

# Effects of the unilateral hearing aid on hearing and quality of life in adult patients

## Abstract

**Aim:** Adult hearing aid applications are known to be common. In this study, the assessment of the satisfaction of short-term use of a unilateral hearing aid in bilateral sensorineural hearing loss in adults with at least three months is intended.

**Methods:** Forty individuals with bilateral sensorineural hearing loss, who use unilateral hearing aid for the first time in 40-65 age range, have been prospectively evaluated. Hearing aid satisfaction surveys are explored with applications before and 3 months after using the unilateral digital hearing aid.

**Results:** There was a statistically significant decrease in total HHIA scores with unilateral HA uses ( $P < 0.01$ ). SDS significantly increased in both ears, but the improvement was more marked in the fitted ear. After 3 months of hearing aid usage, the 95% have had moderate or more benefit with a unilateral HA. Using a hearing aid in the daytime increases patient satisfaction and survey scores improvements have been identified.

**Conclusion:** After 3 months of hearing aid usage in individuals who use these devices for the first time, it has been observed that the psycho-social problems related with hearing decreased considerably, feeling handicapped in terms of hearing loss became less, the quality of life increased in terms of hearing loss, and the individuals made use of the unilateral hearing aid.

**Keywords:** hearing loss, hearing aid, auditory perception, quality of life

Volume 3 Issue 3 - 2015

Şahin H,<sup>1</sup> Akın Şenkal O,<sup>2</sup> Aydın E<sup>3</sup>

<sup>1</sup>Ankara Numune Hastanesi, Turkey

<sup>2</sup>Baskent Üniversitesi Tıp Fakültesi KBB Anabilim Dalı, Turkey

<sup>3</sup>Baskent Üniversitesi Tıp Fakültesi KBB Anabilim Dalı, Turkey

**Correspondence:** Akın Şenkal O, Cukurova University Faculty of Education, Turkey, Email oakinsenkal@yahoo.com

**Received:** February 11, 2015 | **Published:** September 21, 2015

**Abbreviations:** HA, hearing aid; SDS, speech discrimination scores; PTA, pure tone audiometry; QL, quality of life; ps, patient satisfaction; SRT, speech reception threshold

## Introduction

Hearing loss and related problems decrease quality of life and lead to isolation from social life.<sup>1,2</sup> Hearing aid (HA) use is a major treatment method in individuals with hearing loss. Patient satisfaction with HA use is the key factor in determining treatment success. MarkeTrak<sup>1</sup> studies have indicated that patient satisfaction with HA is generally low.<sup>3</sup> In addition, although there are many patients who require a HA, many do not choose to use the device due to negative stigma associated with hearing loss.<sup>1</sup> The majority of HA users prefer unilateral HA use.<sup>4,5</sup> First time HA users between the ages of 40-65 tend to have more active lifestyles relative to geriatric populations and the accurate evaluation of HA usage and satisfaction is critical in this population. Previous studies of HA usage have focused on elderly patients.<sup>6-9</sup> The limited number of studies including middle-aged patients has also included elderly individuals.<sup>4,5</sup> Hearing loss typically occurs gradually and many patients do not fully appreciate the effect of hearing changes with the aging and extended average lifespan, hearing loss will be more prevalent than ever in the coming years.<sup>1-3,10</sup>

There is also evidence that hearing loss can exacerbate the behavioral aspects of Alzheimer's disease and other cognitive disorders, affecting memory, alertness, and general ability to cope beyond the expected limitations associated with cognitive decline.<sup>2,3,11</sup> In the present study, the satisfaction levels of individuals between the ages 40-65 with moderate and moderate-to-severe symmetrical sensorineural hearing loss was evaluated after the use of a unilateral HA for at least 3 months. The aim of the present study was to demonstrate the effects of unilateral HA on speech discrimination

scores (SDS), pure tone audiometry (PTA) thresholds, quality of life (QL), and patient satisfaction (PS) to determine whether patients benefit from the use of a unilateral HA. Questionnaires were used to evaluate the factors that hinder communication among individuals with hearing loss. The change in hearing quality was addressed at the conclusion of the study and the data was used to select the most appropriate device and make adjustments.

## Material and methods

The study protocol was reviewed and approved by the XXXX Medicine and Health Sciences Research Board and Ethics Board (Project No: KA11/249), and supported by XXXXX Research Fund. Sixty-eight patients who presented to the XXXXXX Hospital, Department Of Otolaryngology, between the January and May 2012 with symptoms of hearing loss were included in the study. Forty patients out of the initial group of 68 were re-assessed after 3 months. The patients ranged in age from 40 to 65 (the mean age 58.15 years). The purpose and the scope of the study were explained to all study participants and written and signed *Voluntary Subject Information and Consent Forms* were provided by all participants. Study participants were diagnosed with moderate and moderate-to-severe sensorineural hearing loss following audiometric assessments. None of the study participants had previously used a HA. Patient satisfaction levels were assessed prior to using the device and after 3 months of use.

All individuals were assessed using otological examination and audiological tests. The Speech Reception Threshold (SRT) was tested using three-syllable lists, and the SDS was performed using a monosyllable phonetic balanced word lists (PB-300).

In order to assess satisfaction level regarding the hearing aid, the Hearing Handicap Inventory for Adults – HHIA (7) and International

Outcome Inventory for Hearing Aids - IOI-HA) (11) questionnaire assessments was provided to all participants.

The HHIA consists of 25 questions. Thirteen of the questions the emotional sub-group, and 12 of them form the social/situational sub-group. The questions in the Emotional (E) sub-group evaluate the subjective thoughts of an individual regarding the reactions of the people around him/her relating to of his/her hearing difficulty. The questions in the Social (S) sub-group assess the perceived effects of hearing loss in various social situations. The total points are between 0-100.

IOI-HA consists of 7 items; each item assesses satisfaction level in different areas:

1. Daily usage duration
2. Utilization level
3. Residual Activity Limitation (RAL)
4. Satisfaction
5. Residual Participation Limitation (RPL)
6. Effect on Other People (EOP)
7. Effect on Quality of Life (ELQ)

The total point value of the questionnaire is 35 points.<sup>10</sup> After 3 months of using of hearing aid, both the audiological and questionnaire assessments (HHIA and IOI-HA) were completed together. Participating individuals were asked to complete the HHIA and IOI-HA questionnaires on their own. Individuals with good general health and intellectual ability completed the questionnaires on their own. Individuals who were illiterate were assisted by primary author.

HA type and technology were not assessed as parameters in this study. All statistical analysis was performed using SPSS 15.0. The results are reported as frequency and percentage values. The Willcoxon Test was used for the comparison of the two dependent groups. The nonparametric Chi Square Test and the Fisher Exact Test Analysis were used to compare discrete variables. *p* value less than 0.05 was accepted as statistically significant.

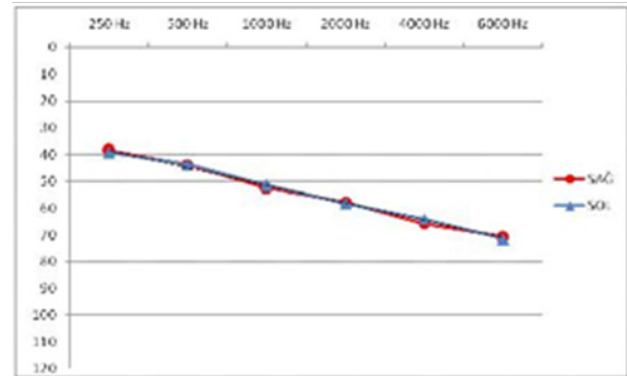
## Results

A total of 47.5% (19/40) of the participants were male and 52.5% (21/40) were female; 45% of the participants were between the ages of 60-65. The average age of these patients was 58.15 years (range 40 - 65). Twenty one participants were given 21 left ear hearing aids and 19 received right ear hearing aids. The pure tone averages were 41.7 dB for the right ear and 45.2 dB for the left ear (Figure 1). The SDS for the right ear was 85.8% and 83.8% for the left ear.

Average total HHIA score before unilateral HA fitting was  $53.55 \pm 27.50$ , with scores ranging from 8 -100. The most commonly encountered problem in the HHIA questionnaire among the individuals participating in the study was "difficulty in hearing while watching television and listening to the radio" (*n*=30), and "difficulty in hearing and understanding colleagues and customers" (*n*=26). All of the individuals in the study answered "No" to the question "Do you feel handicapped because of your hearing loss?"

After 3 months of HA use, the HHIA results were assessed again. The average total HHIA score was  $42.20 \pm 25.75$  and scores ranged from 2-96. Overall there was a significant decrease of 11.35 points (*p*<0.05) in average total HHIA scores. According to the HHIA

results obtained before and after the HA use, the difference in answers given to the majority of the questions was statistically significant (*p*<0.05), with no significant difference in questions 1, 8, 10, 17 and 21. The largest difference in HHIA test results was observed in the 15<sup>th</sup> question; however, overall scores were lower for question 21 after 3month HA use.



**Figure 1** Pure tone hearing thresholds before the hearing aid application (dB).

The average emotional HHIA score before HA use was  $29.45 \pm 14.64$  with a range of 4-52; after HA use the mean score was  $23.60 \pm 13.21$  with a range of 0 -50 points. The difference in mean emotional HHIA scores before and after HA use was 5.85 points, which was statistically significant (*p* < 0.05).

Statistically significant differences (*p*<0.05) were observed in the HHIA questionnaire results obtained before and after HA use according to gender. The emotional status questions suggest that men make more use of HA relative to women.

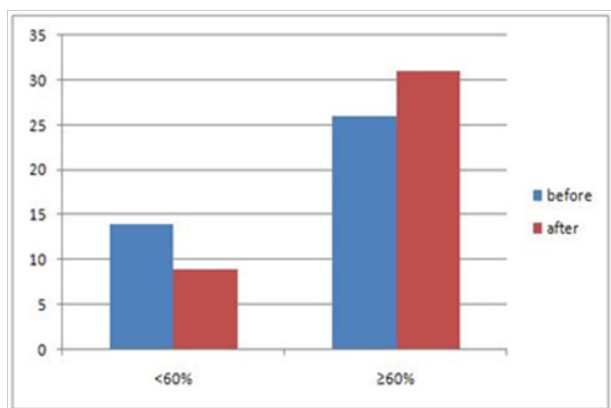
The average IOI-HA score was  $26.85 \pm 3.85$  and scores ranged from 9-33 points. According to the results of the IOI-HA questionnaire, the daily usage duration of the HA was less than 1 hour in 5% of the patients, 4-8 hours in 45%, and as over 8 hours in 50% of the participating patients (Question 1). The entire patient group, 95% (*n* = 38) used the HA for at least 4 hours every day.

Ninety-five percent of participating individuals reported moderate or greater ( $\geq 3$  points) benefit (Question 2). Satisfaction level with the HA was moderate or greater in 90% of the individuals ( $\geq 3$  points) (Question 4). Self-reported QL was increased in 95% of individuals ( $\geq 3$  points) (Question 7). A total of 10% of patients had extreme difficulties in situations where they were expected to hear clearly.

A portion of the questionnaire addressed RAL or "activities based on hearing" after the use of the HA. 17.5% of the patients reported serious limitations due to hearing loss, and 5% stated that they thought other people were seriously annoyed because of their hearing loss.

The HHIA results regarding daily HA usage are statistically significant (*p*<0.05) in individuals using the HA more than 4 hours daily. However, there was no statistically significant difference in individuals using the HA less than 4 hours (*p*=0.32). As the duration of HA use increases, the HHIA values were also increased. The best results were observed in individuals using the HA more than 8 hours.

Prior to HA use, 65% (*n* = 26) of the patients had an SDS  $\geq 60\%$ , and 35% (*n* = 14) of patients had SDS < 60%. After 3 months of HA use, 77.5% (*n* = 31) of the patients had SDS  $\geq 60\%$  and 22.5% (*n* = 9) of the patient SDS were < 60%. This difference in SDS scores in the ear without HA before and after HA fitting was statistically significant (*p* = 0.008) (Figure 2).

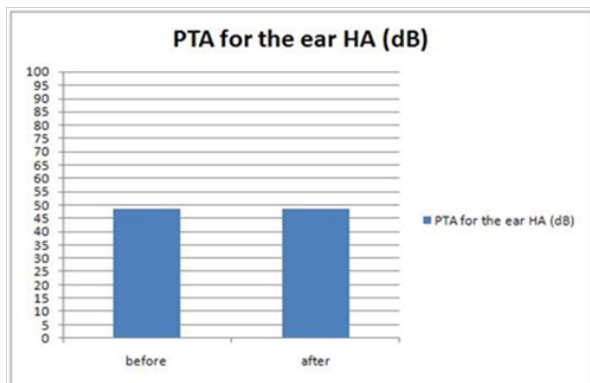


**Figure 2** Distribution of patients regarding speech discrimination scores (%).

Before the HA fitting, the average PTA threshold for the ear with the HA was  $48.70 \pm 7.93$  dB, with thresholds ranging from 40-72 dB. After the HA was fitted, the average PTA threshold was  $48.67 \pm 7.96$  dB and ranged from 40-72 dB in the ear without the HA. There was no statistically significant difference between PTA thresholds before and after HA fitting in the ear with the HA ( $p > 0.05$ ).

## Discussion

Hearing loss is a major health problem that affects individuals of all socioeconomic levels and results in financial difficulties and poorer quality of life.<sup>1-3</sup> Only 20.84% of individuals with hearing loss use a HA in Turkey<sup>11</sup>. A domestic study determined that only 68% of the 50 people over 65 years of age who were advised to use HA actually used the device.<sup>7</sup> Another retrospective study evaluated 100 individuals at the age of 70 and 70 individuals over the age of 70 who used HA.<sup>4</sup> This is the first study which shows data about unilateral HA at a group of 40-65 ages (Figure 3).



**Figure 3** Pure Tone Averages of patients after the unilateral hearing aid application (dB).

After the use of a HA, many individuals benefited in areas related to hearing loss. However, a unilateral HA is not beneficial in noisy public places. Similarly, Newman *et al.* conducted a study in which they determined that individuals with hearing loss were most dissatisfied in group settings, in restaurants and while listening to radio or watching television.<sup>12</sup> HA should recommend bilaterally in 40-65 age groups.

Other studies reported the following complaints after HA usage: (a) dialogues with family members, (b) watching television and listening to radio, (c) understanding speech in a noisy background, and (d) the

feeling of being excluded from the society.<sup>13</sup> In the present study, the most common complaints after HA use were reduced telephone use, the feeling of being hindered during interactions with colleagues and customers, loss of the joy of life, and a feeling of being handicapped. Although the baseline score for telephone use was clearly higher, this score did not improve with the use of a unilateral HA. In previous studies, even individuals reporting high satisfaction with their HA reported difficulties in making telephone calls.<sup>14-16</sup>

According to the IOI-HA questionnaire results, the daily usage duration of HA use is clearly related with the benefit obtained from the HA, reported satisfaction, quality of life and RPL. Reduced participation limitations are expected in the individuals with more HA usage.<sup>10,14,16</sup> Today, 10% of patients state that they do not experience sufficient benefits with HA usage.<sup>10</sup> Possible explanations for this observation may include high expectations from the device prior to use, improper device choice as a result of prices, and technical problems with the device.<sup>10,16,17</sup> According to a previous IOI-HA questionnaire result conducted with 232 patients, device type and the degree of hearing loss are not significant components of patient satisfaction, however the level of the hearing loss influenced the duration of daily HA usage.<sup>17</sup> Daily HA usage duration is important for adaptation to the device and successful application.<sup>18</sup> In this study, meaningful relations between HA usage duration and the IOI-HA scores were identified. These results show that individuals who use the device more frequently experience the greatest benefits.

The results of this study demonstrated that HA users considered the device “useful” and “convenient” despite unilateral application.<sup>19</sup> 90% of the individuals were satisfied with the HA, in accordance with the previously reported data in the literature. The initial HA application and follow-up were performed with the guidance of the audiologist and this may have contributed to high levels of patient satisfaction. Karabulut and Karaşen<sup>20</sup> claim that the audiological rehabilitation programs are effective treating the psychosocial effects of hearing loss. These treatments may be performed by an audiologist.<sup>20</sup>

A high correlation between the improvement in life quality and patient satisfaction levels was observed. A higher correlation was in men than in women after the use of the HA. No meaningful differences between men and women have been previously reported in the literature.<sup>21,22</sup> However, in a study by Tarsuslu Şimşek *et al.*,<sup>23</sup> conducted to determine the effects of depression on life quality and life satisfaction in men and women, life quality and life satisfaction levels were generally higher in men.<sup>23</sup> In the same study, the depression rates were higher in women than among men. In the present study, men reported higher satisfaction levels than women following HA usage; this finding is in accordance with the findings of Tarsuslu Şimşek *et al.*,<sup>23</sup>

Individuals who have higher HHIA at the first assessment use the HA more during the day and make use of it more than women. For this reason, the HHIA is especially helpful in foreseeing the success of the patient in using the HA. The use of the HA for more than 4 hours a day is associated with significantly higher IOI-HA SCORES, and individuals who use the HA more report greater benefits.

This study looked at the positive benefits of amplification and showed that HA use positively affected quality of life. Audiologists who fit HA must implement aural rehabilitation as part of their patients' plan of care to help ensure that individuals who ultimately seek hearing services are treated in a holistic, evidence-based manner that takes their psychosocial, physical, and communication needs into consideration.

## Acknowledgments

None.

## Conflicts of interest

Author declares there are no conflicts of interest.

## Funding

None.

## References

- Kochkin S. MarkeTrak VII: The impact of untreated hearing loss on household income. *Better Hearing Institute*. 2007.
- Kochkin S. MarkeTrak VII: Hearing loss population tops 31 million people. *The Hearing Review*. 2005;12(7):16–29.
- Kochkin S, Beck DL, Christensen LA, et al. MarkeTrak VIII: The impact of the hearing healthcare professional on hearing aid user success. *The Hearing Review*. 2010;17(4):12–34.
- Kahveci O, Miman M, Okur E, et al. Hearing aid use and patient satisfaction. *Kulak Burun Bogaz Ihtis Derg*. 2010;21(3):117–121.
- Hamurcu M, Şener BM, Atas A, et al. Evaluation of patients satisfaction with hearing aids. *ENT-Forum*. 2012;11(2):26–31.
- Özgürsoy OB, Küçük B. Objective analysis of hearing aids performance. *Turkish Journal of Geriatrics*. 2007;10(2):69–72.
- Durmaz A, Hıdır Y, Ulus S, et al. Presbycusis and using of hearing aids among elderly. *Turkish Journal of Geriatrics*. 2011;14(2):122–127.
- Acar B, Yurekli MF, Babademez MA, et al. Effects of hearing aids on cognitive functions and depressive signs in elderly people. *Arch Gerontol Geriatr*. 2011;52(3):250–252.
- Eski E, Yılmaz I. Effects of budget constraints on hearing rehabilitation in patients with presbycusis. *Turkish Journal of Geriatrics*. 2011;14(4):359–361.
- Kirkim G, Serbetcioglu MB, Mutlu B. Assessment of Patient Satisfaction for Hearing Aids Using the Turkish Version of International Outcome Inventory for Hearing Aids. *J ENT Head and Neck Surg*. 2008;16(3):101–107.
- Prime ministry Turkey Disability Survey. Publication of Administration of Disabled Person. *Ankara*. 2002.
- Newman CW, Jacobson GP, Hug GA, et al. Perceived hearing handicap of patients with unilateral or mild hearing loss. *Ann Otol Rhinol Laryngol*. 1997;106(3):210–214.
- Humes LE, Wilson DL, Barlow NN, et al. Longitudinal changes in hearing aid satisfaction and usage in the elderly over a period of one or two years after hearing aid delivery. *Ear Hear*. 2002;23(5):428–438.
- Givens GD, Arnold T, Hume WG. Auditory processing skills and hearing aid satisfaction in a sample of older adults. *Percept Mot Skills*. 1998;86(3 Pt 1):795–801.
- Newman CW, Weinstein BE, Jacobson GP, et al. The Hearing Handicap Inventory for Adults: psychometric adequacy and audiometric correlates. *Ear Hear*. 1990;11(6):430–433.
- Olusanya B. Self-reported outcomes of aural rehabilitation in a developing country. *Int J Audiol*. 2004;43(10):563–571.
- Cook JA, Hawkins DB. Outcome measurement for patients receiving hearing aid services. *Laryngoscope*. 2007;117(4):610–613.
- Magni C, Freiburger F, Tonn K. Evaluation of satisfaction measures of analog and digital hearing aid users. *Braz J Otorhinolaryngol*. 2005;71(5):650–657.
- Özkan S. Hearing, voice and speech disorders in the elderly. *Turkish Journal of Geriatrics*. 1998;11(2):72–75.
- Karabulut H, Karasen RM. Psychosocial Implications of Hearing Aid Applications and Results in the Elderly. *J ENT Special Topics*. 2012;5(2):75–79.
- Cox RM, Alexander GC. The International Outcome Inventory for Hearing Aids (IOI-HA): psychometric properties of the English version. *Int J Audiol*. 2002;41(1):30–35.
- Monzani D, Genovese E, Palma S, et al. Measuring the psychosocial consequences of hearing loss in a working adult population: focus on validity and reliability of the Italian translation of the hearing handicap inventory. *Acta Otorhinolaryngol Ital*. 2007;27(4):186–191.
- Şimşek TT, Yümin ET, Sertel M, et al. Kadın ve Erkek Yaşlı Bireylerde Depresyonun Sağlıkla İlgili Yaşam Kalitesi ve Yaşam Memnuniyeti Üzerine Etkisi. *Fırat Üniversitesi Sağlık Bilimleri Tıp Dergisi*. 2010;24(3):147–153.