Factors Influencing Hearing Aid Satisfaction in South Korea

Ga-Young Kim[1]*, Young Sang Cho[1,2]*, Hye Min Byun[3], Hye Yoon Seol[1,4], Jihyun Lim[5], Jin Gyun Park[3], and Il Joon Moon[1,2]

[1]Hearing Research Laboratory, Samsung Medical Center, Seoul;
[2]Department of Otorhinolaryngology-Head and Neck Surgery, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul;
[3]Demant Korea Co., Ltd., Seoul;
[4]Medical Research Institute, Sungkyunkwan University School of Medicine, Suwon;
[5]Center for Clinical Epidemiology, Samsung Medical Center, Seoul, Korea.

Purpose: The purpose of this study is three-fold: 1) to evaluate factors influencing hearing aid (HA) satisfaction; 2) to provide a profile of HA satisfaction in daily life; and 3) to examine the reasons why people gave up using HAs.

Materials and Methods: Data for 1148 respondents were statistically analyzed and reported.

Results: In the study, age (β=-0.03, $p<0.01$), level of education (β=1.21, $p<0.01$), HA purchase price (β=1.50, $p<0.01$), bilateral amplification (β=1.23, $p<0.01$), wearing time (β=0.28, $p<0.01$), and HA fitting and fine tuning on a regular basis (β=1.71, $p<0.01$) significantly influenced HA satisfaction. In addition, the authors observed that the most satisfactory factors were clarity of sound (53.5%), people's trust in their HA (61.7%), and listening from a quiet environment (72.8%) in the domains of sound quality, HA features, and listening environments, respectively. Finally, with multiple choices being possible, 65% of the 40 respondents who no longer used HAs answered that their HAs ended up in a drawer since the background noise was annoying and distracting.

Conclusion: This study is significant in that it is a large-scale multi-center research to comprehensively examine the factors influencing HA satisfaction in South Korea. This data will provide helpful information that could lead to the successful rehabilitation of hearing loss with HAs.

Key Words: Hearing loss, hearing aids, surveys and questionnaires, health services accessibility, aging

INTRODUCTION

The population of the majority of economically advanced

countries is aging rapidly due to increased life expectancy and low birth rates.[1] Accordingly, the proportion of senile diseases is rising considerably in these countries, and one of the most representative diseases is hearing impairment.[2] Among several options for hearing rehabilitation, hearing aid (HA) is the most popular choice for patients experiencing hearing loss. However, the current supply of HAs appears to meet less than 10% of the global need.[3] In South Korea, the adoption rate and regular use of HAs are only 17.4% and 12.6%, respectively.[4]

In addition, the relatively low satisfaction levels among HA users are another significant problem. MarkeTrak surveys in the United States showed that the overall HA satisfaction rate gradually increased from 53.5% in 1994 to 80% in 2020.[5-7] A previous European study also demonstrated that 72% to 86% of HA owners were highly satisfied with their devices.[8] In Korea, the overall HA satisfaction rate was 60.8%, which is relatively low compared to other countries.[9] The dissatisfaction with HAs leads

to not only lower usage rates but also the spread of negative perceptions to people around them. In other words, user satisfaction with HAs is critical to increasing HA adoption and usage.[5]

Previous studies have been performed to examine the factors influencing HA satisfaction. A recent U.S. survey showed that the top three factors contributing to people's overall satisfaction with HAs were product quality, ease of use, and appearance of the HA.[6,7] According to a 2010 survey, the factors that were most correlated with overall HA satisfaction are listed in rank order: overall benefit, clarity of sound, value, naturalness of sound, reliability of the HA, richness of fidelity of sound, use in noisy situations, ability to hear in small groups, comfort with loud sounds, and sound of voice.[5] A study conducted by a Korean research team revealed that age and small group listening performance were the factors affecting HA satisfaction. However, the factors related to the HA did not have a significant influence on the satisfaction rating.[9]

Most of these surveys were conducted for the purpose of elucidating HA market trends, so extensive statistical analysis was not performed to draw validated conclusions. Even when the statistical analysis was performed, it was difficult to generalize the results due to the relatively small sample size and use of a single recruitment site. The previous studies mentioned above showed large differences in people's satisfaction with HA between countries. Therefore, a large-scale, comprehensive, and systematic survey reflecting the population characteristics of each country is necessary. Unfortunately, a systematic survey system for HA, such as the MarkeTrak and EuroTrak, has not yet been established in South Korea.

Under these circumstances, the authors have tried to design a systematic survey procedure for the Korean HA market and periodically conduct surveys for the first time in South Korea. As one of our survey goals, the current study aimed to evaluate the current rates of HA satisfaction in South Korea.

MATERIALS AND METHODS

Participants

The authors conducted a large-scale nationwide prospective survey on patients who purchased HAs. The questionnaires were administered to people with hearing loss who visited 10 tertiary hospitals, seven general hospitals, 11 clinics, 22 HA centers, three medical equipment distributors, one community welfare center, and one other location in South Korea. By region, the survey was conducted at 11 sites in Seoul, 13 sites in Gyeonggi-do, 5 sites in Incheon, 3 sites in Busan, 3 sites in Gangwon-do, 2 sites in Gwangju, 1 site in Gyeongsangbuk-do, 2 sites in Daejeon, 2 sites in Jeollabuk-do, 2 sites in Chungcheongbuk-do, and 1 site in Jeju. A total of 1555 responses were acquired in the survey, of which 1264 people were current HA users. The authors excluded 62 pediatric patients (under 18 years of age) and 54 participants who did not respond to the International Outcome Inventory for Hearing Aids (IOI-HA) survey. The flow chart of participants is shown in Fig. 1. Therefore, data collected from 1148 subjects were analyzed. The mean age was 71.3±13.6 years, and there were 509 (44.3%) male and 639 (55.7%) female.

Survey questionnaire

A self-reported questionnaire consisting of four domains (demographic, HA purchase, HA use, and HA maintenance) was constructed based on theoretical and methodological considerations from prior research. Statistical analysis of "purchase price" was conducted based on the participants' responses for reasonable and actual purchasing price of HAs. Three categories ($1000–$2500, $2500–$4000, and >$4000) were available for the reasonable price item in the questionnaire. The participants' actual purchasing price was compared to their response for reasonable price to determine whether the purchase price was less expensive, reasonable, or more expensive.

With respect to the HA satisfaction measurement, the authors used the IOI-HA survey. A higher IOI-HA score indicated a more satisfactory HA.[10] Expected factors influencing HA satisfaction were classified into four domains: 1) demographic, 2) purchase of HA, 3) use of HA, and 4) maintenance of HA. Variables corresponding to each domain are shown in Table 1. Regarding HA satisfaction in daily life, respondents were asked to rate their HA experiences on 18 items, using a three-point Likert scale: Dissatisfied, Neutral, and Satisfied. The au-
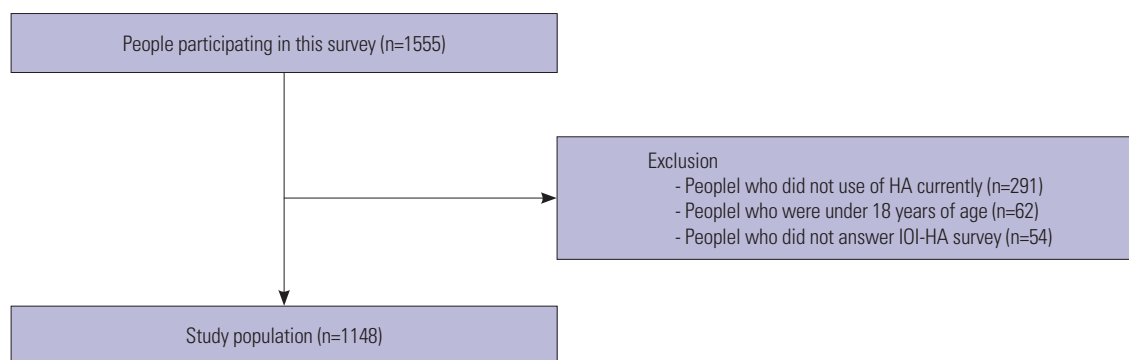

Fig. 1. Flow chart of participants. HA, hearing aid; IOI-HA, International Outcome Inventory for Hearing Aids.

Table 1. Factors Influencing HA Satisfaction

Variable	Crude estimate (95% CI)	*p* value	Adjusted estimate (95% CI)	*p* value
Domain 1: Demographic				
Age	-0.04 (-0.06, -0.03)[†]	<0.01[†]	-0.03 (-0.06, -0.01)[†]	<0.01[†]
Sex		0.14[†]		0.27
Male	Reference		Reference	
Female	0.37 (-0.12, 0.87)		0.31 (-0.24, 0.85)	
Level of education		<0.01[†]		<0.01[†]
Middle school graduate or below	0.65 (0.02, 1.28)[†]		1.21 (0.50, 1.92)[†]	
High school graduate	Reference		Reference	
University graduate	1.18 (0.49, 1.87)[†]		0.48 (-0.30, 1.26)	
Household income (monthly)		<0.01[†]		0.22
<$1000	Reference		Reference	
$1000–$5000	0.48 (-0.10, 1.07)		0.34 (-0.35, 1.04)	
>$5000	1.33 (0.46, 2.20)[†]		0.86 (-0.23, 1.95)	
Job		<0.01[†]		0.29
Office job	1.02 (0.20, 1.83)		0.26 (-0.71, 1.24)	
Blue-collar job	Reference		Reference	
Unemployed	-0.53 (-1.14, 0.07)		-0.22 (-0.90, 0.46)	
Other	-1.09 (-1.79, -0.39)		-0.84 (-1.82, 0.14)	
Domain 2: Purchase of HA				
Reason for HA purchase		0.32		0.07
Hearing loss	Reference		Reference	
Tinnitus	-0.41 (-2.17, 1.34)		-0.17 (-1.97, 1.63)	
No reason	1.88 (-0.21, 3.98)		2.68 (0.55, 4.81)	
Other	-0.17 (-1.19, 0.86)		-0.48 (-1.60, 0.65)	
Place of purchase		0.38		0.11
Hospital	Reference		Reference	
HA center	0.13 (-0.45, 0.70)		0.15 (-0.64, 0.93)	
Etc.	1.46 (-0.62, 3.53)		2.32 (0.14, 4.51)	
Persons consulted for HA		0.75		0.91
Hospital workers	Reference		Reference	
HA center workers	0.13 (-0.45, 0.70)		0.07 (-0.94, 1.07)	
Other	1.46 (-0.62, 3.53)		0.48 (-1.66, 2.63)	
Purchase price*		<0.01[†]		<0.01[†]
Less expensive	Reference		Reference	
Reasonable	1.65 (0.63, 2.67)[†]		1.50 (0.44, 2.56)[†]	
More expensive	1.72 (0.63, 2.81)[†]		0.85 (-0.36, 2.06)	
Payment		0.52		0.21
User	Reference		Reference	
Family	0.21 (-0.32, 0.75)		0.37 (-0.22, 0.96)	
Other	0.49 (-0.51, 1.49)		0.80 (-0.24, 1.85)	
Government subsidy		0.47		0.66
No	Reference		Reference	
Yes	-0.08 (-0.58, 0.43)		0.08 (-0.51, 0.67)	
Unknown	0.69 (-0.52, 1.90)		0.67 (-0.77, 2.11)	
Number of HAs purchased (n=1020)	0.32 (0.19, 0.46)[†]	<0.01[†]	0.12 (-0.04, 0.29)	0.14
Duration of previous HA use (yr)		0.02[†]		0.07
≤1	Reference		Reference	
2–3	0.62 (-0.27, 1.50)		0.57 (-0.32, 1.46)	
4–5	1.18 (0.55, 2.77)[†]		0.69 (-0.21, 1.59)	
6–7	1.66 (0.55, 2.77)[†]		1.38 (0.25, 2.51)[†]	
≥8	1.57 (0.44, 2.71)[†]		1.10 (-0.05, 2.26)	

Table 1. Factors Influencing HA Satisfaction (continued)

Variable	Crude estimate (95% CI)	*p* value	Adjusted estimate (95% CI)	*p* value
Domain 3: Use of HA				
Bilateral amplification		<0.01[†]		<0.01[†]
No	Reference		Reference	
Yes	1.30 (0.81, 1.79)		1.23 (0.63, 1.82)[†]	
Style of HA		0.44		0.07
CIC	Reference		Reference	
ITC/ITE	-0.44 (-1.05, 0.16)		-0.74 (-1.38, -0.11)	
RIC	-0.55 (-1.21, 0.11)		-0.58 (-1.33, 0.17)	
BTE	-0.55 (-1.57, 0.48)		-1.21 (-2.29, -0.13)	
Wearing time (hours/day) (n=1124)	0.31 (0.25, 0.37)	<0.01[†]	0.28 (0.21, 0.36)[†]	<0.01[†]
Remote accessories		0.34		0.54
No	Reference		Reference	
Yes	0.03 (-0.70, 0.76)		-0.44 (-1.21, 0.34)	
Domain 4: Maintenance of HAs				
Place of post-purchase service		0.62		0.63
Hospital	Reference		Reference	
HA center	0.28 (-0.35, 0.90)		0.45 (-0.53, 1.43)	
Other	0.41 (-0.61, 1.43)		0.23 (-1.09, 1.55)	
Post-purchase service manager		0.11		0.15
Hospital workers	Reference		Reference	
HA-related worker	0.25 (-0.95, 1.46)		0.93 (-0.32, 2.18)	
Other	-1.78 (-4.02, 0.46)		-0.55 (-3.04, 1.94)	
HA fitting and fine tuning on a regular basis		<0.01[†]		<0.01[†]
No	Reference		Reference	
Yes	1.38 (0.58, 2.18)		1.71 (0.87, 2.54)	
Number of HA fittings and fine tuning services		0.52		0.18
1	Reference		Reference	
2	0.52 (-0.69, 1.73)		0.68 (-0.76, 2.11)	
3–5	0.33 (-0.76, 1.42)		0.08 (-1.25, 1.42)	
6–10	0.43 (-0.83, 1.69)		-0.38 (-1.86, 1.09)	
≥11	0.53 (-0.88, 1.94)		-0.58 (-2.24, 1.08)	

BTE, behind-the-ear; CIC, completely-in-the-canal; HA, hearing aid; ITC, in-the-canal; ITE, in-the-ear; RIC, receiver-in-the-canal; CI, confidence interval.
*Statistical analysis regarding "purchase price" was conducted based on the participants' responses for reasonable and actual purchasing price of HAs. Three categories ($1000–$2500, $2500–$4000, and >$4000) were available for the reasonable price item in the questionnaire. The participants' actual purchasing price was compared to their response for the reasonable price to determine whether the purchase price is less expensive, reasonable, or more expensive; [†]*p*<0.05.

thors also investigated the intention to use HAs again among HA non-users, and the answers elicited binary (yes/no) responses.

Data collection

Data was collected for 15 months, from August 2019 to October 2020, after obtaining approval from the Institutional Review Board (IRB) of Samsung Medical Center (No.2019-06-116). The face-to-face survey was conducted nationwide by hearing healthcare professionals.

Statistical analysis

The collected data were analyzed using SAS 9.4 (SAS Institute, Cary, NC, USA) and Stata 14 (Stata Co., College Station, TX, USA). Factors influencing HA satisfaction were confirmed through multivariable linear regression analysis. Variables

with a *p*-value less than 0.15 in univariable analysis were considered for inclusion in a multivariable model to present adjusted β coefficients with 95% confidence intervals.[11] In addition, descriptive analysis was used for investigating HA satisfaction in daily life. Finally, among HA non-users, intent to use HAs again was asked.

RESULTS

Factors influencing hearing aid satisfaction

In univariable analysis, variables with a *p*-value less than 0.15 were age, sex, level of education, household income, job, purchase price, number of purchased HAs, duration of previous HA use, bilateral amplification, wearing time, post-purchase service manager, and HA fitting and fine tuning on a regular

basis. After adjusting for significant factors in univariate analysis, multivariate analysis showed that age, level of education, purchase price, bilateral amplification, wearing time, and HA fitting and fine tuning on a regular basis were significant factors for HA satisfaction. As age increased by 1 year, people's satisfaction with their HA decreased by 0.03 (β=-0.03, p<0.01). In terms of level of education, the middle school graduate or below group was 1.21 times more likely to be satisfied with their HAs compared to the high school graduate group (β=1.21, p<0.01). HAs purchased at a reasonable price were 1.50 times more likely to satisfy their users than those purchased at a cheaper price (β=1.50, p<0.01), and HAs with bilateral amplification were 1.23 times more likely to satisfy their users than those with unilateral amplification (β=1.23, p<0.01). For each

hour that wearing time increased, satisfaction with the HA increased by 0.28 (β=0.28, p<0.01). With relation to HA fitting and fine tuning on a regular basis, those with a "Yes" response were 1.71 times (β=1.71, p<0.01) more likely to be satisfied with their HAs than those with a "No" response.

Satisfaction with sound quality

The three items that measure satisfaction with sound quality were clarity of sound, naturalness of sound, and comfort with loud sounds. Among these, HA users had the highest level of satisfaction with the clarity of sound (53.5%). Five hundred users (44.2%) were satisfied with the natural sound of their HA, and 368 (32.5%) consumers felt comfortable with loud sounds with their HA (Fig. 2).
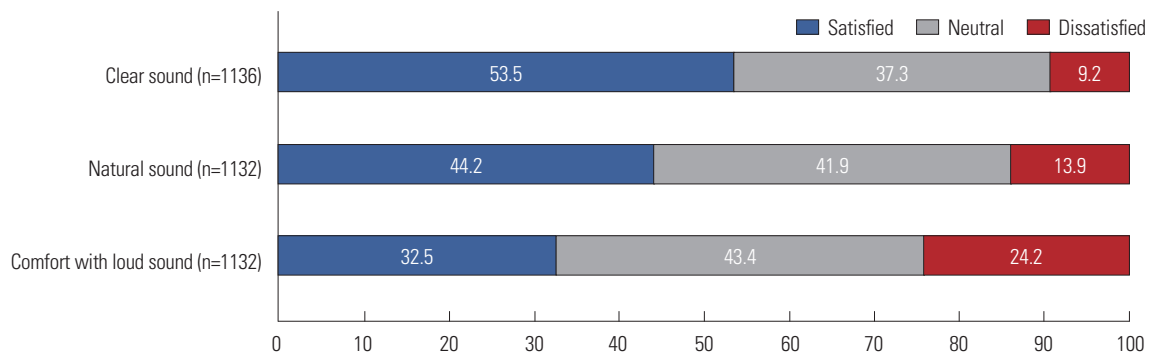

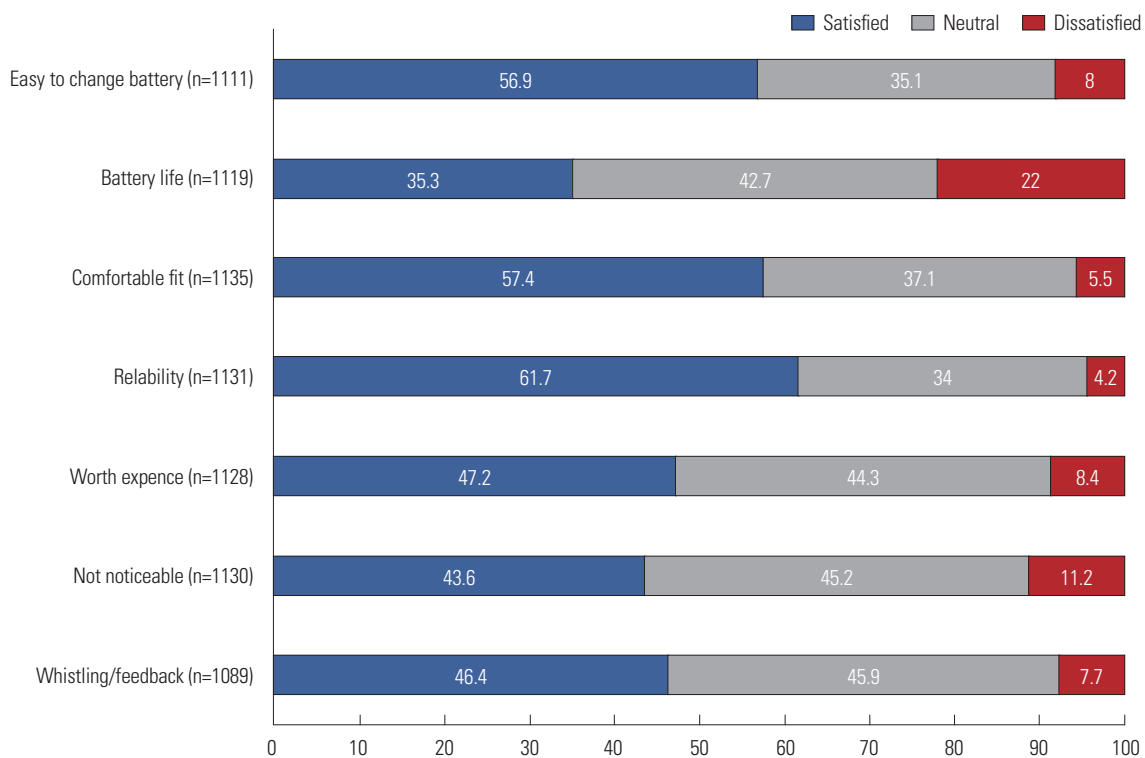**Fig. 2.** Satisfaction with hearing aid sound quality.

Fig. 3. Satisfaction with hearing aid features.

Satisfaction with hearing aid features

Fig. 3 shows user ratings on seven items related to HA features. In order of rank, HA users were most satisfied with these features: 1) reliability of the HA (61.7%), 2) comfortable fit (57.4%), 3) easy-to-change battery (56.9%), 4) worth expense (47.2%), 5) whistling/feedback (46.4%), 6) inconspicuousness (43.6%), and 7) battery life (35.3%).

Satisfaction in various listening situations

Fig. 4 shows satisfaction ratings in eight listening situations. The three highest-rated listening situations were talking in a quiet place (72.8%), talking with family at home (58.4%), and talking on the phone (43.9%). The three lowest-rated situations were talking where echoic (23.1%), large group talk (28.9%), and outdoors (27.3%).

Reasons for not using a hearing aid

Forty people who no longer used HAs also responded with their reasons for not using their HAs. The top two reasons were as follows: HA does not work in noisy places (65%) and it was uncomfortable (40%). Furthermore, 28 out of 37 (75.7%) respondents said they intended to use their HA again.

DISCUSSION

In the study, the subjects' age, level of education, HA purchase price, bilateral amplification, wearing time, and HA fitting and fine tuning on a regular basis significantly influenced HA satisfaction. In addition, the authors observed that the most satisfactory factors were clarity of sound (53.5%), trust in their HA (61.7%), and listening in a quiet listening environment (72.8%) in the domains of sound quality, HA features, and listening environments, respectively.

Within the demographic domain, HA users with lower levels of education were more likely to be satisfied with their HAs. One possible reason for the higher HA satisfaction seen among older users is the large number of elderly people with hearing impairments. Actually, the most common type of hearing loss is age-related hearing loss.[12] However, the relationship between age and HA satisfaction was different from study to study. Mulrow, et al.[13] claimed that lower age was associated with higher satisfaction with HAs. In addition, Hosford-Dunn and Halpern[14] reported that younger HA users had a higher level of satisfaction compared to elderly users. Regarding the level of education, the middle school graduate or below group showed significantly higher HA satisfaction compared to the high school graduate group. This finding was consistent with a study conducted in South Korea.[9] A previous study reported that the satisfaction rate for the HA was significantly higher in the lower education group compared to the higher education group. They interpreted that the higher education group tended to require more medical services. However, greater expectations on HAs could result in more significant disappointment.

Regarding the HA purchase domain, the price of HAs was identified as the only factor involved in HA satisfaction. Inter-
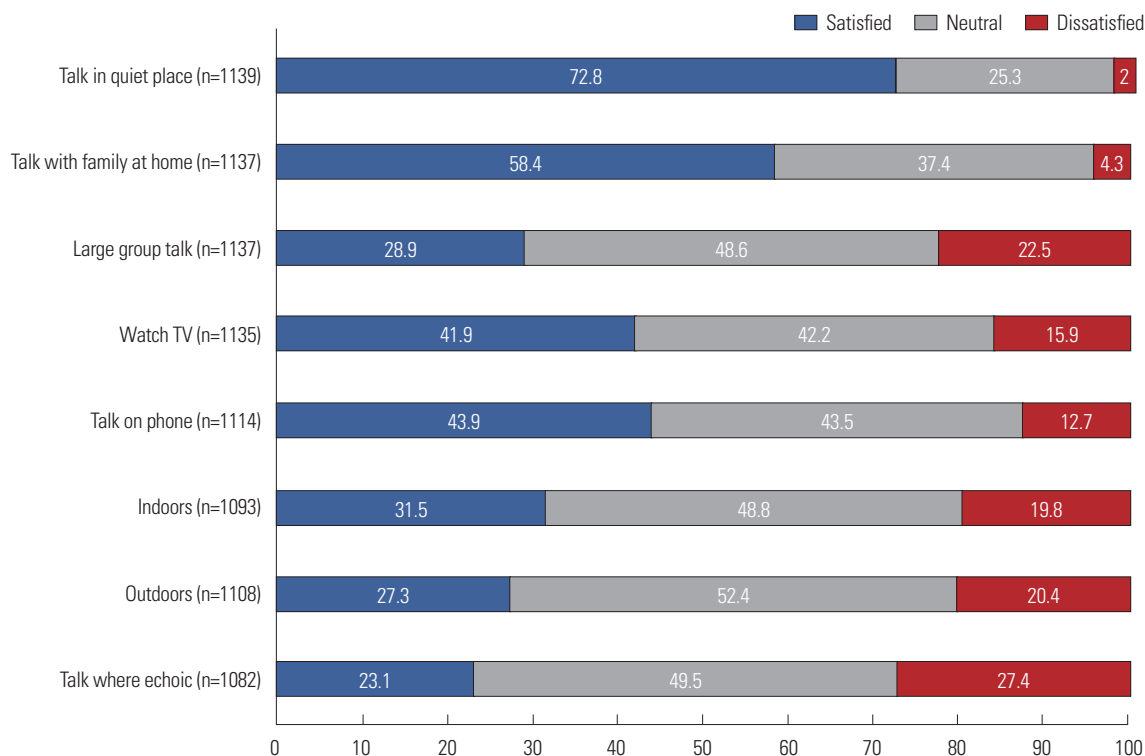

Fig. 4. Satisfaction with hearing aid in various listening situations.

estingly, people who bought HAs at a reasonable price were 1.5 times more satisfied than those who bought cheaper HAs. Low pricing can make the user more aware of its quality in general, and they may be more likely to identify faults or potential shortcomings. This is problematic regarding people's satisfaction, contributing to the belief that what they are buying is not particularly special or valuable. On the other hand, a price that is neither too high nor too low sends a positive message to the user about the quality of the product and the value of their purchase. Furthermore, the MarkeTrak VIII survey found that the value factor (performance of the HA relative to price) was the third-highest correlated factor with overall HA satisfaction.[5]

In terms of the HA use domain, binaural amplification had a 1.23 times higher satisfaction rate than that of unilateral. Binaural fitting showed a bigger benefit when listening in the presence of background noise.[15,16] This is because when the HA is fitted binaurally, more gains will be provided than with monaural hearing, as the two ears are being stimulated simultaneously. Besides, binaural HA users were about 15% more satisfied with their ability to tell the direction of sounds (localization) than those wearing a single HA.[17] The ability to localize the sound source is important in daily communication situations. Therefore, it is a beneficial HA feature for individuals who have hearing loss in both ears but only wear the HA in one ear and for those who are not satisfied with HAs.

In addition, the longer the use time, the higher people's satisfaction was with their HA. There have been many reports showing that the HA use time was associated with satisfaction.[15,16] On the other hand, it can be interpreted that subjects with higher level of satisfaction tended to use their HA for a longer period. This implies that incremental improvements in other satisfaction factors will drive longer wearing times.

With respect to the HA maintenance domain, there were no differences in HA satisfaction depending on the management location, institution, or hearing healthcare professionals. However, those who received HA fitting and fine tuning on a regular basis were 1.71 times more satisfied with their devices than those who did not. Many hearing healthcare professionals have emphasized the importance of counseling and management for HAs. Expert consultation on the use and management of HA leads to a lower HA return rate.[18] In addition, users who regularly receive HA counseling have a significantly reduced hearing handicap.[19] In the study, there was no statistical correlation between the number of fittings and satisfaction, which means that regular and steady management is more important than the number of fittings itself.

The authors also descriptively analyzed HA satisfaction in terms of sound quality, features, and various listening situations. In the results of the survey on sound quality, 53.5% of the respondents were satisfied with the clarity of sound, but only 32.5% were satisfied with the level of comfort while listening to loud sounds. This showed a similar pattern to the MarkeT-

rak VIII results, but there was a difference in its content. In particular, in this survey, there were considerably more groups who provided a neutral response than those who clearly expressed satisfaction or dissatisfaction, which is believed to be due to racial and social differences. However, due to the narrow dynamic range, the discomfort caused by loud sound amplification is still a point to be improved in HAs.

Regarding HA features, the top three most satisfactory factors were people's trust in their HAs, comfortable fit, and convenience of battery exchange. However, a significant number of users expressed dissatisfaction with the battery life. A previous survey also showed that battery life was one of the most unsatisfactory factors.[16] Recently, many patients have begun using rechargeable HAs. The latest released rechargeable HA can be used for about 24 hours after being fully charged. This leads us to believe that the battery problem will be solved spontaneously in the future with increased use of rechargeable HAs over time.

Predicting HA satisfaction in various listening environments is straightforward. A high rate of users (72.8%) reported satisfaction in quiet situations.[5-7] However, fewer than 30% of the respondents were satisfied with the ability of their HA to improve communication in noisy or echoic situations.[6,7]

Finally, the authors asked 40 people why they stopped using their HAs. With multiple choices being possible, 65% of the respondents answered that their HAs ended up in a drawer because the background noise was annoying and distracting. This finding was in line with our results mentioned above. One or more of the following HA features can help with background noise: digital signal processing that is able to differentiate between speech and noise; directional microphones; an FM system that picks up a speaker's voice and transmits the sound directly to a listener's ear; and wireless assistive microphone devices that stream with Bluetooth or near-field magnetic induction technology. The HA user should take full advantage of these features.

This study is significant in that it is a large-scale multi-center research to comprehensively examine the factors influencing HA satisfaction in South Korea. In the future, if a survey were to be conducted on a regular basis, the authors may be able to identify trends in HA use and satisfaction over time. In addition, this data will provide helpful information that could lead to the successful rehabilitation of hearing loss with HAs. Furthermore, the authors suggest a joint research project for the Asian region.

In conclusion, this study is significant in that it is a large-scale multi-center research to comprehensively examine the factors influencing HA satisfaction in South Korea. This data will provide helpful information that could lead to the successful rehabilitation of hearing loss with HAs.

AVAILABILITY OF DATA AND MATERIAL

The data that support the findings of this study are available from the Samsung Medical Center, but restrictions apply to the availability of these data, which were used under approval for the current study, and so are not publicly available.

AUTHOR CONTRIBUTIONS

Conceptualization: all authors. Data curation: Ga-Young Kim, Young Sang Cho, and Jihyun Lim. Formal analysis: Jihyun Lim. Investigation: Hye Min Byun and Jin Gyun Park. Methodology: all authors. Project administration: Ga-Young Kim, Young Sang Cho, and Hye Min Byun. Software: Jihyun Lim. Supervision: Jin Gyun Park and Il Joon Moon. Validation: Ga-Young Kim and Young Sang Cho. Visualization: Ga-Young Kim and Young Sang Cho. Writing—original draft: Ga-Young Kim and Young Sang Cho. Writing—review & editing: all authors. Approval of final manuscript: all authors.

ORCID iDs

Ga-Young Kim   https://orcid.org/0000-0002-8945-4927
Young Sang Cho   https://orcid.org/0000-0002-4040-7206
Hye Min Byun   https://orcid.org/0000-0001-7402-7773
Hye Yoon Seol   https://orcid.org/0000-0002-7040-1884
Jihyun Lim   https://orcid.org/0000-0002-0318-9334
Jin Gyun Park   https://orcid.org/0000-0002-3904-5850
Il Joon Moon   https://orcid.org/0000-0002-3613-0734

REFERENCES

1. United Nations. World population prospects 2019 [Internet] [accessed on 2021 April 16]. Available at: https://population.un.org/wpp/.
2. Lin FR, Niparko JK, Ferrucci L. Hearing loss prevalence in the United States. Arch Intern Med 2011;171:1851-2.
3. World Health Organization. Deafness and hearing loss [Internet] [accessed on 2021 April 16]. Available at: https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss.
4. Moon IJ, Baek SY, Cho YS. Hearing aid use and associated factors in South Korea. Medicine (Baltimore) 2015;94:e1580.
5. Kochkin S. MarkeTrak VIII: consumer satisfaction with hearing aids is slowly increasing. Hear J 2010;63:19-20.
6. Powers TA, Rogin CM. MarkeTrak 10: hearing aids in an era of disruption and DTC/OTC devices. Hear Rev 2019;26:12-20.
7. Jorgensen L, Novak M. Factors influencing hearing aid adoption. Semin Hear 2020;41:6-20.
8. Hougaard S, Ruf S. EuroTrak [Internet] [accessed on 2021 April 16]. Available at: https://www.hearingreview.com/hearing-products/amplification/assistive-devices/eurotrak.
9. Chang YS, Choi J, Park GY, Youm HY, Byun HY, Cho YS. Evaluation of satisfaction with hearing aids using a questionnaire based on MarkeTrak survey. Korean J Otorhinolaryngol-Head Neck Surg 2014;57:304-13.
10. Chu H, Cho YS, Park SN, Byun JY, Shin JE, Han GC, et al. Standardization for a Korean adaptation of the international outcome inventory for hearing aids: study of validity and reliability. Korean J Otorhinolaryngol-Head Neck Surg 2012;55:20-5.
11. Hosmer DW, Lemeshow S. Applied logistic regression. New York: John Wiley & Sons, Inc.; 1989.
12. Michels TC, Duffy MT, Rogers DJ. Hearing loss in adults: differential diagnosis and treatment. Am Fam Physician 2019;100:98-108.
13. Mulrow CD, Tuley MR, Aguilar C. Correlates of successful hearing aid use in older adults. Ear Hear 1992;13:108-13.
14. Hosford-Dunn H, Halpern J. Clinical application of the SADL scale in private practice II: predictive validity of fitting variables. Satisfaction with amplification in daily life. J Am Acad Audiol 2001;12:15-36.
15. Bertoli S, Staehelin K, Zemp E, Schindler C, Bodmer D, Probst R. Survey on hearing aid use and satisfaction in Switzerland and their determinants. Int J Audiol 2009;48:183-95.
16. Brooks DN, Bulmer D. Survey of binaural hearing aid users. Ear Hear 1981;2:220-4.
17. Kochkin S. MarkeTrak V: consumer satisfaction revisited. Hear J 2000;53:1-8.
18. Northern J, Meadows-Beyer C. Reducing hearing aid returns through patient education. Audiol Today 1999;11:10-3.
19. Brooks DN. Use of post-aural aids by National Health Service patients. Br J Audiol 1981;15:79-86.