Impact of Wearing Hearing Aids on Cognitive Abilities and Subjective Tinnitus in Patients with Sensorineural Hearing Loss: A Pilot Study

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Original Scientific Paper

IMPACT OF WEARING HEARING AIDS ON COGNITIVE ABILITIES AND SUBJECTIVE TINNITUS IN PATIENTS WITH SENSORINEURAL HEARING LOSS: A PILOT STUDY

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ABSTRACT – There is an increased number of people with hearing impairment and decreased cognitive abilities among the elderly population. Due to the fact that the auditory system and central nervous system are connected, pathological changes associated with aging occur on both levels. With the development of hearing aid technology, the quality of life of these patients can be improved. The aim of this study was to determine whether wearing a hearing aid has an impact on cognitive abilities and tinnitus. Current research does not show a clear connection between these factors. This study involved 44 subjects with sensorineural hearing loss. They were divided into two groups of 22 people, depending on whether they had previously used a hearing aid or not. Assessment of cognitive abilities was performed via the MoCA questionnaire, and assessment of the impact of tinnitus on daily activities was evaluated using the Tinnitus Handicap Inventory (THI) and the Iowa Tinnitus Handicap Questionnaire (ITHQ). Hearing aid status was classified as a primary outcome, while cognitive assessment and tinnitus intensity were associated variables. Our study showed an association between longer hearing aid use and poorer naming ability (p = 0.030, OR 4.734), poorer delayed recall (p = 0.033, OR 4.537), and spatial orientation (p = 0.016, OR 5.773) when compared with patients who had not used hearing aids, while tinnitus did not correlate with cognitive impairment. Based on the results, we can emphasize the importance of the auditory system as an input source for the central nervous system. The data direct us to improve the rehabilitation strategies for hearing and cognitive abilities in patients. Such an approach results higher quality of life in patients and prevents further cognitive decline.

Key words: *Cognition; Hearing aid; Sensorineural hearing loss; Tinnitus; Quality of life*

Introduction

Sensorineural hearing loss (SNHL) is a type of hearing loss that occurs due to disorders in the structures of the inner ear or the vestibulocochlear nerve[1]. In 2019, hearing loss was fourth on the list of causes of years of life lived with disability (YLD)[2]. The World

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Health Organization defines Disabling Hearing Loss (DHL) as hearing loss greater than 40 dB in the ear with better hearing in adults (aged 15 and older) and a hearing loss greater than 30 dB in the ear with better hearing in children[3]. According to 2018 data, there were 466 million people with DHL, which is 6.1% of the world population. Rough calculations for 2050 imply that the prevalence of DHL could rise to 933 million. Aging and population growth trends support this estimate. The number of people over the age of 60 is set to approximated double and the number of people over the age of 80 to triple between 2015 and 2050[3].

Hearing impairment is associated with poor cognitive function. Numerous studies have shown that there is at least a mild hearing impairment in 60% of people over the age of 50 with poor cognitive test scores[4]. It is also important to bear in mind that hearing impairment is a risk factor in the development of dementia[5]. Undiagnosed hearing loss may exacerbate behavioral symptoms associated with dementia[4]. There are various hypotheses about the association between decline of cognitive functions and hearing impairment. Some point to the existence of neurodegenerative changes in the central nervous system that also affect the neural pathways related to the auditory system. Others focus on long-term deprivation of the input auditory signals that directly or indirectly affect cognitive abilities, which is especially important when considering that a significant number of patients with SNHL also suffer from tinnitus as a deprivation-related phenomenon. Alternative explanations include increased compensatory mental effort during the execution of cognitively demanding tasks[6]cognitive performance, social isolation, depression and hearing aid use was carried out with a subsample of the UK Biobank data set (n = 164,770. There is a statistically significant association between presbycusis and cognitive function domains[7]. Specifically, such hearing impairment affects global cognitive ability, executive functions, episodic memory, information processing speed, semantic memory, and visuospatial abilities. The use of hearing aids and cochlear implants leads to improved cognitive function, and additional research is needed to determine treatment options and techniques to achieve optimal cognitive enhancement[8].

Tinnitus is one of the most common symptoms related to the auditory system. It is defined as the perception of sound without the presence of external auditory stimuli. It can be both subjective and objective, although the latter is very rare. Subjective tinnitus can result from infection, neoplasm, cerumen, or neurological, traumatic, cardiovascular, and metabolic causes[9]. The main risk factor is hearing loss, but the association between the two entities is not straightforward[10]. The prevalence of tinnitus is 10-15% among the adult population[9,11]. There is evidence of a relationship between tinnitus and maladaptation of the central auditory pathways as a repercussion of damage to peripheral structures. Complex changes in the neuronal activities in the nuclei of the central nervous system lead to a disturbed pattern of input signal processing related to both cognition and the perception of tinnitus[12].

The aim of this study was to examine the differences in cognitive ability between patients with a sensorineural hearing loss depending on hearing aid use and to determine whether tinnitus is associated with cognitive decline.

Patients and methods

The subjects in this study were patients referred to an audiology examination due to SNHL in the period from April 9, 2021 to June 9, 2021. The study included 44 subjects of both sexes with hearing impairment divided into two groups: those that wore a hearing aid and those who did not, but were candidates for its use. The patients were matched according to demographic characteristics in both groups to control for sampling bias. The eligibility criteria for unilateral hearing aid use is a minimal average pure tone audiogram (PTA) hearing threshold of 40 dB on speech discriminating frequencies of both ears (0.5, 1, 2, and 4 kHz), while bilateral hearing aid use requires a >20% improvement in best speech discrimination on 65 dB while using bilateral hearing aids compared with unilateral use. The purpose of the study was explained to the respondents during the audiology examination, and informed consent was obtained from all participants.

Assessment of cognitive functions was performed by completing the Montreal Cognitive Assessment (MoCA), version 7.2, validated and translated into Croatian. MoCA evaluates cognitive abilities in the following domains: visual-constructive abilities, naming, memory, attention, language, abstraction, delayed recall, and orientation. The test application time was approximately 10 minutes. The total possible score is 30 points, and a score of 26 points or more is considered normal. In order to assess the difficulties caused by tinnitus, respondents also filled out the Tinnitus Hand-

icap Inventory (THI) and the Iowa Tinnitus Handicap Questionnaire (ITHQ) translated into Croatian. THI consists of 25 questions that can be answered with "Yes", "Sometimes", and "No", which are scored with four, two, or zero points. The sum of the values of all the answers provides a THI result with a value from zero to a hundred. The evaluation of the results is as follows: slight or no handicap (0-16), mild handicap (18-36), moderate handicap (37-56), severe handicap (58-76), and catastrophic handicap (78-100). The ITHQ consists of 27 statements to which respondents indicate their agreement on a scale from zero to one hundred. Zero indicates that the respondent completely disagrees with the statement, and one hundred means that the respondent fully agrees with the statement. Relevant anamnestic data (age, sex of the subjects, the length of wearing a hearing aid, the results of MoCA, THI, and ITHQ) were stored in a Microsoft Office Excel table. The primary end point was the presence of cognitive impairment, and the dependent variable was hearing aid use. Association with tinnitus severity was labeled as a secondary outcome in our analysis.

Data analysis was performed with the SPSS statistical program (Version 22.0 © 2013 IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp), using descriptive statistics. The correlation of variables was analyzed by a of binary logistic regression model in which the use of a hearing aid was a dependent variable. The links between a binary variable (the primary outcome of statistical analysis) and a set of independent variables were described by a p-value and were coded with 0 or 1. Several categorical and continuous independent predictor variables were included in the analysis. Binary logistic regression identified variables that were significantly associated with increased or decreased risk of a particular outcome by determining the p-value and the risk ratio (OR) that may be greater than 1 if the risk is increased, or less than 1 if the risk is reduced. The significance level was set to $\alpha = 0.05$.

Results

The study included 44 respondents divided into two groups: those who wore a hearing aid and those who did not, but were candidates for its use. There were 22 respondents in each group, of whom 8 were men and 14 women. The median age was 70.5 years in the non-hearing aid group and 68.5 years in the hearing aid group (Table 1, Figure 1). In the sample, 47.6% of respondents had used hearing aids for up to one year (Figure 2). All 44 respondents completed the MoCA questionnaire. There was an equal number of subjects with normal and pathological test scores in the groups (Table 2). Neither group showed a higher percentage of overall cognitive impairment, but logistic regression analysis showed associations between certain subgroups in our data set. Analysis linked the patients that were using a hearing aid with MoCA test subgroups with regard to poorer naming ability ($p = 0.030$, OR 4.734), poorer delayed memory ($p = 0.033$, OR 4.537), and poorer spatial orientation ($p = 0.016$, OR 5.773). There were no significant associations between cognitive ability and variables in patients that had not been hearing aid users prior to our study.

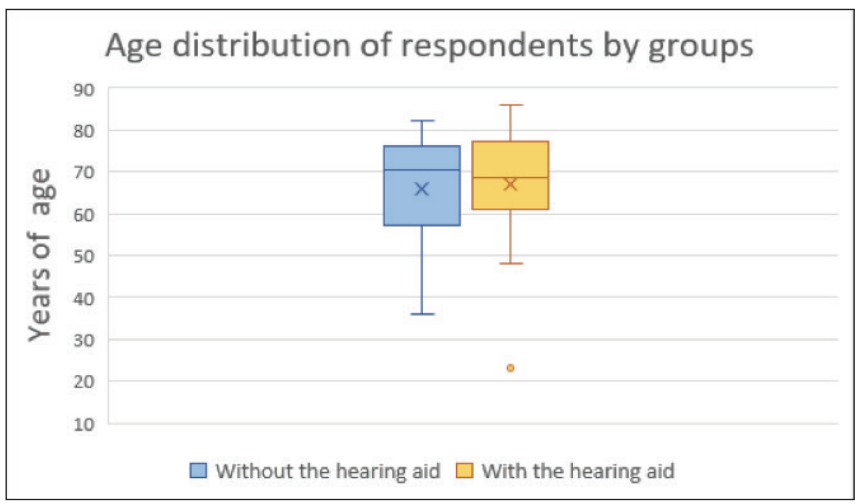

Figure 1. Age distribution of respondents

Table 1. Basic demographic characteristics of the respondents

	Without the hearing aid (N=22)		With the hearing aid (N=22)	
	n	%	n	%
Sex				
Male	8	36,4	8	36,4
Female	14	63,6	14	63,6
Age range				
20-24	0	0.0	1	4.5
25-29	0	0.0	0	0.0
30-34	0	0.0	0	0.0
35-39	1	4.5	0	0.0
40-44	2	9.1	0	0.0
45-49	2	9.1	1	4.5
50-54	0	0.0	1	4.5
55-59	0	0.0	1	4.5
60-64	3	13.6	5	22.7
65-69	1	4.5	2	9.1
70-74	5	22.7	3	13.6
75-79	6	27.3	5	22.7
80-84	2	9.1	1	4.5
85-89	0	0.0	2	9.1
Years of education				
≤12 years	13	59.1	13	59.1
>12 years	9	40.9	9	40.9

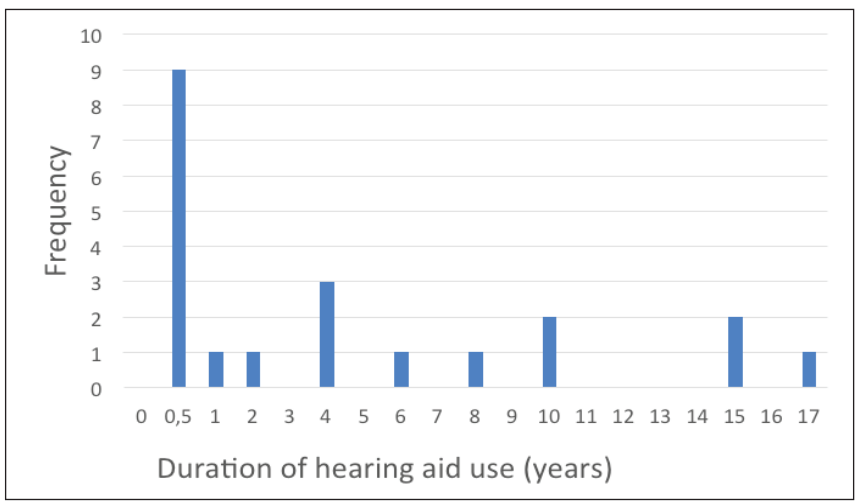

Figure 2. Number of respondents according to the duration of hearing aid use

Other analyzed variables, including tinnitus type and severity, did not show a significant correlation with the primary outcome (Table 3).

Three subjects from the non-hearing aid group and four subjects from the hearing aid group did not have tinnitus and did not complete the THI questionnaire. In both groups, there was an equal number of people with a level one handicap. There were no respondents with a catastrophic handicap in the hearing aid group (Table 4).

Table 2. Distribution of respondents in both groups according to the results of the MoCA

	Without the hearing aid (N=22)		With the hearing aid (N=22)	
	n	%	n	%
MoCA (total score)				
≥26	8	36.4	8	36.4
<26	14	63.6	14	63.6

Table 3. Relationship between hearing aid use and the corresponding cognitive domain, expressed as odds ratio (OR)

	OR	P
MoCA		
Alternating Trail Making	0.227	0.634
Visuoconstructional Skills (Cube)	0.271	0.603
Visuoconstructional Skills (Clock)	0.032	0.857
Naming	4.734	0.030
Attention (Forward Digit Span)	0.385	0.535
Attention (Vigilance)	0.784	0.376
Attention (Serial 7s)	1.556	0.212
Language (Sentence repetition)	0.222	0.638
Language (Fluency)	0.050	0.823
Abstraction	1.149	0.284
Delayed recall	4.537	0.033
Orientation	5.773	0.016
Regular schooling	0.222	0.638
Total	2.545	0.111

Table 4. Distribution of respondents in both groups according to THI result ranges

	Without the hearing aid (N=19)		With the hearing aid (N=18)	
	n	%	n	%
THI result				
0-16	5	26.3	5	27.8
18-36	7	36.8	5	27.8
38-56	3	15.8	5	27.8
58-76	2	10.5	3	16.7
78-100	2	10.5	0	0.0

Table 5. ITHQ results classified into categories (F1, F2, and F3) for both groups

	Without the hearing aid (N=19)	With the hearing aid (N=18)
	Median (IQR*)	Median (IQR*)
ITHQ		
F1	30 (0 – 50)	15 (0 – 45)
F2	60 (50 – 90)	52.5 (41.3 – 68.8)
F3	80 (50 – 100)	65 (23.8 – 73.8)

*IQR = Interquartile range (Q1 Q3)

ITHQ questions were divided into three categories depending on the domain of tinnitus disorders: social, emotional, and behavioral tinnitus effects (F1), tinnitus and hearing (F2), and outlook on tinnitus (F3). As in the case of the THI questionnaire, patients without tinnitus did not complete the ITHQ (Table 5).

Discussion

In people with SNHL, stimuli reaching the auditory cortex are reduced in quantity and quality. Difficulties in cognitive functioning occur as a consequence of reduced input signals that play a role in the learning and development of cognitive abilities. At present, the mechanisms describing the association between hearing impairment and cognitive decline have not yet been established[13]. Nevertheless, research has shown some degree of cognitive performance differences in people with hearing impairments compared with those with normal hearing[14–17]cognitive screening tools rely on oral administration of instructions and stimuli that may be impacted by HL. This systematic review aims to investigate (a. Apart from the fact that the results of cognitive ability assessment are generally lower, it is necessary to determine specific cognitive domains associated with SNHL.

This study used MoCA to assess cognitive impairment because it tests a wide range of abilities and can detect mild cognitive impairment with high sensitivity. In a study by Shen et al., the median overall MoCA score was 26.5 in a group of 28 subjects with mild to moderate SNHL[16]. In his research, Humes presents the results obtained in a study conducted on 93 respondents where the median overall MoCA score was 26.4[17]gap detection, and auditory temporal-order identification were completed at T1 and T2. The Mini-Mental State Examination was completed at T1 and T2, whereas the Montreal Cognitive Assessment (MoCA. In our study, the median score was 23.5 in both groups. The difference found in our research in comparison with the studies mentioned above cannot be explained by the higher age of the respondents. The MoCA analysis and the comparison of data between the groups indicated the existence of a statistically significant association between wearing a hearing aid and three of the ten domains assessed in the questionnaire: poorer naming ability, less delayed recall, and spatial orientation. There was no significant correlation between the other evaluated domains, as shown in a similar study by Utoomprurkporn et al.[14]cognitive screening tools rely on oral administration of instructions and stimuli that may be impacted by HL. This systematic review aims to investigate (a. There is no consensus on the role and impact of hearing loss on the deterioration of cognitive functioning[18]. The results of a study by Wong et al. showed a significant decline in cognitive abilities in orientation in time and space, registration, complex commands, and repetition. There was no statistically significant association in the delayed recall domain, as was the case in our study[15]. Nevertheless, such results indicate the complexity of the relationship between hearing and cognitive processes. The most common complaint among people with hearing impairment difficulty in understanding words in the presence of tinnitus[6,15,18]cognitive performance, social isolation, depression and hearing aid use was carried out with a subsample of the UK Biobank data set (n = 164,770. According to the research by Loughrey et al., hearing loss was less associated with the decline in executive functions and recall compared with long-term and semantic memory. Additionally, semantic memory showed a decline similar to a decline in episodic memory[7]. Research has shown that a reduced signal-to-noise ratio can reduce the ability to

remember spoken words even in people with good hearing[18,19]. Redistribution of neuronal resources is required due to the poorer information input signal as a result of hearing impairment. Research has confirmed this theory with evidence of a change in the pattern of brain activity and a reduced density of gray matter in the area of the primary auditory cortex[19].

In this paper, the existence of an association between wearing a hearing aid and poorer outcomes in certain domains indicates the existence of changes in the cognitive functioning system. What was difficult to assess was the period from the development of hearing loss to the start of hearing aid use. Prolonged deprivation of auditory input signals prior to hearing aid use may cause irreversible effects, with subsequent use of hearing aids not leading to improvement[15]. A meta-analysis of 33 studies showed that cognitive abilities were lower in patients with SNHL compared with people with normal hearing, regardless of assistive technology use (hearing aid or cochlear implant)[8]. On the other hand, a study from the United Kingdom showed that the use of hearing aids was associated with better cognitive functioning[6]cognitive performance, social isolation, depression and hearing aid use was carried out with a subsample of the UK Biobank data set (n = 164,770. The results of a study by Loughrey et al. showed that hearing aids can be beneficial in the domain of short-term and semantic memory[7]. The issue that requires further analysis is identifying the cut-off duration of uncompensated hearing impairment leading to irreversible changes in the central nervous system. The outcome of such a study could be planned timely intervention in the form of hearing aid implantation that would objectively improve the cognitive functioning of patients and reduce the impact of tinnitus on daily activities.

The data obtained by the present study on the impact of hearing aid use on tinnitus did not reach statistical significance. Additionally, there was no correlation between the length of wearing a hearing aid and the THI value measuring the degree of difficulty occurring due to tinnitus. Evidence from studies on this topic is currently inadequate due to differences in the nature of tinnitus among respondents and due to differences in the methods used[20]. Analysis of the results did not show a correlation between cognition and tinnitus symptoms. Similarly, in a study by Fetoni et al., the Mini-Mental Status Exam was used as a test of cognitive assessment of the subjects and the result did not correlate with the THI value[12].

Research on tinnitus and mental disorders has found a complex association of tinnitus with depression and anxiety, with a statistically significant level of association between the degree of tinnitus handicap and emotional disturbances[21]and anxiety and depression among adults. Study Design: Cross-sectional analysis of a national health survey. Methods: Adult respondents in the 2007 Integrated Health Interview Series tinnitus module were analyzed. Data for tinnitus symptoms and severity and reported anxiety and depression symptoms were extracted. Associations between tinnitus problems and anxiety, depression, lost workdays, days of alcohol consumption, and mean hours of sleep were assessed. Results: Among 21.4 ± 0.69 million adult tinnitus sufferers, 26.1% reported problems with anxiety in the preceding 12 months, whereas only 9.2% of those without tinnitus reported an anxiety problem (P <.001. In order to better interpret the results of cognitive assessment and the impact of tinnitus on daily activities, it is also necessary to determine the existence of latent or manifest mental disorders. The ITHQ results presented in the categories depending on the domain of difficulty showed that disorders related to the social, emotional, and behavioral impact of tinnitus were the lowest-ranked and represented a minor problem. On the other hand, claims related to a subjective opinion about tinnitus were marked by high values, especially in the group of respondents who did not wear a hearing aid. Sullivan et al. analyzed the assessment of tinnitus in patients with cochlear implants using the ITHQ. The results showed significant improvement in social, physical, and emotional functioning[22]. There are no published studies that used ITHQ as a method to test tinnitus effects in patients with SNHL who used a hearing aid.

This study had potential limitations. The small number of respondents in the groups may have resulted in an interpretation of the results without statistical significance. Sampling bias due to the small number of patients in both groups may have been responsible for the absence of clear differences between groups regarding cognitive ability depending on hearing aid use. Additionally, the majority of hearing aid users had been using the devices for one year, which may not be a period of time long enough for specific cognitive dysfunction areas to differentiate. This, in turn, may obscure the beneficial in-

fluence of long-term hearing aid use on cognition. In addition, the results may have identified certain areas of irreversible cognitive dysfunction that may not be affected by hearing aid use. In the hearing aid group, it is possible that the device settings were not adequately adjusted in some participants. Furthermore, when reading the instructions for the MoCA, there is a possibility that some respondents did not understand the oral instructions. Such misinterpreted instructions may have affected the finding on the existence of cognitive difficulties. This study can be seen as a preliminary result pilot study, highlighting the intricate connections between auditory processing and cognitive decline that will be elucidated in studies with larger scope and patient enrollment.

Conclusion

An analysis of MoCA, THI, and ITHQ conducted among groups of SNHL subjects who used and did not use a hearing aid showed a statistically significant association between long-term hearing loss and certain cognitive abilities. The results of the assessment on the impact of tinnitus on functioning in everyday life did not show a statistically significant difference between groups of respondents, and may indicate the existence of irreversible changes that cannot be corrected by wearing a hearing aid.

References

1. Sensorineural Hearing Loss - StatPearls - NCBI Bookshelf [Internet]. [cited 2021 May 19]. Available from:https://www.ncbi.nlm.nih.gov/books/NBK565860/
2. Age-related and other hearing loss — Level 3 cause | Institute for Health Metrics and Evaluation [Internet]. [cited 2021 May 20]. Available from:http://www.healthdata.org/results/gbd_summaries/2019/age-related-and-other-hearing-loss-level-3-cause
3. WHO | Prevention of blindness and deafness [Internet]. [cited 2021 May 22]. Available from:https://www.who.int/pbd/deafness/estimates/en/
4. Nirmalasari O, Mamo SK, Nieman CL, Simpson A, Zimmerman J, Nowrangi MA, et al. Age-related hearing loss in older adults with cognitive impairment. *Int Psychogeriatrics.* 2017;29(1):115–21. doi:10.1017/S1041610216001459
5. Ray M, Dening T, Crosbie B. Dementia and hearing loss: A narrative review. *Maturitas.* 2019;128(June):64–9. doi:10.1016/j.maturitas.2019.08.001
6. Dawes P, Emsley R, Cruickshanks KJ, Moore DR, Fortnum H, Edmondson-Jones M, et al. Hearing loss and cognition: The role of hearing aids, social isolation and depression. *PLoS One.* 2015;10(3):1–9. doi:10.1371/journal.pone.0119616
7. Loughrey DG, Kelly ME, Kelley GA, Brennan S, Lawlor BA. Association of age-related hearing loss with cognitive function, cognitive impairment, and dementia a systematic review and meta-analysis. *JAMA Otolaryngol - Head Neck Surg.* 2018;144(2):115–26. doi:10.1001/jamaoto.2017.2513
8. Lawrence BJ, Jayakody DMP, Henshaw H, Ferguson MA, Eikelboom RH, Loftus AM, et al. Auditory and Cognitive Training for Cognition in Adults With Hearing Loss: A Systematic Review and Meta-Analysis. *Trends Hear*. 2018;22:1–20. doi:10.1177/2331216518792096
9. Baguley D, McFerran D, Hall D. Tinnitus. *Lancet.* 2013;382(9904):1600–7. doi:10.1016/S0140-6736(13)60142-7.
10. Nondahl DM, Cruickshanks KJ, Huang GH, Klein BEK, Klein R, Javier Nieto F, et al. Tinnitus and its risk factors in the Beaver Dam Offspring Study. *Int J Audiol*. 2011;50(5):313–20. doi:10.3109/14992027.2010.551220
11. Cederroth CR, Lugo A, Edvall NK, Lazar A, Lopez-Escamez J-A, Bulla J, et al. Association between Hyperacusis and Tinnitus. *J Clin Med*. 2020;9(8):2412. doi:10.3390/jcm9082412
12. Fetoni AR, Di Cesare T, Settimi S, Sergi B, Rossi G, Malesci R, et al. The evaluation of global cognitive and emotional status of older patients with chronic tinnitus. *Brain Behav.* 2021;11(8):1–9. doi:10.1002/brb3.2074
13. Logroscino G, Panza F. The Role of Hearing Impairment in Cognitive Decline: Need for the Special Sense Assessment in Evaluating Cognition in Older Age. *Neuroepidemiology*. 2016;46(4):290–1. doi:10.1159/000445988
14. Utoomprurkporn N, Woodall K, Stott J, Costafreda SG, Bamiou DE. Hearing-impaired population performance and the effect of hearing interventions on Montreal Cognitive Assessment (MoCA): Systematic review and meta-analysis. *Int J Geriatr Psychiatry*. 2020;35(9):962–71. doi:10.1002/gps.5354
15. Wong LLN, Yu JKY, Chan SS, Tong MCF. Screening of cognitive function and hearing impairment in older adults: A preliminary study. Biomed Res Int. 2014;2014. doi:10.1155/2014/867852
16. Shen J, Anderson MC, Arehart KH, Souza PE. Using cognitive screening tests in audiology. Am J Audiol. 2016;25(4):319–31. doi:10.1044/2016_AJA-16-0032.
17. Humes LE. Associations Between Measures of Auditory Function and Brief Assessments of Cognition. Am J Audiol. 2020;29(4):825-837. doi: 10.1044/2020_AJA-20-00077. PMID: 32976027; PMCID: PMC8608158.
18. L Beck D, Bant S, A Clarke N. Hearing loss and cognition: a discussion for audiologists and hearing healthcare professionals. J Otolaryngol Res. 2020;12(3):72–8. doi:10.15406/joentr.2020.12.00459
19. Fulton SE, Lister JJ, Bush ALH, Edwards JD, Andel R. Mechanisms of the Hearing-Cognition Relationship. Semin Hear. 2015;36(3):140–9. doi:10.1055/s-0035-1555117
20. Kikidis D, Vassou E, Markatos N, Schlee W, Iliadou E. Hearing Aid Fitting in Tinnitus: A Scoping Review of Meth-

odological Aspects and Effect on Tinnitus Distress and Perception. J Clin Med. 2021;10(13):2896. doi: 10.3390/jcm10132896. PMID: 34209732; PMCID: PMC8269061.

21. Bhatt JM, Bhattacharyya N, Lin HW. Relationships between tinnitus and the prevalence of anxiety and depression. Laryngoscope. 2017;127(2):466–9. doi:10.1002/lary.26107

22. Sullivan CB, Al-Qurayshi Z, Zhu V, Liu A, Dunn C, Gantz BJ, et al. Long-term audiologic outcomes after cochlear implantation for single-sided deafness. Laryngoscope. 2020;130(7):1805–11. doi:10.1002/lary.28358

Sažetak

UTJECAJ NOŠENJA SLUŠNOG POMAGALA NA KONGNITIVNE SPOSOBNOSTI I SUBJEKTIVNI STATUS TINITUSA U BOLESNIKA SA ZAMJEDBENOM NAGLUHOŠĆU: PILOT STUDIJA

A. Košec, N. Erceg, G. Grinblat, A. Nikolić Margan, G. Geber i *M. Ries*

Među starijom populacijom nalazimo povećan broj osoba s oštećenim sluhom i smanjenim kognitivnim sposobnostima. Zbog povezanosti slušnog sustava sa središnjim živčanim sustavom, dolazi do patoloških promjena na obje razine. Razvoj tehnologije u području slušnih pomagala poboljšao je kvalitetu života takvih bolesnika.

Cilj istraživanja je utvrditi postoji li utjecaj nošenja slušnog pomagala na kognitivne sposobnosti i šum u uhu. Trenutna istraživanja ne pokazuju striktno povezanost ta dva entiteta.

U provedenoj studiji sudjelovalo je 44 ispitanika sa zamjedbenim oštećenjem sluha. Podijeljeni su u dvije skupine po 22 osobe, ovisno o tome koriste li slušno pomagalo. Procjena kognitivnih sposobnosti vršila se putem Montrealske ljestvice kognitivne procjene (MoCA), a procjena utjecaja šuma u uhu na svakodnevne aktivnosti putem upitnika Tinnitus Handicap Inventory (THI) i Iowa Tinnitus Handicap Questionnaire (ITHQ). Analizirana je povezanost nošenja slušnog pomagala s rezultatima navedenih upitnika.

U našem istraživanju pokazana je povezanost duljeg nošenja slušnog pomagala i lošije sposobnosti imenovanja (p=0,030, OR 4,734), slabijeg odgođenog prisjećanja (p=0,033, OR 4,537) i prostorne orijentacije (p=0,016, OR 5,773). Tinitus nije pokazao povezanost s kognitivnim oštećenjem.

Rezultati govore o specifičnim vezama između slušnog sustava i funkcije središnjeg živčanog sustava. Ovi nas podaci usmjeravaju na poboljšanje strategije rehabilitacije sluha i kognitivnih sposobnosti u bolesnika. Takvim se pristupom omogućava veća kvaliteta života i prevencija daljeg kognitivnog oštećenja.

Ključne riječi: *Slušno pomagalo; Kvaliteta života; Tinnitus; Kognicija; Zamjedbena nagluhost*