Factors associated with hearing aid outcomes including social networks, self-reported mental health and service delivery models

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ABSTRACT

Purpose: This study aims to identify and describe factors that influence hearing aid outcomes including social networks, self-reported mental health and service delivery models.

Methods: A prospective cross-sectional online survey was sent to hearing aid users recruited through an online platform (www.hearingtracker.com) between October and November 2021. The survey contained questions on patient demographics, audiological, general health and social factors, and self-reported hearing aid outcomes using the International Outcome Inventory for Hearing Aids (IOI-HA). Regression models evaluated potential contributing factors of hearing aid outcomes on the IOI-HA.

Results: 398 hearing aid users completed the survey with an average age of 66.6 (13. SD) years of which 59.3% were male. Positive contributing factors of hearing aid outcomes (IOI-HA total score) were social network of people with hearing loss with hearing aids ($p<0.010$; 0.03 Exp B [0.01, 0.1 95% CI]), self-reported mental health ($p< 0.05$; 0.6 Exp B [0.01, 1.2 95% CI]), work situation ($p<.001$, 1.9 Exp B [0.7, 2.8 95% CI]), quality of life ($p<.005$; 1.2 Exp B [0.3, 1.1 95% CI]) and self-reported hearing difficulty ($p<.02$; 0.8 Exp B [0.2, 1.5 95% CI]). Negative contributing factors of hearing aid outcomes included social networks of people with hearing loss without hearing aids ($p<.001$; -0.1 Exp B [-0.3, 0.1 95% CI]) and service delivery model of private or university clinic compared to big box retailers ($p<.003$; Exp B [-2.6, 0.5 95% CI]).

Conclusion: Novel factors including social network of persons with hearing loss who use hearing aids, self-reported mental health, service delivery model and work situation are significant contributors to hearing aid outcomes. These newly identified factors can inform public hearing health promotion and individualized audiological care to optimize hearing aid outcomes.

KEYWORDS

Hearing loss, Hearing aid, Outcomes, Use, Benefit, Satisfaction

INTRODUCTION

Hearing loss affects more than 1.5 billion people globally of which 430 million can benefit from appropriate intervention (World Health Organization, 2021). In the US more than 30 million persons have bilateral hearing loss and could benefit from amplification (Lin et al., 2011). Hearing aids are the most common treatment with demonstrated effectiveness for improved hearing and communication (Ferguson et al., 2019). Apart from improvement in hearing and communication, hearing aids have been shown to reduce the psychological impact of hearing loss on individuals diagnosed with hearing loss including decreased depression (Tsimpida et al., 2022). Additionally, studies have shown that individuals with hearing loss who use hearing aids experience improved quality of life and report better overall health status (Ferguson et al., 2019). A meta-analysis by Chisolm et al (2007) also confirmed the benefits of hearing aids in improving health related quality of life (HRQoL) through limiting the effect of hearing loss on psychological, social, and emotional well-being of hearing aid users.

Ensuring optimal hearing aid outcomes is increasingly important to researchers, clinicians, civil organizations, and hearing aid manufacturers. Influenced by the increasing prevalence of hearing loss, costs of unaddressed hearing loss and the required public health investment to improve access to hearing health care, the importance of supporting optimal hearing aid outcomes is a health priority (World Health Organization, 2021). Additionally, hearing aid outcomes have been measured to demonstrate the efficacy of treatment, provide evidence for third-party payment, carry out cost-benefit analyses, and justify resource allocation (Saunders et al., 2005). Clinically, hearing aid outcomes can be measured using objective (e.g., hearing aid use through data logging), behavioral (e.g., hearing aid benefit measures through speech testing with and without hearing aids) and/or self-reported measures (i.e., standardized patient-reported outcome measures [PROMs]). These outcome measures quantify the results of the intervention, with self-assessment tools focusing on the quantification of behavior in the psychological system including benefit and satisfaction (Bray & Nilsson, 2002). Self-reported measures of hearing aid outcomes such as benefit and satisfaction are positively associated with hearing aid use; indicating an increasing use of hearing aids by those benefiting from and satisfied with hearing aids (Gurjit et al., 2015; Houmøller et al., 2021; Wang et al., 2021).

Hearing aid outcome measures of use, benefit and satisfaction are included in widely used standardized PROMs such as Abbreviated Profile of Hearing Aid Benefit (APHAB), Satisfaction with Daily Amplification (SADL) and the International Outcome Inventory for Hearing Aids (IOI-HA). The IOI-HA is a widely used self-reported scale of hearing aid outcomes (Cox & Alexander, 2002) which consists of seven questions (Cox & Alexander, 2002; Cox et al., 2003). Apart from advantages such as ease of use and time efficiency; the IOI-HA scale covers a wide range of hearing aid outcome indicators through its items covering seven domains including 1) Daily use; 2) Benefit; 3) Residual activity limitations; 4) Satisfaction; 5) Residual participation restrictions; 6) Impact on others and 7) Quality of life.

Several studies have examined audiological factors influencing hearing aid outcomes, focusing mostly on hearing aid use, benefit and satisfaction (Aazh et al., 2015; Arnold et al., 2019; Wu et al., 2019). In a cross-sectional study of 1653 hearing aid users by Hickson et al. (2010), hearing aid attributes of fit/comfort, clarity of tone and sound, and comfort with loud sounds were identified as determinants of outcomes measured on the IOI-HA. More recently, a cross-sectional study of 235 hearing aid users by Wang et al. (2021) identified audiological factors such as word recognition score and daily hearing aid use which accounts for 17.1% and 8.1% of hearing aid outcomes, respectively and non-audiological factors such as the price of the hearing aid and age which accounts 4.2% and 1.6% of the hearing aid outcomes, respectively.

Established contributing factors of hearing aid use, benefit and satisfaction include factors like the hearing loss severity which have been reported to have mixed associations of negative, positive and no association with the hearing aid outcomes (Arnold et al., 2019; Tognola et al., 2019; Meyer et al., 2014). Other factors like higher word recognition score (WRS) have been positively associated with improved hearing aid use, benefit and satisfaction (Houmøller et al., 2021). Non-audiological factors are also associated with outcomes. For example, higher purchase price of hearing aids has been positively associated with hearing aid outcomes and more hearing aid problems are negatively associated with hearing aid outcomes (Wang et al., 2021; Bennett et al., 2020).

More recently, studies have looked at new factors that have not been investigated previously. For example, Giuliania (2021) showed that an active neurological disorder that contributes to mental health is a negative determinant of hearing aid use. Another recent clinical trial by Humes et al. (2017) demonstrated that service delivery models including audiology best practices and direct-to-consumer models did not show any significant differences in hearing aid satisfaction. These recent studies highlight the importance of investigating unexamined factors that are potential contributors to hearing aid outcomes. The current study therefore aimed to extend existing evidence on factors influencing hearing aid outcomes by investigating factors such as social networks, self-reported mental health and service delivery models that have limited or no evidence to date.

METHOD

Study Design

The study used a cross-sectional survey design as part of a larger survey aimed at examining the language used by hearing aid users in describing their experiences (Swanepoel et al., 2022). Ethical approval (IRB-FY21-248) was obtained from the respective institution review boards (IRB-FY21-248, HUM009/0622). All participants completed an informed consent (supplementary material 1) form before completing the online survey.

Participants

The study includes 398 hearing aid users recruited using a convenience sample from the Hearing Tracker (www.hearingtracker.com) database. Hearing Tracker is a website that provides comprehensive and up-to-date information about hearing instruments and services to consumers (Manchaiah et al., 2020). Participants from the Hearing Tracker community are hearing aid users who have signed up to receive up-to-date information on hearing instruments on the hearing tracker platform. Any interested hearing aid user based in the United States of America may join the hearing tracker community. An email with the study invitation and a link to the survey was sent out to the Hearing Tracker membership database. The link was sent to groups of hearing aid users who are active on the hearing tracker platform. A reminder email was sent a week later to the potential participants. To confirm that they are hearing aid users, the survey (supplementary material 1) had an item confirming the nature of their hearing aid fitting (ie. unilateral and bilateral). This study excluded hearing aid users who are not part of the hearing tracker community, contributing to potential sample bias and limitations in generalizing the study results.

Survey

An online survey was sent to Hearing Tracker members via the Qualtrics platform during October and November 2021. The survey contained questions on 1) demographic 2) audiological variables; 3) self-reported hearing aid outcomes; 4) general health, 5) self-reported mental health and 6) social network information. Demographic items included age, gender, race, ethnicity, work situation, education level, household income and living arrangement. In this study, work situation refers to the participant's current state of employment and consists of the following employment status options; retired, out of work and employed.

Audiological items included self-reported hearing difficulty, duration of hearing loss, duration before hearing aids were obtained after the patient started noticing hearing problems, monaural or binaural fitting, hearing aid style (in the ear or behind the ear), hearing aid brand, and service delivery model. For the self-reported hearing aid benefit and satisfaction measure, the IOI-HA (Cox & Alexander, 2002) outcome tool was used. The IOI-HA consists of seven items which were scored using a 5-point Likert scale, with a score of five indicating the best result and a score of one indicating the worst. Thus, a higher score on each question as well as on the total score was indicative of a better outcome (Cox & Alexander, 2002).

General social networks were defined as the number of people in households, children, close friends and grandchildren. Social network related to hearing loss and hearing aids which was divided into two categories, (i) social networks of people with hearing loss and no hearing aids and (ii) social networks of people with hearing loss with hearing aids, indicating the number of known people with hearing loss with and without hearing aids, respectively. Self-reported mental health in the context of this study represents the general status of self-reported mental well-being.

Data Analysis

Survey data were extracted from the Qualtrics platform into Microsoft Excel. The data screening process included identifying (i) missing values and (ii) unconsented responses. The following responses were excluded: participants who did not provide consent (n=23); participants who had only an implantable device(s) (e.g., cochlear implants, bone anchored hearing devices; n=3); participants who did not have the conventional type of hearing aids but used direct-to-consumer devices such as Personal Sound Amplification Products (PSAP) (n=14). After the elimination of participants who had incomplete data, the remaining 398 participants were included in the data analysis. All statistical analyses were completed in SPSS (IBM Corporation, v 28).

Assumption testing was conducted, with the results indicating a violation of the assumptions of normality, linearity and homogeneity of variance for some demographic variables. As such, seven ordinal regression models were built for each of the IOI-HA items, item 1 to 7 (ordinal variables) and one quantile regression model was built for the IOI-HA total score (continuous variable) as the dependent variable. The independent (contributing factor) variables included demographic variables (i.e., age, gender, race, ethnicity, work situation, education level, living arrangement, household income), audiological variables (i.e., self-reported hearing difficulty, duration before hearing aid purchased, type of hearing aid service delivery model), social network variables (i.e., general social networks and social networks related to hearing loss and hearing aids), self-reported general health, self-reported mental health and quality of life.

To explore how well a model fits, the final model (i.e., the model with only significant contributing factors) was compared to the null model. For ordinal regression models, the omnibus test uses a likelihood ratio Chi-square test (χ^2) (Tallirida & Murray, 1987) to compare the final model against the thresholds-only model with a p-value less than 0.05 indicating a statistically significant improvement. For models IOI-HA1 to IOI-HA7, the results were as follows: χ^2 values =34.418, 49.650, 81.786, 58.600, 93.540, 52.357, and 47.333 with all p-values < 0.001. For quantile regression models, the model quality is assessed by comparing the mean absolute error (MAE) of the final model to that of the intercept-only model (Hodson, 2022). A lower MAE shows improvement, and for this study, there was a 6.26% reduction in error as the MAE lowered from 3.357 to 3.148 from the intercept-only model to the final model (supplementary material 2). It should be noted that some practitioners interpret the pseudo R^2 to determine the quality of quantile regression models; however, this was not done for this study since researchers (Gomez-Cravioto et al., 2022; Kurzawa & Lira, 2015) have pointed out that pseudo R^2 values cannot be interpreted as R^2 values from classical linear regression and, accordingly, we considered the percentage reduction of the MAE to assess model quality**.**

RESULTS

Demographics of the Study Sample

398 hearing aid users completed the survey with an average age of 66.7 (13 SD) years. On average, participants had hearing loss for 24 (18.6 SD) years and spent 6.9 (11.3 SD) years before the purchase of hearing aids. Most participants were male (59.3%) and white (87.7%) (Table 1). The average number of general social networks participants had was 12 (SD 8.2) people. Participants on average reported knowing 3.5 (SD 6.9) people with hearing loss with no hearing aids and 9 (SD 18) people with hearing loss with hearing aids.

Contributing Factors of Hearing Aid Outcomes

Self-reported hearing difficulty, self-reported mental health, quality of life and social networks (with HL and HA) were significant positive contributing factors of IOI-HA total score (Table 2; 8. IOI-HA total score). The *service delivery model* and *social network for HL and no HA* were significant negative contributing factors of IOI-HA total score (Table 2; 8. IOI-HA total score). With regards to *service delivery model*, participants who received hearing health care services from a private clinic or university obtained an IOI-HA total score that was 1.573 less on average than participants who received hearing health care services through the service delivery model of warehouse (e.g., big box retailers such as Costco).

Table 1: Demographic variables of study participants (n=398)

Continuous variables	**Mean**	**SD**
Age	66.6	13. 0
HL duration (in yrs)	24.0	18.6
Duration before HA (in yrs)	6.9	11.3
General social networks	12.0	8.2
Social network (related to HL and HA)		
Social networks (HL no HA)	3.5	6.9
Social Networks (HL with HA)	9. 0	18. 0
Categorical variables	**N**	**%**
Gender		
Female	162	40.7%
Male	236	59.3%
Race		
Other	49	12.3%
White	349	87.7%
Ethnicity		
Non-Hispanic or Latino	382	96.0%
Hispanic or Latino	16	4.0%
Work Situation		
Retired	247	62.1%
Out of work	18	4.5%
Employed	133	33.4%
Education level		
University degree	298	74.9%
Some college but not degree	78	19.6%
High school or less	22	5.5%
Household Income		
$150,000 or more	74	18.6%
$100,000-$149,000	102	25.6%
$50,000-$99,999	139	34.9%

$25,000-$49,999	57	14.3%
Under $25,000	26	6.5%
Living arrangement		
On my own	67	16.8%
With spouse/partner	274	68.8%
With my family or with a friend	57	14.3%

Table 2: Significant contributing factors ($p<0.05$) of hearing aid outcomes based on the ordinal regression models for IOI-HA 1-7 and a quantile regression model for IOI-HA total score

IOI-HA Item	Significant contributing factors	*P*-value	Exp B (95% CI)
1 Daily use (1)	Quality of life (+)	0.001	1.9 (1.3, 2.7)
	Hearing loss duration (+)	0.001	1.9 (1.3, 2.7)
	Self-reported hearing difficultly (-)	0.036	0.6 (0.4, 0.9)
	Uni-Bil hearing aid fitting (-)	0.049	2.4 (0.9, 5.9)
2. Benefit (2)	Service delivery (+)	0.003	1.8 (1.2, 2.7)
	Quality of life (+)	<0.001	1.6 (1.3, 2.2)
	Work Situation (-)	<0.001	0.4 (0.3, 0.7)
	Social networks (HL no HA) (-)	0.002	0.95 (0.9, 1.0)
	Social networks (HL with HA) (+)	0.001	1.02 (1.01, 1.04)
3. Residual activity limitations (3)	Social networks (HL no HA) (-)	0.004	0.95 (0.9, 1.0)
	Social Networks (HL with HA) (+)	0.032	1.008 (1.0, 1.013)
	Self-reported hearing difficulty (-)	<0.001	2.1 (1.6, 2.7)
	Service delivery model (-)	0.044	1.5 (1.0, 2.2)
	Age (-)	0.010	0.98 (0.96, 0.1.0)
	Mental Health (-)	0.009	1.3 (1.0, 1.6)
	Race (-)	0.047	1.9 (1.0, 3.4)
	Living Arrangement	0.037	0.5 (0.2, 0.6)
4. Satisfaction (4)	Quality of life (+)	<0.001	1.9 (1.4, 2.5)
	Social Networks (HL with HA) (+)	0.028	1.015 (1.002, 1.028)
	Social Network (HL no HA) (-)	0.003	0.96 (0.93, 1.0)
	Self-reported hearing difficulty (-)	0.014	0.7 (0.5, 0.9)
	Service Delivery Model 2(-)	0.001	2.1 (1.3, 3.3)

	Work Situation (-)	0.001	0.5 (0.3, 0.7)
	Race (-)	0.006	0.4 (0.2, 0.8)
5. Residual participation restriction (5)	Living arrangement (+)	0.006	0.4 (0.2, 0.5)
	Ethnicity (+)	0.003	0.2 (0.1, 0.6)
	Social networks (HL no HA) (+)	0.009	0.9 (0.9, 0.9)
	Self-Reported hearing difficulty (-)	<0.001	1.9 (1.5, 2.5)
	Service delivery model 2 (-)	<0.001	1.9 (1.3, 2.7)
	Quality of life (-)	<0.001	1.9 (1.5, 2.5)
6. Impact on others (6)	Self-reported hearing difficulty (+)	<0.001	1.8 (1.4, 2.3)
	Quality of life (+)	<0.001	1.8 (1.4, 2.4)
	Ethnicity (+)	0.004	0.2 (0.1, 0.6)
	Social Networks (HL no HA) (+)	0.009	0.97 (0.95, 1.0)
7. Quality of life (7)	Mental Health (+)	0.005	1.4 (1.1, 1.6)
	Quality of life (+)	<0.001	1.9 (1.3, 2.5)
	Work Situation (-)	0.012	0.6 (0.4, 0.9)
8. IOI-HA Total	Social Network (HL and HAs) (+)	0.010	0.03 (0.01-0.1)
	Social Networks HL no HA (-)	<0.001	0.1 (-0.2, -0.02)
	Mental Health (+)	0.05	0.6 (0.01, 1.2)
	Service Delivery Model (-)	0.001	-1.6 (-2.7, -0.7)
	Quality of Life (+)	0.005	1.2 (0.3, 1.1)
	Work Situation (+)	0.001	1.9 (0.7, 2.8)
	Self-reported hearing difficulty (+)	0.02	0.8 (0.2-1.5)

Quality of life was shown to be a positive contributing factor throughout most IOI-HA items. Higher *self-reported hearing difficulty* was shown to be a negative contributing factor of IOI-HA items. Furthermore, *service delivery model* had varying results across IOI-HA items. For hearing aid use (IOI-HA item 1), benefit (IOI-HA item 2), and satisfaction (IOI-HA 4); factors such as *quality of life, service delivery model, self-reported hearing difficulty, work situation and social networks (HL no HA)* were significant contributing factors. Work situation was a negative contributing factor of hearing aid benefit and satisfaction indicating that those who were employed had reduced hearing aid benefit and satisfaction. Larger *social networks (HL with HAs*) were shown to be a positive contributing factor of hearing aid benefit and satisfaction. Unique factors such as *self-reported mental health* was only positively associated with quality of life (IOI-HA item 7) and the IOI-HA total score.

DISCUSSION

Several additional contributing factors of hearing aid outcomes were identified in this study. In terms of *social networks*, knowing more people with hearing loss that use hearing aids was positively associated with improved hearing aid outcomes. Conversely, knowing more people with hearing loss not using hearing aids was associated with poorer hearing aid outcomes. These findings highlight the advantage of a larger social network of persons with hearing loss owning hearing aids. Such advantages include access to knowledge from first-hand experiences on hearing aids, knowledge on optimizing hearing aid use, assistance in the selection of effective hearing aids, the reduction of stigma and improved attitude towards hearing loss and hearing aids (Ruusuvuori et al., 2021). A study by Chundu et al (2020) investigated the social representations of people with hearing loss using the social representation theory (SRT) and identified negative connotations of perceptions and attitudes towards hearing aids among people with hearing loss. In another study, Chundu et al. (2021) examined social representations of hearing aids which showed that appearance and design are one of the most common aspects people recall when they think about hearing aids. These findings highlight the importance of addressing stigma and negative attitudes towards hearing aids by people with hearing loss to improve hearing aid outcomes. These can be promoted through education on hearing aid technology and increased exposure to people with hearing loss using hearing aids to promote shared values and beliefs (Chundu et al., 2020).

Despite the increasing prevalence of mental health problems or diagnoses, such as depression in the global population (Nochaiwong et al., 2021), the impact of mental health difficulties on hearing aid outcomes has not been widely investigated. In this study, *self-reported mental health* was found to be not associated with hearing aid use (IOI-HA item 1) but better *self-reported mental health* was positively associated with improved overall hearing aid outcomes (IOI-HA total). For hearing aid use (IOI-HA item 1), a cohort study of 666 hearing aid users by Dawes et al. (2015) showed similar results of a non-significant association between mental health and hearing aid use. Contrastingly, a study of 93 people with hearing loss by Stark and Hickson (2004) demonstrated a positive relationship between mental health measured through the Short Form 36 (SF-36) survey and hearing aid use. The current existing literature on mental health is focused on the outcome of hearing aid use, indicating a need for further exploration on other measures of hearing aid outcomes, including the overall hearing aid outcomes (IOI-HA total). The relationship between self-reported mental health and overall hearing aid outcomes (IOI-HA-total) highlights the importance of considering patient's mental health in the management of hearing loss through the use of hearing aids.

In terms of *service delivery model*, patients receiving hearing aids through big box stores (e.g., retailers such as Costco) and third-party payers demonstrated significantly better hearing aid outcomes compared to those receiving hearing aids through private practice or university clinics. One randomized double-blind placebo-controlled trial by Humes et al. (2017) compared different service delivery models including audiology best practice and a lower cost direct to consumer (DTC) model. Humes et al. (2017) did not find significant differences in overall hearing aid outcomes but did find significantly lower levels of satisfaction and likelihood to purchase for the DTC group. Additionally, the purchase price of the hearing aid did not have a significant effect on the hearing aid outcomes. The purchase price of hearing aid did however negatively affect the decision to retain the hearing aids, with 85% of those who decided not to retain their hearing aids in the typical audiology best practice model.

The current study and Humes et al. (2017) compare different set of service delivery models, indicating a need for studies comparing hearing aid outcomes on service delivery models in private clinics, university clinics and big box retailers. Unlike Humes et al. (2017), this study did not consider the moderating effect of hearing aid purchase price on hearing aid outcomes and the decision to retain hearing aids for the selected service delivery models. Although the direct effect of cost was not formally investigated, our findings may be partly related to cost-benefit expectations as hearing aids obtained through big box stores and third-party payers generally have lower cost when compared to private practice and university clinics.

Generally, *quality of life* was shown to be a positive factor for improved hearing aid outcomes. A consumer survey by Picou (2020) showed similar results whereby a high quality of life was shown to contribute towards higher levels of hearing aid satisfaction. Although demonstrated to contribute to most IOI-HA items, quality of life has typically been studied as an outcome of hearing aid use as opposed to a contributing factor of hearing aid outcomes. For example, a study by Kochkin (2011) showed hearing aid use as a positive determinant of improved quality of life. A systematic review by Brodie et al. (2018) showed that all forms of audiology rehabilitation including hearing aids, cochlear implants and bone anchored hearing devices improve quality of life. Nevertheless, it is not surprising to see that those with better quality of likely are likely to benefit and be more satisfied with their hearing aids.

Work situation measured as the participant's current state of employment (consisting of options including retired, out of work and employed) was explored in this study whereby working/being employed was a positive determinant of hearing aid outcomes as opposed to not working. Factors that may contribute towards the improved hearing aid outcomes for employed hearing aid users include income (Fuentes-López et al., 2019), affordability for hearing aids and hearing aid maintenance (Blustein & Weinstein, 2016), and improved quality of life associated with being employed (Carlier et al., 2013). These results contrast with those reported by Meyer et al. (2014) and Korkmaz et al. (2016) where being employed, or employment status had no influence or effect on hearing aid outcomes.

Severity of *self-reported hearing difficulty* was shown to be a positive contributing factor of improved hearing aid outcomes. Other studies such as Helvik et al. (2016), Hickson et al. (2010) and Klyn et al. (2020) confirm the positive association between self-reported hearing difficulty measured through non-standardized questionnaires and hearing aid outcomes. Self-reported hearing difficulty is an expression of the patient's experience with hearing loss in daily living and may be influenced by impacts of hearing loss experienced by a patient such as communication difficulties, stress and anxiety (Kim et al., 2017). A combination of self-reported hearing difficulty and other clinical measures of hearing sensitivity such as the PTA is important in quantifying hearing loss/difficulty used in the prescription of hearing aid treatment.

Limitations

Although self-reported hearing difficulty measures some form of hearing sensitivity, the gold standard in the measurement of hearing sensitivity is pure tone audiometry (Kiely et al., 2012) was not available in this study. The influence of hearing sensitivity has been demonstrated to influence IOI-HA outcomes (Aazh et al., 2015; Houmoller et al., 2022; Staehelin et al., 2011; Wang et al., 2021). It is also noteworthy that the use of other clinical measures of hearing aid outcomes such as objective (e.g., hearing aid use through datalogging) and behavioral (e.g., hearing aid benefit measures through speech testing with and without hearing aids) measures were not used. Another limitation of this study is in using a single survey question as a measure of general self-reported mental health. Apart from limitations related to study measures, the main limitation of this study is the potential sampling bias as a result of the recruitment method utilized, whereby only hearing aid users who were subscribed to the hearing tracker website were invited to partake in the study. As a result, there may be noticeable differences between the study sample and the general population in terms of demographic factors such as age, race, education, and income which could limit the generalization of the study results to the general population.

CONCLUSION

Factors including social network of persons with hearing loss using hearing aids, mental health and service delivery model have been identified as important factors that predict hearing aid outcomes in this study. As an exploratory study, future investigations should further consider and explore these factors to strengthen evidence on their relationship with hearing aid outcomes. These newly identified factors can support public hearing health promotion and individualized audiological care to optimize hearing aid outcomes.

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DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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