping of traumatic incidents, such as hearing loss.

To analyze the biological factors, age could be identified as a factor that influences the acquisition of vocabulary. However, it knows that much of the vocabulary develops up

Table 4. Comparison between the use of electronic devices and the performance of the Vocabulary Test through Figures (Tvfus92o) by installation range of hearing loss

Uses auxiliary device		Mean	Median	SD	n	CI	p-value
To 10	No	76.45	70.65	12.96	3	14.67	0.091
	Yes	87.23	88.00	9.34	19	4.20	
11 to 20	No	84.03	80.40	10.25	3	11.60	0.485
	Yes	88.69	89.13	7.58	5	6.64	
21 to 30	No	83.70	83.70	- x -	1	- x -	0.846
	Yes	80.26	83.70	15.91	7	11.79	
31 to 40	No	75.65	70.65	19.55	5	17.14	0.582
	Yes	83.33	91.30	14.76	3	16.70	
41 to 50	No	81.90	77.17	14.17	3	16.03	0.348
	Yes	89.56	91.30	7.67	5	6.73	
More than 51	No	75.62	77.17	10.92	14	5.72	0.017*
	Yes	86.41	85.33	8.67	10	5.37	

*Significant values (p≤0.05) – ANOVA test

Note: SD = standard deviation; CI = confidence interval

Table 5. Number and percentage of subjects according to the classification performance on the receptive vocabulary test through figures (Tvfus92o)

		Level of Receptive Vocabulary - Tvfus92o				
		Very reduced	Reduced	Mean	High	Very high
TVfus (92o) normative data for 4th grade		79 a 82	83 a 86	87 a 93	94 a 98	≥99
Performance according to the subject (n=78)		32 (41.0%)	10 (12.8%)	17 (21.8%)	17 (21.8%)	2 (2.6%)
Schooling		Very reduced	Reduced	Mean	High	Very high
2 years (n=3)	Normative data (%correct)	64 a 68	69 a 74	75 a 86	87 a 92	≥93
	Performance of the subject	1 (33.4%)	0 (0.0%)	2 (66.6%)	0 (0.0%)	0 (0.0%)
3 years (n=7)	Normative data (%correct)	65 a 71	72 a 78	79 a 92	93 a 98	≥99
	Performance of the subject	3 (42.8%)	2 (28.6%)	2 (28.6%)	0	0
≥4years (n=68)	Normative data (%correct)	79 a 82	83 a 86	87 a 93	94 a 98	≥99
	Performance of the subject	25 (36.8%)	9 (13.2%)	15 (22.1%)	17 (25.0%)	2 (2.9%)
Total* (n=78)		29 (37.2%)	11 (14.1%)	19 (24.3%)	17 (21.8%)	2 (2.6%)

* Performance and years of study

Normative data in % correct

Note: Tvfus92o = Receptive vocabulary test through figures USP

to 12 years (when it reaches about 20 000 words)^(19,20), the age range studied showed no correlation between performance on receptive vocabulary and age. Although, it is considered that the vocabulary is continually develops over a lifetime, thanks to the dynamism of the language⁽²⁾, its scope depends more on extrinsic factors, such as the experiences and opportunities (variables such as profession/occupation, cultural habits, social interaction, family environment, among others), than age itself.

Regarding to biological factors related to hearing loss, studies show that all types of hearing impairment, regardless of their degree or configuration, has an impact on communication, even though variable⁽²¹⁻²³⁾. The impact is not only on the linguistic level, but is reflected in a brain reorganization, transferring auditory cortical areas for visual processing even

in subjects with mild-moderate hearing impairment acquired in adulthood^(24,25). Therefore, the lack of correlation between the degree of hearing loss and receptive vocabulary, in this study, can be attributed to the fact that all subjects were analyzed, somehow, and constrained by disability.

It is also considered that, on this biological factor influencing socio-cultural variables and the use of resources to enable mitigation of restrictions imposed by disability, which may have reflected a greater level of adaptation of the subjects with more severe hearing losses. In this study, the variable “degree of hearing loss” represented one of the limits of research, because there were only two representatives with mild hearing loss, so that, for further statistical analysis would be necessary to develop a more extensive study with increasing the sample.

Considering the effect of hearing loss on brain organization, described above^(24,25), and the factors related to participation restriction and reduction of language experiences, would be supposed that subjects with hearing loss no longer had a greater reduction of receptive vocabulary. However, no correlation was found between duration of hearing loss and receptive vocabulary. It is important to realize that this time is independent of the use of electronic hearing devices and therefore cannot be defined as a period of sensory deprivation, because most individuals have the resources that allowed the sound perception, although with the inherent restrictions equipment.

The relationship between the use of a technological resource (HA or CI) and receptive vocabulary, demonstrated in this study reinforces the crucial role of hearing recovery in the maintenance of auditory experiences, being a determinant factor for the lower participation restriction^(26,27). However, only the technological resource is not sufficient to ensure a good performance in the vocabulary. Other factors, such as the possibilities of interaction, the contexts of use of hearing and sociocultural habits, along with the technological resource, can provide better prognosis, because although the equipment gives the individual the opportunity to hear, are the cognitive and interactional processes that allow you to listen to and extract information from what you hear.

The limitation of this study was the fact that he had not been a group of normal-hearing subjects, performing the comparison with a test that has not yet been standardized for the young and adult population. We chose to define the sociocultural and biological factors that influence the performance of the hearing impaired in tests of receptive vocabulary, beyond just describing your performance, since this data can lead to thoughts about the prognosis and rehabilitation process in these individuals.

The language of hearing impaired adults with acquisition of post-lingual hearing loss is still somewhat debated topic in the literature that talks mainly about their quality of life without focusing on aspects of language. This study contributes to reflection on this subject, in order to encourage further research on the reception and linguistic expression in its various aspects, in post-lingual hearing-impaired population.

CONCLUSION

Sociocultural factors, education and reading habits and the use of electronic devices positively influence the oral receptive vocabulary. Biological factors such as age, degree of disability, and acquisition time of the hearing loss had no influence on it. Most participants in the sample had reduced or a very reduced performance when compared to listeners with 7-10 years.

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REFERÊNCIAS

1. Chiari BM. Língua e linguagem: forma, conteúdo e uso na presença dos déficits de audição. In: Marchezan IQ, Justino H, Tomé MC. Tratado de fonoaudiologia. 3a ed. São Paulo: Roca; 2014. p. 632-34.
2. Costa MCM, Chiari BM. Verificação do desempenho de crianças deficientes auditivas oralizadas em teste de vocabulário. *Pró-Fono*. 2006;18(2):189-96. <http://dx.doi.org/10.1590/S0104-56872006000200008>
3. Amemiya EE, Goulart BN, Chiari BM. Use of nouns and verbs in the oral narrative of individuals with hearing impairment and normal hearing between 5 and 11 years of age. *São Paulo Med J*. 2013;131(5):289-95. <http://dx.doi.org/10.1590/1516-3180.2013.1315384>
4. Soares AD, Goulart BNG, Chiari BM. Narrative competence among hearing-impaired and normal-hearing children: analytical cross-sectional study. *São Paulo Med J*. 2010;128(5):284-8. <http://dx.doi.org/10.1590/S1516-31802010000500008>
5. Geers AE, Sedey AL. Language and verbal reasoning skills in adolescents with 10 or more years of cochlear implant experience. *Ear Hear*. 2011;32 Suppl:39S-48. <http://dx.doi.org/10.1097/AUD.0b013e3181fa41dc>
6. Abdellaoui A, Tran Ba Huy P. Success and failure factors for hearing-aid prescription: results of a French national survey. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2013;130(6):313-9. <http://dx.doi.org/10.1016/j.anorl.2012.09.014>
7. Oliveira LN, Soares AD, Chiari BM. Leitura da fala como mediadora da comunicação. *CoDAS*. 2014;26(1):53-60. <http://dx.doi.org/10.1590/S2317-17822014000100008>
8. World Health Organization - WHO. Prevention of blindness and deafness: grades of hearing impairment. Geneva: World Health Organization; 1997 [acesso em 15 jul 2013]. Disponível em: http://www.who.int/pbd/deafness/hearing_impairment_grades/en/index.htm
9. Capovilla FC, organizador. Teste de vocabulário por figuras USP (TVfusp). São Paulo: Mennon; 2011.
10. Snitz BE, Unverzagt FW, Chang CC, Bilt JV, Gao S, Saxton J et al. Effects of age, gender, education and race on two tests of language ability in community-based older adults. *Int Psychogeriatr*. 2009;21(6):1051-62.
11. Soares EC, Ortiz KZ. Influence of schooling on language abilities of adults without linguistic disorders. *Sao Paulo Med J*. 2009;127(3):134-9. <http://dx.doi.org/10.1590/S1516-31802009000300005>
12. Ganguli M, Snitz BE, Lee CW, Vanderbilt J, Saxton JA, Chang CC. Age and education effects and norms on a cognitive test battery from a population-based cohort: the Monongahela-Youghiogheny Healthy Aging Team. *Aging Ment Health*. 2010;14(1):100-7. <http://dx.doi.org/10.1080/13607860903071014>
13. Dunn LM, Dunn DM. Peabody picture vocabulary test (PPVT™-4). 4a ed. San Antonio: Pearson Education; 2007.
14. Constantinidou F, Christodoulou M, Prokopiou J. The effects of age and education on executive functioning and oral naming performance in greek cypriot adults: the neurocognitive study for the aging. *Folia*

- Phoniatr Logop. 2012;64:187-98. <http://dx.doi.org/10.1159/000340015>
15. López-Higes R, Rubio-Valdehita S, Prados JM, Galindo M. [Cognitive reserve and linguistic skills in healthy elderly persons]. *Rev Neurol*. 2013;57(3):97-102. Spanish.
16. Hallberg LR, Carlsson SG. Hearing impairment, coping and perceived hearing handicap in middle-aged subjects with acquired hearing loss. *Br J Audiol*. 1991;25(5):323-30. <http://dx.doi.org/10.3109/03005369109076605>
17. Jefferson AL, Gibbons LE, Rentz DM, Carvalho JO, Manly J, Bennett DA et al. A life course model of cognitive activities, socioeconomic status, education, reading ability, and cognition. *J Am Geriatr Soc*. 2011;59(8):1403-11. <http://dx.doi.org/10.1111/j.1532-5415.2011.03499.x>
18. Secretaria de Comunicação Social. Hábitos de informação e formação de opinião da população brasileira II (Compilado). Brasília, DF: Secretaria de Comunicação Social; 2010.
19. Smith MM. Competência lexical, dicionários e discurso: encontros e estranhamentos. *Letras Hoje*. 2005;40(1):183-98.
20. Domingues MA. Desenvolvimento e aprendizagem: o que o cérebro tem a ver com isso? Canoas: Ed. da Ulbra; 2007. Capítulo 18: Construção cerebral: da segunda infância aos 18 anos. p. 167-76.
21. Benichov J, Cox LC, Tun PA, Wingfield A. Word recognition within a linguistic context: effects of age, hearing acuity, verbal ability, and cognitive function. *Ear Hear*. 2012;33(2):250-6. <http://dx.doi.org/10.1097/AUD.0b013e31822f680f>
22. Piquado T, Benichov JI, Brownell H, Wingfield A. The hidden effect of hearing acuity on speech recall, and compensatory effects of self-paced listening. *Int J Audiol*. 2012;51(8):576-83. <http://dx.doi.org/10.3109/14992027.2012.684403>
23. Lash A, Rogers CS, Zoller A, Wingfield A. Expectation and entropy in spoken word recognition: effects of age and hearing acuity. *Exp Aging Res*. 2013;39(3):235-53. <http://dx.doi.org/10.1080/0361073X.2013.779175>
24. Campbell J, Sharma A. Compensatory changes in cortical resource allocation in adults with hearing loss. *Front Syst Neurosci*. 2013;25;7:71. <http://dx.doi.org/10.3389/fnsys.2013.00071>
25. Campbell J, Sharma A. Cross-modal re-organization in adults with early stage hearing loss. *PLoS One*. 2014;9(2):e90594. <http://dx.doi.org/10.1371/journal.pone.0090594>
26. Silva DP, Silva VB, Aurélio FS. Auditory satisfaction of patients fitted with hearing aids in the Brazilian Public Health Service and benefits offered by the hearing aids. *Braz J Otorhinolaryngol*. 2013;79(5):538-45. <http://dx.doi.org/10.5935/1808-8694.20130098>
27. Campos PD, Bozza A, Ferrari DV. Habilidades de manuseio dos aparelhos de amplificação sonora individuais: relação com satisfação e benefício. *CoDAS*. 2014;26(1):10-6. <http://dx.doi.org/10.1590/S2317-17822014.001-0003>