

The Effect of Consistent Hearing Aid Use on Quality of Life and Depression in Older Persons: From Objective Data Log Evidence

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Abstract

Objectives: The aims of the present study were to figure out the relationship between the quality of life and depression mood and wearing time of hearing aids of older persons with age-related hearing loss using objective data log.

Materials and Methods: Twenty-three older persons (13 female, 10 male; mean age 75.9±5.72) who were fitted with bilateral hearing aids due to age-related hearing loss were included in the study. All hearing aids had the data log feature. The World Health Organization Quality of Life – For Older (WHOQOL-OLD) and Geriatric Depression Scale (GDS) were applied to subjects.

Results: The Spearman test demonstrated a moderately and significant positive correlation between the hearing aids wearing time and WHOQOL-OLD ($p = .038$, $r = .43$). And also, there was a moderately and significant negative correlation between hearing aid using time and GDS ($p = .034$, $r = -.44$).

Conclusion: We highlight that health is a state of physical and mental well-being, and we suggest that presbycusis management should include not just auditory treatments but also psychosocial therapy with a holistic approach. In the present study, the choice to focus on objective data logging in hearing aids rather than subjective self-reports and reveal the impact of consistent device use on quality of life and depression in older persons adds to the novelty of the field.

Keywords: *presbycusis, age-related hearing loss, data logging, quality of life, depression.*

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Introduction

Presbycusis, commonly known as age-related hearing loss, is generally considered a biological indicator of the aging process. The condition has bilateral and symmetrical characteristics, with a high frequency and a slow progression. Approximately one-third of individuals between the ages of 61 and 70 are affected by this condition, whereas the prevalence increases to over 80% among individuals aged 85 years and beyond. Following hypertension and arthritis, this health condition is the most commonly observed chronic ailment among elderly individuals (Kotby et al., 2008).

The inadequacy to remediate this disease's progress and the insufficient comprehension of its pathogenesis are significant aspects of the problem (Ciorba et al., 2012). It may be underrecognized due to its gradual onset, and it may be undertreated due to its absence from normal health check-ups. Numerous older persons and professionals ascribe hearing loss to natural aging rather than recognizing it as a disorder that influences a variety of psychosocial and physical health issues (Kotby et al., 2008; Said, 2017).

The difficulties stem from more than just a loss of hearing; they might also include a person's reduced ability to engage in some activities (such as following conversations) and their exclusion from other facets of life (Hartley et al., 2010; Mondelli & de Souza, 2012). They can lead to psychiatric issues, causing those to isolate themselves due to the difficulties in interacting in their social context. Frequently, the family of hearing-impaired patients lacks the patience to deal with the hearing impairment and, as a result, does not engage in typical conversations with the patient, instead telling him or her solely of serious matters. Due to hearing difficulties, older persons experience embarrassment, which may contribute to depression (Mondelli & de Souza, 2012). Consequently, cutbacks in engagement can have detrimental effects on an individual's quality of life and mental health (Organization, 2007).

The use of amplification through hearing aids is the core of main audiologic management for age-related hearing loss, with the goals of decreasing auditory impairment, optimizing the individual's auditory activities, and minimizing participation constraints (Kiessling et al., 2003). However, optimal management of this disorder should also incorporate an evaluation of quality of life and a psychological evaluation (Kaplan - Neeman et al., 2012; Van Vliet, 2005). Furthermore, a considerable number of hearing aids end up not being used in the case of only audiological intervention without psychosocial care.

Given that geriatric people with age-related hearing loss have psychosocial difficulties, and since management of hearing loss alone does not always guarantee using the hearing aid, it's

essential to investigate the relationship between the quality of life, depression mood, and wearing time of hearing aid. Understanding the associations of these processes is critical to forming a more holistic management plan. The purpose of this study is to figure out the relationship between the quality of life and depression mood and the wearing time of hearing aids of older persons with age-related hearing loss. In the current study, the choice to focus on objective data logging in hearing aids rather than subjective self-reports and reveal the impact of consistent device use in older persons adds to the novelty of the field.

Materials And Methods

The research was carried out at the Audiology Department at Hacettepe University, where the participants were provided with a written consent form that outlined the objectives and scope of the study. The research project received approval from the Ethics Board for Non-Interventional Clinical Research at Hacettepe University, with the assigned code GO 20/627.

Participants

Potential participants were recruited among patients who applied to the Audiology Unit of Hacettepe for routine audiological evaluation between 2020-2021. Of 26 patients older than 65 years with presbycusis who had been using their hearing aids for at least two years, three patients did not give approval to participate in the study, and one patient was excluded due to additional disorders. We included 23 voluntary individuals (13 female, 10 male) without neurological diseases. The mean age of the participants was 75.9 (range: 67–90, SD: 5.72) years.

Audiologic Evaluation

The hearing thresholds of the subjects were measured at frequencies ranging from 0.125 to 8 kHz using the protocols outlined by the British Society of Audiology (BSA, 2000). Additionally, the bone-conducted thresholds of the participants were acquired using a bone vibrator, and it was observed that the air-bone gap did not surpass 10 dB HL. The mean pure tone threshold (PTA) within the frequency range of 0.125-8 kHz exhibited values ranging from 32 to 69 dB HL in both ears. The disparity in auditory thresholds between the ears within the frequency range of 0.125–8kHz did not surpass a 20 dB hearing level. The right and left hearing thresholds of subjects are presented in Figure 1. The mean audiometric thresholds of the group were right PTA_{0.125–8 kHz}; 53 (± 7.8), left PTA_{0.125–8 kHz}; 54 (± 8.6).

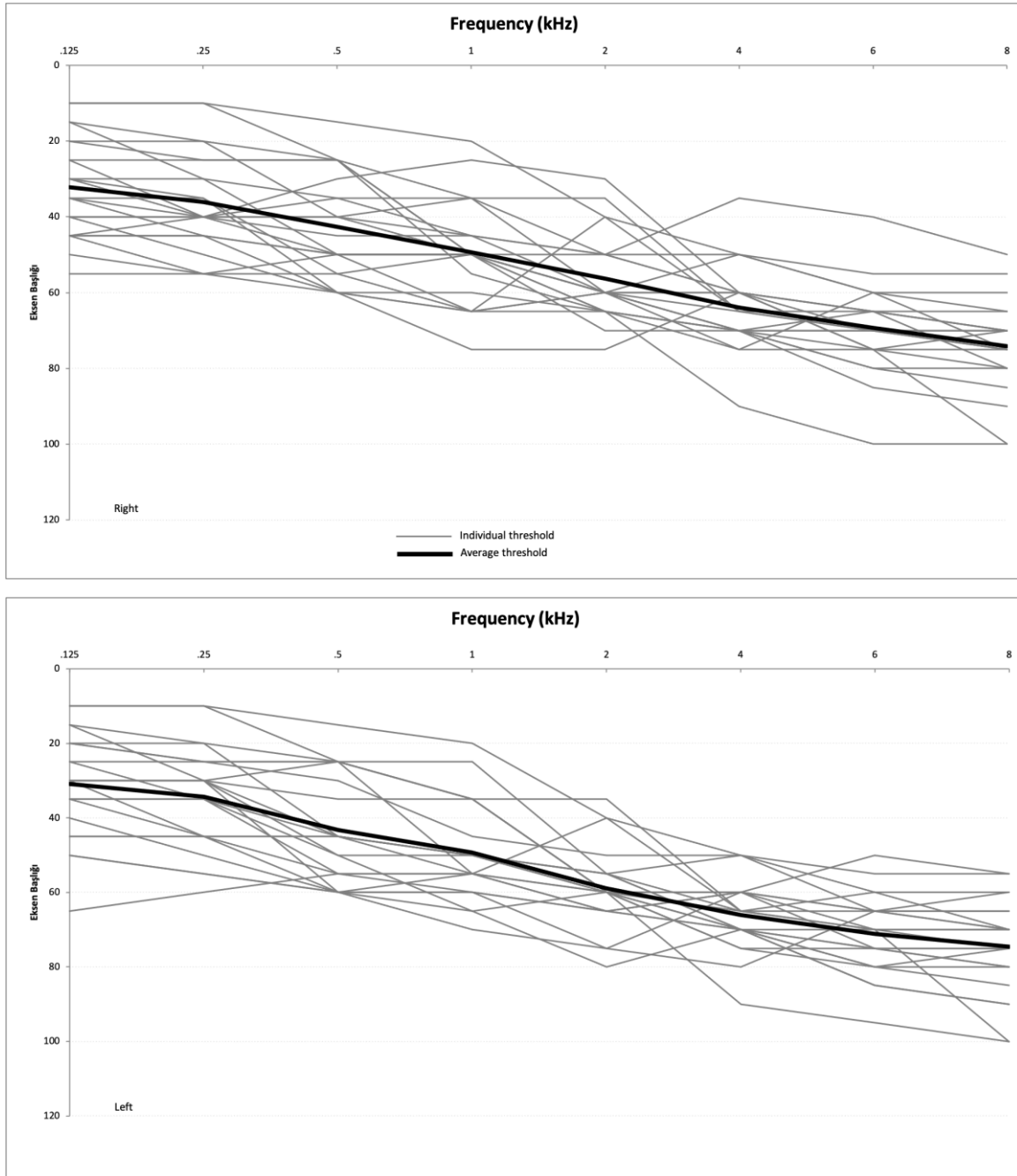


Figure 1. Right ear (upper) and left ear pure tone air-conduction audiometry results of the subjects.

Data Logging

All participants were using bilateral *Phonak* hearing aids for at least two years, and all of their devices included a data log. The mean usage time of the hearing aid was 2.95 ± 1.17 .

The World Health Organization Quality of Life – Old (WHOQOL-OLD)

The WHOQOL-OLD consists of 24 questions (Power et al., 2005). Eser et al. conducted a Turkish validity and reliability study of the WHOQOL-OLD scale (Eser et al., 2010). The WHOQOL-OLD scale is comprised of six dimensions, including "past, present, and future

activities," "sensory functions," "social participation," "death and dying," "autonomy," and "intimacy," and a total of 24 Likert-type questions. The "Past, Present, and Future Activities" dimension reflects the satisfaction derived from life's successes and the outlook for the future. The "sensory functions" domain refers to the influence of sense alterations on life quality. The "social participation" criterion refers to the capacity to take part in everyday activities. The "death and dying" dimension indicates anxiety, concern, and fear regarding death and dying. The "autonomy" dimension refers to a person's ability to be self-sufficient. The "intimacy" criterion evaluates the ability to form personal and intimate relationships. The lowest possible score for each question is 1, and the maximum is 5. The range of sub-dimension scores is from 4 to 20. As the cumulative score on the scale rises, the quality of life also improves (Karakas et al., 2023).

Geriatric Depression Scale (GDS)

This was developed by Yesavage et al. with the aim of measuring depressive symptoms among elders (Yesavage et al., 1982). The scale consists of 30 items simply responded as 'yes' or 'no' by the older persons participants. The scale has a minimum of 0 and a maximum of 30 points. A total score of 0-10 shows no depression, a score of 11-13 indicates probable depression and a score of 14 or higher indicates definite depression. For this study, the cut-off point of the depression scale was set at 14. Ertan et al. conducted the Turkish validity and reliability study of the GDS scale.(Ertan et al., 1997).

Statistical Analysis

The sample size calculation was made using G*Power 3.1 software. The alpha error was 0.05, the beta error was 0.20, and the power variable was 80% in the sample calculation, and the calculation was made according to the Spearman correlation test. The effect size H1 coefficient was determined as 0.5 based on the pilot study. As a result of the calculation, the number of samples was found to be 21.

Data analysis was performed using the IBM SPSS (version 26.0; SPSS, INC). The variables were investigated using visual (histograms, probability plots) and analytical methods (Shapiro-Wilk's test) to determine whether the data were normally distributed. While investigating the associations between non-normally distributed variables, the correlation coefficients and their significance were calculated using the Spearman test. A 5% type-I error level was used to infer statistical significance.

Results

The mean, standard deviation, and minimum-maximum values of the hearing aids wearing time, WHOQOL-OLD, and GDS were indicated in Table 1.

Table 1. Descriptives of the hearing aids wearing time, WHOQOL-OLD, and GDS.

	Mean	Standard Deviation	Minimum-Maximum
Hearing Aids Wearing Time	12.64	1.95	8-16.4
WHOQOL-OLD	81.3	7.89	67-101
GDS	8.83	6.51	1-22

Hearing Aids Wearing Time & WHOQOL-OLD

The Spearman test demonstrated a moderate and significant positive correlation between the hearing aid wearing time and WHOQOL-OLD ($p = .038$, $r = .43$).

Hearing Aid Wearing Time & GDS

The Spearman test showed a moderate and significant negative correlation between hearing aid-using time and GDS ($p = .034$, $r = -.44$).

Discussion

The aim of this study was to investigate the relationship between the quality of life, depression, and hearing aid-wearing time of older persons with age-related hearing loss. In light of the current study, it was determined that the quality of life of older persons increased, and depression decreased as the duration of device use increased.

Our results revealed a moderate and significant positive correlation between the hearing aids wearing time and WHOQOL-OLD. It showed that the longer the older persons wear their devices during the day, the better their quality of life. Our results were consistent with previous studies that reported that hearing aid use improves quality of life (Ciorba et al., 2012; McArdle et al., 2005). A comprehensive, multi-site investigation was done by McArdle et al. in which a total of 380 individuals were randomly assigned to either the experimental group, which received immediate hearing aid therapy, or the control group, which received delayed hearing aid treatment. The efficacy of hearing aids in enhancing both general QoL and hearing-related QoL domains has been proven, with a more pronounced improvement observed when assessing

QoL using measures specifically designed for hearing-related outcomes (McArdle et al., 2005). Hearing loss causes distorted or incomplete communication, which leads to increased isolation and withdrawal and, as a result, diminished sensory input. Consequently, the life space and social interactions of the hearing-impaired individual are constrained, leading to adverse effects on their psychosocial well-being. These effects manifest as feelings of embarrassment, fatigue, irritability, tension, stress, depression, negativism, rejection, loneliness, social isolation, and a decline in overall psychological health (Karakaş et al., 2023).

The results of the present study revealed a moderate and significant negative correlation between the hearing aid-wearing time and GDS. It showed that the longer the older persons wore their devices during the day, the more their depression decreased. Two small prospective studies found that using hearing aids reduced depression symptoms within three months (Acar et al., 2011; Boi et al., 2012). Similar findings were seen in the Blue Mountains Study, where hearing aid use was associated with lower odds (OR =0.32) of developing depressed symptoms (Gopinath et al., 2009). Prospective longitudinal investigations in nursing home participants found similar decreases in depressive symptoms (OR= 0.30) and improvements in mental health in ambulatory patients who used hearing aids (Boi et al., 2012; Boorsma et al., 2012).

A range of probable depression mechanisms in hearing loss have been hypothesized. A decrease in activities of daily living found in older persons with hearing loss, possibly related to communication problems, is believed to be a contributing factor. A well-studied process refers to communication issues caused by hearing loss, which may provide difficulties in social and relational functioning. Intervention studies to improve the ways of interacting have resulted in decreased anxiety and depression symptoms in adults with hearing loss, providing support to this suggested mechanism. Loneliness and social isolation have also been proposed as further consequences of communication difficulties, with a lack of social support being a known predictor of depression. Loneliness and social isolation are common among older people with hearing loss. These may be caused, in part, by difficulty following a conversation, which leads to an increased sense of isolation. When the relationship between hearing loss and depression is adjusted for social involvement, the correlation is weaker. Patterns of decreased prefrontal cortex activity have recently been reported in neuroimaging investigations of older persons people with hearing loss and depression, indicating a probable common neuropathological route. These data suggest that brain alterations or degeneration might be responsible for both hearing loss and depression (Cosh et al., 2019).

This paper has some strengths and limitations. We recognize that criteria such as marital status, educational status, and who the older persons live with, which may have an impact on

data, were not considered. On the other hand, we know that the use of hearing aids is commonly measured with the subjective self-report method, and self-reported time is longer than the time recorded in the data log (Taubman et al., 1999). Therefore, we believe the use of objective data logging in our study and the association of quality of life and depression scales with these periods of use add value to the study.

Conclusion

As a result of the study, we highlight that health is a state of physical and mental well-being, and we suggest that presbycusis management should include not just auditory treatments but also psychosocial therapy with a holistic approach. In the present study, the choice to focus on objective data logging in hearing aids rather than subjective self-reports and reveal the impact of consistent device use on quality of life and depression in older persons adds to the novelty to the field.

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Conflicts of interest: There are no conflicts of interest, financial or otherwise.

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