Original Research Paper

BIOPSYCHOSOCIAL IMPACTS OF DISTURBANCE OF HEARING PROCESSING IN ELDERLY INDIVIDUALS

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ABSTRACT The aim of this study is to demonstrate through a theoretical review, auditory processing and its alterations in the elderly, the biopsychosocial impacts that this disorder causes, as well as some resources that can be used to reduce the lags in the auditory processing involved in auditory processing. Since with aging the auditory system becomes less accurate and more conducive to the development of such changes. The data collection was carried out through a systematic review of the literature present in didactic books, course completion papers, master's thesis, doctoral theses and scientific articles obeying the norms of the Brazilian Society of Speech and Hearing journal. A synthesis of the researches that report on auditory processing disorders in elderly individuals, as well as the communication difficulties faced by them, was presented. He concluded that there are several imbalances caused by the auditory processing disorder in the elderly, so it is necessary to continue scientific studies in this area to apply adequate interventional measures in order to guarantee the rehabilitation of the individual in time to minimize the effects of auditory disorder in this population.

KEYWORDS : auditory processing, senescence, auditory rehabilitation, hearing

INTRODUCTION

Hearing is one of the human senses that contributes most to social interaction. In addition, it is a sensory function that allows us to receive, analyze and interpret the sounds. From the auditory system any and every audible acoustic stimulus to the human being when passing through the hearing is submitted to mechanisms and processes in order to construct information about the received signal, making it of useful operation through the auditory processing¹.

Aging is a natural consequence of the development process of a society. During this process, all structures of the organism are gradually modified, affecting the quality of life in the elderly. The sound lags of the elderly also result from alterations in structures involved in the neurological processing of auditory information that also unfavorably affect comprehension and language synthesis².

In this sense, central auditory processing (PAC) refers to the efficiency and effectiveness with which the central nervous system uses the auditory information, it refers to a set of mechanisms and cprocesses responsible for the phenomena of lateralization and location of sound, auditory discrimination, recognition of auditory patterns, temporal aspects of hearing - integration, discrimination, ordering and temporal masking - and auditory abilities with competitive and degraded acoustic signals³.

Thus, the occurrence of alteration in any mechanisms, stages and / or abilities of the hearing generates impediment in the correct use of the auditory information, causing a central auditory processing disorder (CAPD) also called central auditory dysfunction or auditory processing disorder. resulting from sensory deprivation, hearing loss, neurological problems or other. The central auditory processing disorder (CAPD) refers to difficulty in the percentage processing of information in the central nervous system⁴.

In view of this, one study reported that hearing disorders in the elderly occur at an incidence of 5 to 20% in people of at least 60 years of age and about 60% in people over 60 years of age. That is, a very high number when it comes to the individual's auditory capacity, which tends to isolate him and deprive him of the sources of information and communication 5. Observing the impact of senescence on auditory processing, the importance of the subject for Speech-Language pathology and the validity of studying the effects of age is verified, as this causes damage to the auditory function in the individual and as a consequence, the elderly

individual experiences a reduction in their quality of life, therefore, it is necessary to research in order to deepen the knowledge regarding the physiological degeneration of the auditory system during the course of the age.

LITERATURE REVISION

The activity of the peripheral auditory system involves the capture and transmission of the sound wave, so the activity of the central auditory system is responsible for the processing of auditory information and its function is discrimination, location, sound recognition, comprehension, selective attention and auditory memory. In addition to the peripheral portion and the central portion, other central areas may be involved in auditory processing. They are: frontal lobe, temporal-parietal connection and occipital lobe. These structures integrate auditory sensory information⁴.

Senescence refers to organic, morphological and functional changes that occur in the body due to aging, since, this aging process occurs from the age of 40, being defined as progressive and degenerative that leads to a series of associated changes of the passage of time and can bring countless consequences to the individual, among them we can mention: biological, physiological and psychological changes⁷.

Aging can determine degenerative changes at each level of the auditory system. Currently, more than 15 million Brazilians have hearing disorders, and only 40% of those affected recognize the disease. Among these patients, we find the elderly, with special attention in this work. As a result, estimates indicate that by the year 2020, a total of 32 million people over the age of 60 are expected to reach population aging, making as one of the major public health challenges⁴.

Interest in the relationship between aging and auditory processing has been gradual in the last years, mainly in audiology, due to the subsistence of elderly with peripheral auditory integrity and / or elderly with functional gain of hearing aid adequate for the loss, but they present audiological symptoms incompatible with such audiological characteristics. Therefore, recent studies have demonstrated that such difficulties may be associated with loss of ability to perform auditory processing of sounds, associated with aging ⁸.

Listening and understanding are tasks of active listening - they require focus and attention. They require sensory integrity of the

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central nervous system. Human beings make decisions and build knowledge from what they hear and process. Thus, auditory information processing allows the brain to analyze the acoustic characteristics of auditory stimuli and to transform, in an organized way, raw sensory data into verbal units, such as words and phrases, and in nonverbal units, such as acoustic contour, pauses, emphasis and other characteristics of effective-emotional expression⁹.

Auditory experiences play a key role in the ability to communicate, as well as in understanding and socialization. In this context, auditory processing, as defined by the American Speech-language-Hearing Association, involves the mechanisms and processes of the auditory system that are responsible for: lateralization and localization of sounds, auditory discrimination, pattern recognition and temporal aspects of hearing, including resolution , masking, integration and temporal ordering, auditory performance with competitive and degraded acoustic signals¹⁰.

It is also defined as an inherent set of abilities on which the human being depends to understand what he hears. That is, it is a series of factors that succeed each other in time and that allow the individual to perform a meta-cognitive analysis of the sound impacts - speech comprehension. It prominently encompasses the structures of the central nervous system: auditory pathways and cortex, and the mechanisms that are classified as, sensing, sensation, discrimination, location, memory comprehension and selective attention¹¹.

The disorder of central auditory processing is considered a hearing disorder in which the individual has an inability to analyze and interpret sound stimuli or to give a meaning to these sounds. It would be the inability to focus, discriminate, recognize or understand information through the auditory system. Although his auditory acuity is within the normal range. This may be due to sensory deprivation, hearing loss, neurological alterations or other^{13.}

It may occur in isolation or coexist with other disorders, such as attention deficit hyperactivity disorder; specific language development disorders; reading disorder or dyslexia; and disorder of the development of written expression, such as with peripheral hearing abnormalities or as a result of normal aging. The literature shows the increase according to age and the data are quite variable (from 23 to 76%), and individuals over 60 years old can reach 70%6. Moreover, the auditory processing disorder can be characterized as a deficit in the neural processing of the auditory stimulus, from the detection of the presence of sound to the analysis of the linguistic information, involving perceptual, cognitive and linguistic functions. The author adds that the Central Auditory Processing System, is composed of processes that need a good functioning of its structures connected to the peripheral and central nervous system. This means that a simple disturbance or failure can cause the individual to not be able to interpret the sound they heard, since the interpretation of the sounds depends on their hearing abilities being organized and structured ¹⁴. Currently in the national and international literature are found studies that analyze the audiological profile of elderly individuals, regarding the effects of the aging process specifically on auditory processing, we know that aging involves an increased susceptibility to physical, psychological and sociocultural aggression. The sensory system becomes less accurate, the pattern of sleep changes and there are declining aspects of memory. That is, there are many sensory deficiencies that accompany old age⁴.

In addition, CAPD is characterized by a functional difficulty resulting from dysfunctions of the auditory abilities and may be related to a global dysfunction that the central nervous system undergoes in the aging process. Therefore, it causes in the elderly the difficulty of understanding speech (hearing, but not understanding) due to the decrease in the ability to process the sounds¹⁵.

In order to analyze the efficiency of the central auditory functions of the elderly, a study evaluated the auditory (central) processing of 40 elderly individuals in the age group of 60 to 75 years through the tests of identification of synthetic sentences with ipsilateral competitive message, test of frequency patterns and test of alternating disyllables by means of dichotic task. The authors observed that the elderly of the research presented percentages of correct answers below the norms of normality of adults in the three tests performed, which suggests that elderly individuals who report hearing well present a relevant prevalence of signs of inefficiency of the central auditory functions 16. The most common complaint of these elderly individuals is the difficulty of understanding the spoken language, especially in unfavorable situations, such as in noisy environments or an increased speech rate. In addition, this difficulty seems to be greater than expected when considering the degree of hearing loss. Therefore, this difference may be related to other sociocultural and emotional factors, leading some elderly to overvalue, and others to deny hearing impairment^{17.}

If speech intelligibility is compromised, it is common for the elderly person to feel embarrassed, trying not to expose themselves to communicative situations. It is difficult for the elderly to ask people around them to repeat what they have said, it is easier to demonstrate that they have understood the message or simply prefer to isolate themselves. Therefore, this inability to communicate is one of the sensory deprivations that most frustrates the elderly individual, producing devastating consequences in his biopsychosocial life. It also causes greater impact in communication, leading the individual to isolation and avoiding situations of communication that are threatening¹⁸.

With hearing loss, feelings of insecurity, fear and even disability begin to emerge, and doubts about the possible progression of loss are something that can leave the adult restless. Difficulties in communication cause the elderly to doubt their abilities and abilities, both professionally and personally, leading to serious changes in their quality of life, depression and even the isolation of society⁵.

Since communicative ability is a decisive factor in the determination of autonomy, independence and well-being in the elderly, auditory or linguistic alterations can be autonomous, promoting certain social rejection, isolation, depression, stress, frustrations, anxiety among other characteristics that depend directly on the history and lifestyle of each subject^{10.}

Therefore, the role of the speech therapist with the elderly is increasingly contributing to optimize biopsychosocial aspects, especially when this is part of an interdisciplinary process. The resources used for auditory rehabilitation help to minimize the difficulty of communication, since it "brings back" the possibility of auditory improvement, providing greater integration of the subject in society¹⁸.

In this way, to bring to the knowledge of the elderly population knowledge that can contribute to an "early" perception of the hearing conditions in this age group, will enable actions to promote hearing health. Consequently, the understanding of auditory aspects contributes positively to the communicative process of this population.

METHODOLOGY

The present research is a bibliographical review. The bibliographic review is a set of norms that aims to help contribute to the theoretical constructions and the delimitation of the objectives of scientific research. In addition, this research is qualitative in nature19. For, the qualitative research presents exploration character, that estimates to describe, to understand and to explain the subject approached20. The data collection is being carried out through a systematic review present in didactic books, dissertation, doctoral dissertations and scientific articles (selected in databases of Virtual Health Library / VHL, thesis and dissertation bank, PUBMED, LILACS - BIREME, CIELO and CEFAC). This research has been reviewing original articles, master's thesis, books and doctoral theses, published in the last 10 years (2006/2016), obeying the norms of the journal Brazilian society of phonoaudiology. From the searches were found 37 bibliographical references and all of them

were used.

DISCUSSION

Auditory processing involves the detection, analysis and interpretation abilities of sound stimuli, these abilities occur in the peripheral auditory system and in the central auditory system ¹². However, regardless of the adopted definition, it can be said, in general, that the Central Auditory Processing is the ability we have to perceive the sound stimuli around us, to analyze what we hear and to store information obtained by the sound ²².

One study reports that when auditory skills are not developed for any reason, whether physical or psychological, the individual may have a disorder in Central Auditory Processing. This disorder is the break in one or more stages of auditory processing ²³. In addition, other authors affirm the idea by saying that this break in one or more steps generates an impediment in the ability to analyze and interpret sound patterns ²⁴. However, the central auditory processing disorder is much more complex than this, and occurs when there is an inefficient neurophysiological representation of the acoustic signal, temporal processing and inaccurate neural synchrony, atypical hemispheric asymmetry of auditory representation (mainly speech) and inefficient inter-hemispheric transfer of auditory information ⁴.

The percentage of the population that presents communication difficulties increases progressively with age, and the changes of the hearing in the aging include progressive sensorial, neural, estrial degeneration and of support of the cochlear cells beyond central processing ¹⁸. To clarify, a study was investigated the possible relationships between the changes in auditory processing and the aging of the auditory system, where they were investigated, through a study containing 12 elderly people aged 65 to 75 years with bilateral normal hearing. The results showed that the fact that older subjects, with normal auditory thresholds present abnormal results and poorer performance than young normal hearing subjects, would imply alterations related to age ¹⁵.

The psychological, biological and physiological changes resulting from aging are not uniform and affect every organism concomitantly ²⁵. This happens with hearing and, consequently, with communication, since listening and interpreting involves central mechanisms of understanding, information processing, elaboration of a response to the stimulus received and the issuance thereof. At each stage of this complex process, there is loss of functioning characteristics with age ²⁷.

For this reason, aging and disease can not be treated independently, but synchronicly, in order to maintain the quality of life and the biopsychosocial health of that individual^{28.}

In order to clarify this fact, the complaints and otological concerns, as well as the communication difficulties of elderly individuals, were investigated. The most mentioned situations of communication difficulties were the presence of noise in the environment, followed by the use of television ²⁴. However, the difficulty of spoken language is one of the most mentioned complaints by the elderly, especially in unfavorable communication situations, such as increased speech rate 5. Therefore, the factors underlying the possible effects of aging on speech recognition are probably related to auditory processing may lead to complaints of greater than expected speech comprehension difficulty for the presented audiological profile^{29,30}.

Some epidemiological studies indicate that several problems reduce the quality of life of the elderly, hearing disorders are among the most common ^{31,32}. This means that the communication difficulties of the elderly that are often related to auditory alterations may contribute to a process of devaluation and underestimation affecting the social relationship of these individuals ³³. However, difficulties in auditory processing go much further than this, and can interfere in the daily life of the individual leading to difficulties of attention, changes in speech and / or

writing, difficulty in literacy, difficulty in mathematics, difficulty in interpreting texts, lateralization, agitation and apathy.

Currently, auditory processing has been attracting researchers from several areas, including speech therapy ³⁵. However, the lack of information from the elderly population about the importance of early detection of this auditory disorder as well as the reduced participation of other health professionals in the valorization of auditory processing are possibly important factors in the late detection ³⁶. As a consequence, programs and companies involving information about what is, when and the main therapeutic interventions of auditory processing and the population in general must be implemented and motivated to reach a longevity with more quality ³⁷.

CONCLUSION

The researched literature points to serious implications of auditory processing disorders for elderly communication. However, the understanding of the pathophysiology of aging, especially of auditory aging leads the human being to be able to understand and thus contribute to appropriate intervention measures be applied and thus ensure rehabilitation in time to minimize the effects of this auditory disorder in this population. This study showed the need for more researches that can discuss the emotional and social issues complained of by the elderly and that, eventually, are related to the disturbances of the auditory processing. Thus, it is possible to rectify person to social interaction, family, friends and co-workers.

It is concluded, therefore, that the audiological work in this age group of the population is very complex and requires the audiologist to be sensitive and empathic in understanding the difficulties faced by the patient.

REFERÊNCIAS

- Azzolini, V. C.; Ferreira, M. I. D. C. Processamento auditivo temporal em idosos. Arq.Int. Otorrinolaringol, São Paulo, v. 14, n. 1, p. 95-102, Jan/março, 2010.
- [2] Pinheiro, M. M. C. et al. A influência dos aspectos cognitivos e dos processos auditivos na aclimatização das próteses auditivas em idosos. J Soc Bras Fonoaudiol, Florianópolis, v. 14, n. 04, p. 309-15, jul/agosto, 2012.
- [3] Hennig, T. R. et al. Efeitos da reabilitação auditiva na habilidade de ordenação temporal em idosos usuários de próteses auditivas. J Soc Bras Fonoaudiol, Santa Maria-RS v.24, n.01, P. 26-33, Agost/Novemb, 2012.
- [4] Buss, L. H.; Graciolli, L. S.; Rossil, A. G. Processamento auditivo em idosos: implicações e soluções. Rev. CEFAC, Santa Maria-RS, v. 12, n.01, p. 160-151, Jan/Fevereiro, 2010.
- [5] Ruschel, C. V.; Carvalho, C. R.; Guarinello, A. C. A eficiência de um programa de reabilitação audiológica em idosos com presbiacusia e seus familiares. Rev Bras Fonoaudiol, Curitiba-PR, v.12, n.02, p. 95-08, Mar/Maio, 2007.
- [6] Bevilacqua, M. C. et al. Tratado de Audiologia. 1º Ed. [3º reimpr.]. São Paulo: Santos, 2014.880 p.
- [7] Souza, M. G. C. O sentido da audição e as dificuldades atribuídas por um grupo de idosos. 2007. 114 f. Dissertação (mestrado em fonoaudiologia) – programa de pós graduação, Pontifica Universidade Católica de São Paulo. São Paulo. 2007.
- [8] Zaidan, E. et al. Desempenho de adultos jovens normais em dois testes de resolução temporal. Pró-fono, v. 20, n. 1, p. 19-24, 2008.
- [9] Alonso, R. avaliação eletrofisiológica e comportamental do processamento auditivo central e treinamento auditivo em indivíduos idosos. 2011. 189 f. tese (doutorado em ciências) faculdade de medicina da universidade de São Paulo. São Paulo. 2011.
- [10] Fridlin, S. L.; Pereira, L. D.; Perez, A. P. Relação entre dados coletados na anamnese e distúrbio do processamento auditivo. Rev. CEFAC, v. 16, n. 2, p. 405-412, Mar/Abr, 2014.
- [11] Sanchez, M. L.; Alvarez, A. M. M. A. Processamento auditivo central: avaliação. In: Costa SS, Cruz OLM, Oliveira JAA. Otorrinolaringologia: princípios e práticas. São Paulo: Artmed; 2006. p.191-202.
- [12] RAMOS, Berenice Dias; ALVAREZ, Ana Maria; SANCHEZ Maura Ligia. Neuroaudiologia e processamento auditivo: novos paradigmas. RBM/OR v. 2, n. 2 p. 51-58. 2007.
- [13] Rochland, Adriano; Borba, Júlio. Primeiros passos na fonoaudiologia. 1º ed. São Jose dos Campos: Pulso, 2006. 285 p.
- [14] Torquato, R., J. A alteração do processamento auditivo e a relação com a dificuldade de aprendizagem da escrita. 2012. 45 f. monografia (especialização em psicopedagogia) universidade do tuiuti do paraná. Curitiba. 2012.
 [15] Lima, C., C. Avaliação comportamental e eletrofisiológica das funções auditivas no
- [15] Lima, C., C. Avaliação comportamental e eletrofisiológica das funções auditivas no processo de envelhecimento. 2013. 129 f. dissertação (mestrado em ciências) programa de ciências da reabilitação. Faculdade de medicina da universidade de São Paulo. 2013.
- [16] Sanchez, M. L., Nunes, F. B., Barros, F., Ganasça, M. M., Caovilla, H. H. Avaliação do processamento auditivo em idosos que relatam ouvir bem. Ver Bras Otorrino, v.74, nov-dez.2008.896-902.
- [17] Bianchi, Lana. Distúrbio do processamento auditivo central, a doença da incompreensão. Correio Brasiliense. Brasília, 15 mai. 2011. Entrevista.
- [18] Liporaci, F. D., Frota. S. M. M. C., envelhecimento e ordenação temporal auditiva. Rev. CEFAC. Rio de Janeiro. 2010 Set-Out; 12(5):741-748.
- [19] Tomasi, C.; Medeiros, J. B. Comunicação científica de normas técnicas para redação científica. 1º ed. São Paulo: Atlas, 2008.
- [20] Gerhardt, T.E.; Silveira, D.T. Métodos de pesquisa. 1º ed. Porto alegre: editora da UFRGS, 2009.

- [21] Costa, M.I. D., A influência da terapia do processamento auditivo na compreensão em leitura: uma abordagem conexionista. 2007. 169 f. Tese (Doutorado em Letra) -Programa de Pós graduação em Letras da Faculdade de Letras. Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, 2007.
- [22] Medeiros, Priscilla Livorati Salgado, Processamento Auditivo na Escola:como trabalhar pedagogicamente com o aluno, Anuário da Produção de Iniciação Científica Discente, v. 11, n. 12. 2008.
- [23] Sinckevicius, Kenia Curtis. O Distúrbio do Processamento Auditivo e o Trabalho com Jogos na Sala de Aula. 2010. S8 f. Monografia (Especialização Lato Sensu em Distúrbios de Aprendizagem) - Centro de Referência em Distúrbios de Aprendizagem - CRDA, São Paulo, 2000.
- [24] Calais LL, Russo ICP, Borges ACLC. Desempenho de idosos em um teste de fala na presença de ruído. Pró-Fono. 2008; 20(3):147-52.
- [25] Morais, A., A. A eficácia do treinamento auditivo acusticamente controlado em idosos com transtorno do processamento auditivo. 2015. 150f. Dissertação (mestrado em ciências). Faculdade de medicina da universidade de são Paulo. São Paulo. 2015.
- [26] Calais, L. et al. Queixas e preocupações otológicas e as dificuldade de comunicação de indivíduos idosos. Rev. Bras Fonoaudiol, v. 1, n. 13, p. 12-9, jun/jul, 2008.
- [27] Paniz, S. I. M. habilidades auditivas centrais em idosos com envelhecimento normal. 2012 140 f. Monografia (especialização em neuropsicologia), universidade federal do rio grande do sul, porto alegre, 2012.
- [28] Ciozac, S., I., et al. senescência e senilidade: novo paradigma na atenção à saúde. Rev. Enferm. USP., v. 20, n. 1, p. 18-25, 2011.
- [29] Gordon-Salant, S. Speech perception and auditory temporal processing performance by older listeners: implications for real-world communication. Semin Hear, v. 27, p. 264-268, 2006.
- [30] Banai K, Kraus N. Neurobiology of (Central) Auditory Processing Disorder andLanguage-Based Learning Disability In: MUSIEK, FE, CHERMAK, GD, Handbook of (Central) Auditory Processing Disorder-Auditory Neuroscienceand Diagnosis; Plural Publishing, San Diego, CA; v: 1.2007;89-116.
- [31] Carmo LC, Silveira JAM, Marone SAM, D'Ottaviano FG, Zagati LL, Lins EMDVS. Estudo audiológico de uma população idosa brasileira. Revista Brasileira de Otorrinolaringologiaaringologia. 2008;4(3):342-9.Carvallo
- [32] Martins KVC, Câmara MFS; Fatores de risco para perda auditiva em idosos. Rev Bras Promoç Saúde, Fortaleza, abr./jun., 2012; 25(2): 176-181.
- [33] Veneman C E; Gordon-Salant S; Matthews LJ; Dubno, J R. Age and Measurement Time-of-Day Effects on Speech Recognition in Noise.Ear and Hearing; May/June 2013; 34(3), 288–299.Veras.
- [34] Burguetti, FA, Carvallo, RMM; Sistema auditivo eferente: efeito no processamento auditivo; Revista Brasileira de Otorrinolaringologiaogia vol.2008; 74(5):737-45.
- [35] Zalcman, T. E., Shochat, E. A. A eficácia do treinamento auditivo formal em indivíduos com transtorno do processamento auditivo. Rev Soc Bras Fonoaudiol. São Paulo. 2007;12(4):310-4.
- [36] Samelli, A. G., Mecca, F. F. D. N., treinamento auditivo para transtorno do processamento auditivo: Uma proposta de intervenção terapêutica. Rev. CEFAC, São Paulo.
- [37] Ávila, R. R. A., Murphy, C. F. B., Shopchat, E. efeitos do treinamento auditivo em idosos com comprometimento cognitivo leve. Psicologia: São Paulo. Reflexão e Crítica, 27(3), 547-555.