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**Assessment of the socio-emotional state of persons with presbycusis using  
hearing amplification**

Процена социо-емоционалног стања особа са пресбијакузијом које користе  
слушну амплификацију

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## Assessment of the socio-emotional state of persons with presbycusis using hearing amplification

### Процена социо-емоционалног стања особа са пресбиакузијом које користе слушну амплификацију

#### SUMMARY

**Introduction/Objective** Presbycusis or senile hearing loss is a physiological phenomenon that manifests as a gradual effect of hearing loss in adults. The aim of this work is to examine the socio-emotional state of elderly people with hearing loss.

**Methods** The research was conducted at the Department of Audiology and Vestibulology of the Zemun Clinical Hospital Center. A subjective assessment was conducted using the Hearing Handicap Inventory for the Elderly – HHIE scale. This questionnaire is designed to assess the emotional and social functioning of people with presbycusis and to monitor the effect of auditory rehabilitation. Basic data were obtained through audiological diagnostics, questionnaires and interviews with respondents.

**Results** 120 subjects participated in this research, 60 subjects with senile hearing loss using auditory amplification and 60 subjects with senile hearing loss without hearing amplification. In subjects with auditory amplification, there is no statistically significant difference in the results of the HHIE at the beginning of the study and after one year ( $t = 1.07$ ,  $df = 59$ ,  $p = 0.28$ ), but a statistically significant difference is observed in the HHIE-S score ( $t = 3.0$ ,  $df = 59$ ,  $p = 0.004$ ). In 17 subjects who did not have a hearing aid at the beginning of the research, during the research, for a period of one year, auditory amplification was carried out and a good correlation between the HHIE and the subscales on the HHIE test/retest was established.

**Conclusion** Hearing amplification often does not fulfill its goal in individuals - to improve listening and speech intelligibility, which may be a consequence of untimely amplification.

**Keywords:** old age; presbycusis; hearing impairment; hearing rehabilitation

#### САЖЕТАК

**Увод/Циљ** Пресбиакузија или старачка наглувост је физиолошка појава која се манифестује постепеним ефектом губитка слуха код одраслих особа. Циљ овог рада је испитати социо-емоционално стање код старијих особа са оштећењем слуха.

**Метод** Истраживање је спроведено на Одсеку за аудиологију и вестибулогију Клиничко болничког центра Земун. Спроведена је субјективна процена скалом *Hearing Handicap Inventory for the Elderly – HHIE*. Овај упитник дизајниран је за процену емоционалног и социјалног функционисања особа са пресбиакузијом као и праћење ефекта слушне рехабилитација. Основни подаци добијени су аудиолошком дијагностиком, путем упитника и интервјуом са испитаницима.

**Резултати** У овом истраживању учествовало је 120 испитаника, 60 испитаника са старачком наглувошћу који користе слушну амплификацију и 60 испитаника са старачком наглувошћу без слушне амплификације. Код испитаника са слушном амплификацијом у резултатима *HHIE* на почетку истраживања и после годину дана нема статистички значајне разлике ( $t = 1.07$ ,  $df = 59$ ,  $p = 0.28$ ) али у скору *HHIE-S* уочава се статистички значајна разлика ( $t = 3$ ,  $df = 59$ ,  $p = 0.004$ ). Код 17 испитаника који на почетку истраживања нису имали слушни апарат, током истраживања, у периоду од годину дана, спроведена је слушна амплификација и утврђена је добра корелација *HHIE* и подскеале на тесту/ретесту *HHIE*.

**Закључак** Слушна амплификација често код појединаца не испуњава свој циљ – побољшања слушања и разумљивости говора, што може бити последица неблаговремене амплификације.

**Кључне речи:** старост; пресбиакузија; слушна оне-способљеност; рехабилитација слуха

## INTRODUCTION

Presbycusis or senile hearing loss is a physiological phenomenon [1], which is a gradual, cumulative effect of hearing loss in adults. It is a progressive and irreversible, bilateral hearing loss due to degeneration of the cochlea and related inner ear structures or auditory nerves. It is a sensorineural hearing loss characterized by the inability to translate or transmit sound signals into nerve impulses [2]. The process of hearing loss lasts several years, is gradual and most often affects the high frequencies of hearing first, sometimes unrecognizable because the

presentation and clinical course can be variable. Presbycusis is characterized by reduced hearing sensitivity and reduced intelligibility of speech in a noisy environment, slowed central processing of acoustic information and impaired localization of sound sources [3]. In addition, hearing loss accompanied by difficulties in speech intelligibility contributes to a decrease in concentration and memory, which negatively affects the social isolation of these persons.

The cause of presbycusis is a combination of multiple factors, genetics, cumulative environmental exposures, and pathophysiological changes associated with aging [4]. Based on numerous studies, it was concluded that presbycusis most often refers to the loss of sensory structures in the inner ear, although the main causes are still unclear. [5].

Living with hearing loss is, in many ways, experienced by patients as having a chronic illness. Older people often ignore their ailments and do not accept listlessness, sadness, which is due to age, shame, lack of understanding or fear of feeling rejected. Many people experience social isolation and rejection in old age as a result of single life, lack of close family ties. In people with hearing impairment, the possibility of communication is reduced, which leads to social isolation, because the sense of hearing is an important prerequisite for social interaction [6]. Difficult or impossible communication can also lead to emotional difficulties that usually accompany some chronic conditions (endocrinological, vascular, neurological, oncological) [7, 8]. Research shows that with the progression of hearing loss, anxiety occurs most often [9]. Clinically significant symptoms of anxiety are present in 15% to 42% elderly people and most often occur in those who have a chronic disease or some degree of disability. The prevalence of anxiety disorders in older people ranges from 12% to 15% in society, and up to 28% in clinical institutions [10]. Anxiety as an emotional disorder is reflected in a number of biological, social and physical factors. Anxiety symptoms, fear, poor sleep quality, loss of interest, reduced concentration, chronic unexplained pain are often attributed to old age, dementia or a person's poor general condition, which means that anxiety in old age can be undiagnosed for a long time and therefore inadequately treated [11]. In these patients, it is very important to diagnose poor audiology and the time when hearing amplification should be recommended in order to prevent physical, cognitive and functional conditions. The main goal of the rehabilitation of these patients is to minimize the effect of the hearing deficit and enable them to actively participate in family and social activities, helping them to cope with the hearing loss and the limitations it causes. Most often, monaural adaptations are carried out, even with bilateral hearing loss.

The reasons for this can be different: refusal to use two hearing aids, reduced ability to handle the devices, asymmetric hearing loss, reduced central processing of information, aesthetic reasons, financial problems, etc. [12]. Timely hearing rehabilitation can give significant results, however, it must be taken into account that the optimal time interval for the intervention is very short so that the hearing rehabilitation results are as effective as possible [13].

The aim of this work is to examine the socio-emotional state of elderly people with hearing loss with hearing amplification at the beginning of research and year after that, and also at people without hearing amplification at the at the beginning of research and year after using it.

## **METHODS**

### **Study design and procedures**

In this research participated 120 subjects, 60 subjects with senile hearing loss using hearing amplification and 60 subjects with senile hearing loss without hearing amplification. The age of the respondents ranged from 47 to 85 years. The selection of subjects was carried out after audiological observation and evaluation at the Department of Audiology and Vestibule at Clinical Hospital Center Zemun after establishing or confirming the diagnosis of senile hearing loss.

The research was conducted from April 2017 to September 2018 at the Department of Audiology and Vestibulology of Clinical Hospital Center Zemun. The basic data were obtained on the basis of audiological diagnostics, through questionnaires and interviews with respondents. The examination was conducted the first time when the subjects came to the otorhinolaryngology or audiology clinic and the second time after one year.

A subjective assessment of social and emotional functioning was conducted using a Likert-type scale, the Hearing Handicap Inventory for the Elderly – HHIE [14]. This questionnaire was designed to assess the emotional and social functioning of subjects with presbycusis and to monitor the effect of auditory rehabilitation. The scale is composed of two subscales, the HHIE-E subscale which has 13 items and examines the emotional consequences of hearing impairment and the HHIE-S subscale which has 12 items and investigates social and situational aspects. Respondents responded to the offered answers: yes (4); sometimes (2) and not (0) according to the current state. HHIE scores range from 0 - 16 / no hearing impairment; 17 - 42 / mild to moderate hearing disability; more than 43 points / significant hearing disability).

We used a Likert scale to assess the general hearing score as bad, neither bad nor good, good and excellent. (Table 2)

In the statistical processing of the data, descriptive measures, the arithmetic mean with the associated standard deviation, as well as the minimum and maximum were used. Frequency and percentages, and t-test for dependent samples were used. The level of statistical significance was defined as  $p < 0.05$  for all analyses. Statistical processing and analysis was done in the computer program Statistical Package for the Social Sciences - SPSS, version 22.0.

The research has received consent of the Ethics Committee of the Zemun Clinical Hospital Center (protocol number 224/1-2017).

## RESULTS

In this research participated 120 respondents aged from 46 to 85. The average age of the respondents was 68.68 and standard deviation was 8.40.

In the group of respondents with hearing amplification, there were 31 (51.7%) male respondents and 29 (48.3%) female respondents, while in the group without hearing amplification, there were 29 (48.3%) male respondents and 31 (51.7%) female respondents (Table 1).

The group of respondents with hearing amplification (Table 2) defines their health as neither good nor bad ( $n = 30$ ): HHIE ( $M = 50.93$ ;  $SD = 17.07$ ), (HHIE-S ( $M = 30.73$ ;  $SD = 9.21$ ), HHIE-E ( $M = 20.20$ ;  $SD = 9.57$ ), which is in the domain of mild to moderate hearing impairment that has a negative impact on emotional and social functioning in daily life activities. Hearing amplification enables better listening; however, its quality depends on several factors so that the impaired person people with hearing loss, despite hearing correction, often cannot clearly define their attitude and its impact on the overall state of health.

The group of respondents without hearing amplification (Table 3) defines their health as neither good nor bad ( $n = 28$ ): HHIE ( $M = 48.2$ ;  $SD = 17.41$ ), HHIE-S ( $M = 29.07$ ;  $SD = 9.32$ ), HHI-E ( $M = 19.18$ ;  $SD = 9.83$ ) which is in the domain of mild to moderate hearing impairment that negatively affects emotional and social functioning in daily life activities.

Table 4 shows the average score ( $M$ ) and standard deviation ( $SD$ ) of the HHIE test and retest scores of subjects with auditory amplification: HHIE test ( $M = 50.03$ ;  $SD = 19.32$ ), HHIE retest

( $M = 48.43$ ;  $SD = 19.35$ ) ; HHIE-S test ( $M = 30.03$ ;  $SD = 10.73$ ), HHIE-S retest ( $M = 26.98$ ;  $SD = 10.75$ ); HHIE-E test ( $M = 20.00$ ;  $SD = 10.23$ ); HHIE-E retest ( $M = 21.44$ ;  $SD = 10.33$ ). A dependent samples t test examined the difference between test and retest HHIE, HHIE-S, and HHIE-E scores, in terms of mean score, standard deviation, and degrees of freedom (SD and df) to determine whether the difference was large enough so that could be considered statistically significant ( $p < 0.05$ ).

In the total score of the HHIE, no statistically significant difference was observed at the beginning of the study and after one year in the subjects with hearing amplification ( $t = 1.07$ ,  $df = 59$ ,  $p = 0.28$ ), but a statistically significant difference was observed in the score of the HHIE-S ( $t = 3.0$ ,  $df = 59$ ,  $p = 0.004$ ), with a lower mean score of the HHIE-S on the retest (test  $M = 30.03$ ,  $SD = 10.73$  / retest  $M = 26.98$ ,  $SD = 10.75$ ), which confirms the audiological view of the positive effects of auditory amplification on the reduction hearing disability and improving social interaction. The analysis of the HHIE-E subscale did not reveal a statistically significant difference ( $t = -1.88$ ,  $df = 59$ ,  $p = 0.06$ ) on the test and retest.

In the case of 17 subjects who did not have a hearing aid at the beginning of the research, hearing amplification was carried out during the research, over a period of one year. A good correlation of the HHIE score and subscales on the test/retest was found (Table 5). HHIE at the beginning of the research and after one year, for significance level  $p < 0.05$ : HHIE test / retest ( $t = 2.7$ ,  $df = 16$ ,  $p = 0.016$ ); HHIE-S test/retest ( $t = 2.96$ ,  $df = 16$ ,  $p = 0.009$ ); HHIE-E test/retest ( $t = 0.64$ ,  $df = 16$ ,  $p = 0.52$ ). Comparing the average HHIE on the test ( $M = 43.12$ ;  $SD = 22.19$ ) and retest ( $M = 37.18$ ;  $SD = 21.11$ ), we can see that after hearing amplification, the subjective assessment of hearing impairment was expressed to a lesser degree after one year. The statistical significance of the difference between the HHIE-S score on the test and the retest ( $p = 0.009$ ) was observed, and by comparing the average score on the test ( $M = 26.71$ ;  $SD = 12.86$ ) and the retest ( $M = 21.65$ ;  $SD = 9.95$ ), a lower assessment of hearing disability was observed on the retest, which indicates a significant impact of auditory amplification on the social component of hearing disability. Auditory amplification, the ability to listen and establish communication influenced the improvement of the social and social life of the respondents. By comparing the value of the HHIE-E subscale score ( $p = 0.52$ ), no statistically significant difference was observed between the non-test and the retest in subjects who underwent auditory amplification during the research.

## DISCUSSION

Listening is a complex process of absorbing and interpreting sound and is essential for understanding information [15]. Hearing makes it possible to localize sound, that is, navigate in space, perform complex life functions and exchange information. However, during the years of life, the sense of hearing decreases in each individual following the process of physiological aging [16].

In this research study, there were equally male and female respondents, with auditory amplification 31 (51.7%) male respondents and 29 (48.3%) female respondents, while in the group without auditory amplification there were 29 (48.3%) male respondents, male and 31 (51.7%) female, which is in accordance with previous research [17, 18].

The age of the respondents in this study ranged from 46 to 85 years, the average age of the respondents is 68.68. The results of this study are comparative with the results of a larger number of studies that state that hearing loss occurs in the elderly [19, 20].

Hearing loss in people with presbycusis occurs gradually, very often the period until hearing amplification is very long (five to ten years). Losing the ability to hear and clearly understand a particular voice message leads to alienation, isolation, loneliness and reduced energy. In this way, a person with hearing loss becomes an observer and not an active participant in his life. [21]

The results of the research in this study showed a negative impact of hearing impairment on the socio-emotional state of persons with presbycusis ( $p = 0.002$ , for  $p < 0.05$ ) with greater hearing disability after one year (test /  $M = 44.29$ ,  $SD = 15.73$ ; retest /  $M = 49.29$ ;  $SD = 15.73$ ) in the group without auditory amplification, which confirms previous views about the negative impact of hearing impairment on the whole life and deepening of complaints if hearing correction is not performed [22, 23]. Older adults with hearing loss face many of the same fears as any person with a disability. External factors also have a significant effect on the feeling of hearing impairment: environment, education, socio-economic status, satisfaction with family and professional life, as well as many other life issues and situations to which a person is exposed. Due to limited opportunities for communication, social isolation and other consequences, people with presbycusis often experience a deterioration in their general health, i.e. anxiety and depression [24]. However, in the case of 17 respondents who did not have a hearing aid at the beginning of the research, during the research, over a period of one year, hearing

amplification was carried out. A good correlation of the HHIE score and subscales on the HHIE test/retest at the beginning of the study and after one year was established, for the significance level  $p < 0.05$ : HHIE test/retest ( $t = 2.7$ ,  $df = 16$ ,  $p = 0.016$ ); HHIE-S test/retest ( $t = 2.96$ ,  $df = 16$ ,  $p = 0.009$ ); HHIE-E test/retest ( $t = 0.64$ ,  $df = 16$ ,  $p = 0.52$ ). Auditory amplification, the ability to listen and establish communication influenced the improvement of the socio-emotional life of these respondents. In order to enable good social and professional functioning, the rehabilitation program of the elderly should be aimed at alleviating the factors that limit their participation in society.

The goal of auditory rehabilitation is to improve listening function, maintain functionality in the social environment, increase self-esteem, improve cognitive abilities and enable prevention of many conditions [25, 26, 27]. Auditory rehabilitation is achieved by providing a technological device - a hearing aid in order to improve sound reception and thus the listening process. Listening support involves teaching people how to use technology and how to create an optimal environment [28, 29].

An important part of auditory rehabilitation is positive transfer with the patient, which includes, first of all, monitoring and support during auditory amplification. Considering the frequent existence of prejudices or bad experiences about the functionality of hearing aids, professional support is needed during their use. Therefore, individual screening is a very important factor that affects the success of hearing rehabilitation [30], but also the improvement of the socio-emotional state of these people.

## CONCLUSION

Hearing amplification often does not fulfill its goal in individuals - to improve listening and speech intelligibility, which may be a consequence of untimely amplification. The results of our work point to the necessity of conducting hearing rehabilitation with an overview and systematic monitoring of the use of hearing aids, as well as determining the need for speech rehabilitation based on the conducted tests with the aim of improving communication and the quality of life of people with presbycusis.

**Conflict of interest:** None declared



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**Table 1.** Structure of respondents by gender, with hearing amplification and without hearing amplification

Auditory amplification		Gender		Total
		M	F	
Yes	Number	31	29	60
	%	25.8	24.2	50
No	Number	29	31	60
	%	24.2	25.8	50
Total	Number	60	60	120
	%	50	50	100

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**Table 2.** Hearing Handicap Inventory for the Elderly Scale – subjects with auditory amplification at the beginning of research

General hearing score	N = 60	HHIE		HHIE-S		HHIE-E	
		M	SD	M	SD	M	SD
No answer	1	/	/	/	/	/	/
Bad	4	61	9.3	36	3.65	25	7.63
Neither good nor bad	30	50.93	17.07	30.73	9.21	20.2	9.57
Good	22	45.45	21.25	26.82	11.6	18.64	11.04
Very good	3	40.7	25.32	28.67	19	12	10

HHIE – Hearing Handicap Inventory for the Elderly Scale; M – average; SD – standard deviation

**Table 3.** Hearing Handicap Inventory for the Elderly Scale – subjects without auditory amplification at the beginning of research

General hearing score	N = 60	HHIE		HHIE-S		HHIE-E	
		M	SD	M	SD	M	SD
No answer	2	/	/	/	/	/	/
Bad	2	83	4.24	47	1.41	36.00	2.82
Neither good nor bad	28	48.25	17.41	29.07	9.32	19.18	9.83
Good	26	37.46	15.61	24.92	8.93	12.54	7.62
Very good	2	44	2.82	29.2	13.46	14	2.82

HHIE – Hearing Handicap Inventory for the Elderly Scale; M – average; SD – standard deviation

**Table 4.** Hearing Handicap Inventory for the Elderly Scale – test and retest of respondents with auditory amplification

Test	M	SD	Stand. error	t	p
HHIE test	50.03	19.32	2.47	1.07	0.28
HHIE retest	48.43	19.32	2.47		
HHIE-S test	30.03	10.73	1.37	3	0.004*
HHIE-S retest	26.98	10.75	1.37		
HHIE-E test	20	10.23	1.31	-1.88	0.06
HHIE-E retest	21.44	10.33	1.32		

HHIE – Hearing Handicap Inventory for the Elderly Scale; M – average; SD – standard deviation; t – hearing disability; p – social interaction;

\*statistically significant ( $p < 0.05$ )

**Table 5.** Hearing Handicap Inventory for the Elderly Scale – test and retest of respondents with subsequent auditory amplification

Test	M	SD	Stand. error	t	p
HHIE test	43.12	22.19	5.38	2.7	0.016*
HHIE retest	37.18	21.11	5.12		
HHIE-S test	26.71	12.86	3.12	2.96	0.009*
HHIE-S retest	21.65	9.95	2.41		
HHIE-E test	16.41	10.57	2.56	0.64	0.52
HHIE-E retest	15.53	11.54	2.8		

HHIE – Hearing Handicap Inventory for the Elderly Scale; M – average; SD – standard deviation; t – hearing disability; p – social interaction;

\*statistically significant ( $p < 0.05$ )