Perception of a Self-Fitting Hearing Aid Among Urban-Dwelling Hearing-Impaired Adults in a Developed Country

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Abstract

A self-fitting hearing aid is a personal amplification device that is designed to be assembled, programmed, and fine-tuned by the user, without the need for additional equipment or professional support. A written description of the device was presented to 80 older adults with a hearing impairment, all of whom were residents of an urban area in a developed country. In response to a structured questionnaire, the majority of participants reported that the self-fitting hearing aid concept was a good idea (83%), would be of personal benefit (60%), and could be managed independently by the user (90%). Overall, half of the participant group agreed with all three statements. Two were uncertain about the concept, but none of the participants rejected it outright. There were no significant differences between the opinions of participants with previous hearing aid experience and those without. Participant responses to open-ended questions revealed that the main benefits of a self-fitting hearing aid were thought to be the ability to self-adjust the device's settings (reported by 33% of participants) and increased convenience (20% of participants). The main drawback, mentioned by 25% of participants, was a preference for professional guidance through the fitting process. These results suggest that the self-fitting hearing aid may present as an alternative product in developed countries for those users who prefer to be in control of the fitting process.

Keywords

hearing aids, self-fitting, amplification

Introduction

A companion article in this volume (Convery, Hartley, Keidser, & Dillon, 2011) introduced the concept of a self-fitting hearing aid, a device that can be assembled and programmed without the need for audiological or computer support. The self-fitting hearing aid is primarily aimed at individuals with hearing impairment in developing countries, as they suffer disproportionately from shortages in the number of hearing aids manufactured and distributed worldwide and the lack of hearing health care professionals to fit them. The self-fitting concept is currently untested in developing countries and therefore the theoretical advantages and disadvantages of such a device, as discussed in Convery, Hartley, Keidser, & Dillon, (2011), are uncertain.

Whereas the advantages and disadvantages of introducing a self-fitting hearing aid in a developing country are primarily practical in nature, such as the lack of a clinical infrastructure to provide people with hearing impairment with a range of fitting options, the issues related to releasing a self-fitting hearing aid in developed countries are expected to be more personal or individual. Despite significant improvements in hearing aid technology over the last 20 years, and regardless of differences in service delivery models, hearing

aid penetration remains at approximately 20% of the hearing-impaired population in many developed countries (Davis, 2003; Dillon, 2008; Kochkin, 2005). In a survey of Americans with hearing loss who do not wear amplification, Kochkin (2007) found that the perceived high cost of devices, distrust of medical professionals, and insufficient knowledge about how to access hearing health care services were among the reasons cited for nonadoption of hearing aids.

The unique characteristics of a self-fitting hearing aid may serve to overcome one or more of these barriers, and thus be perceived by some potential hearing aid candidates as advantageous relative to a traditional hearing aid. For example, 20% of respondents to the Kochkin (2007) survey reported that they did not know where to go for a hearing test or a hearing aid fitting, a group that likely reflects those individuals who have become aware of personal listening difficulties but who have yet to enter the hearing health care

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system. The lack of prior hearing test results would not be a barrier to accessing a self-fitting hearing aid, as an objective measure of the user's hearing thresholds is conducted by the device itself. Similarly, many individuals do not proceed with a hearing aid fitting due to perceived stigma and reluctance to disclose hearing difficulties to a professional. The stigma associated with wearing a hearing aid was reported as a barrier by 90% of the Kochkin (2007) survey respondents and a distrust of hearing health care professionals by 24% of those surveyed. Such individuals may feel more comfortable using a self-fitting hearing aid, as the hearing aid assembly and programming, tasks that are traditionally done by the manufacturer and the audiologist, respectively, are in this case performed by the end user.

If the characteristics of a self-fitting hearing aid are perceived as disadvantageous, however, an individual with hearing impairment may prefer a traditionally fitted device. For example, a hearing aid candidate with poor functional vision or problems with manual dexterity, potential issues cited by 20% of respondents to the Kochkin (2007) survey, may feel that assembling his or her own hearing aid is too difficult a task to undertake. Other people with hearing loss may prefer the support and guidance of an experienced professional when receiving hearing aids for the first time. Hearing loss is considered a chronic health condition, and patient education has been shown to contribute to successful management of such other chronic conditions as diabetes and hypertension (Holman & Lorig, 2000). Although the nature of the educational strategies varies, the primary goals of any health education program are typically to foster behavior change and to encourage self-management through the enhancement of patients' knowledge about their condition or disease (WorldWIDE, 2011). Such programs have been shown to be successful in a range of populations; for example, elderly, rural-dwelling men with type 2 diabetes demonstrated improved health outcomes after participating in a multidisciplinary, culturally appropriate education program, despite having low levels of formal education and literacy (Chen et al., 2011). Professionally delivered patient education is not entirely incompatible with a hearing aid that users fit to themselves, however. Although users of a self-fitting hearing aid will be completing the fitting and fine-tuning process on their own, there is potentially still a role for hearing health care professionals, particularly in the areas of auditory rehabilitation and "arm's length" assistance with device management issues. In support of this, a study by Öberg, Wänström, Hjertman, Lunner, and Andersson (2009) demonstrated that audiologists are able to effectively use telephone interviews to determine the outcome of a hearing aid fitting among clients who are new to amplification. Several additional studies have shown that patients and health care providers have been able to successfully manage such chronic conditions as depression and diabetes via telephone or Internet consultations (Simon, Von Korff, Rutter, & Wagner, 2000; Wakefield et al., 2011).

When evaluating the efficacy of a new device, it is of interest to examine not only its objective performance (e.g., in the case of a hearing aid, its electroacoustic characteristics) but also how it will be subjectively perceived by its potential users, particularly if the proposed device is a departure from the target market's current experience. Determining the subjective views of a cross-section of people with hearing loss will assist both in identifying the target audience for a self-fitting hearing aid and in marketing the device to that audience.

The primary objective of this study was to study the perception of a self-fitting hearing aid among older adults with a hearing loss in a developed country. Specifically, this study aimed to determine the proportion of individuals with a hearing impairment who are interested in a self-fitting hearing aid following a brief written and verbal introduction to the concept, and to determine which aspects of the self-fitting hearing aid were most and least appealing to this population. A secondary aim was to compare the characteristics of participants who accepted the concept with those who rejected it. However, a very skewed distribution of data did not lend itself to a sensible analysis.

Method

Participants

Participants were selected for inclusion in the study if they were between 45 and 90 years of age and had a measurable hearing loss in at least one ear, which we defined as a four-frequency average (4FA; average of pure tone thresholds at 0.5, 1, 2, and 4 kHz) greater than 25 dB HL.

Forty participants were recruited from the National Acoustic Laboratories' (NAL) participant database. As the NAL database is primarily made up of older individuals with previous amplification experience (individuals on the database have a median age of 73 years and 70% of them currently wear hearing aids), recruitment of the remaining participants focused on individuals between the ages of 45 and 60 and people without prior hearing aid experience. Participants on the younger side of our age range were desirable to ensure a reasonable distribution with respect to parameters that are associated with hearing aid management difficulties, such as manual dexterity. In addition, individuals without prior hearing aid experience were targeted as we anticipate that initially, it will be primarily new users who will access a self-fitting hearing aid. To that end, 40 participants were drawn from employees of local businesses and residents of local low-care retirement villages.

Of the 80 participants, 28 were female and 52 were male. The median age of the group was 73 years. On average, the group rated their hearing as fair, with a mean of 14 years of amplification experience among the 62 participants who currently wear or have previously worn hearing aids.

Table 1. Distribution of Participant Responses to Questions on the Perception Questionnaire Relating to Their Perception of the Self-Fitting Concept in General, And Their Opinion as to Whether They Believed Such a Device Would Provide Them With Personal Benefit

	Like self-fitting concept	Will provide personal benefit
Yes	66	48
No	2	6
Unsure	12	26
Total	80	80

The treatment of participants in this study was approved by the Australian Hearing Ethics Committee and conformed in all respects to the Australian government's National Statement on Ethical Conduct in Human Research.

Procedure

All study tasks were completed in a single appointment, which was carried out at NAL or in a quiet room at the participant's retirement village. A hearing screening was completed for those participants for whom we did not have an audiometric record. The purpose of the screening was to confirm, rather than quantify, the hearing loss. An Interacoustics AD17TA portable audiometer was used to present two 25 dB HL pure tones to each ear via TDH-39 headphones at 0.5, 1, 2, and 4 kHz. Participants were enrolled in the study if, at a minimum, they failed to detect one presentation of the tone at one frequency in one ear. Information about the make, model, and style of the participant's hearing aid(s) was recorded for those participants who were currently aided.

Participants were provided with a written description of the self-fitting hearing aid concept (Appendix A) and were given the opportunity to discuss what they had read with the experimenter. The description offered a brief summary of current clinical practice with respect to obtaining a hearing aid. It then suggested that in the future, it may be possible to obtain a hearing aid that can be self-fitted without the assistance of a hearing health care professional. The expected steps involved in the self-fitting procedure, such as receiving and assembling a set of parts, inserting the device into the ear, and pressing a button to activate the fitting procedure were explained. The description emphasized the fact that the device is currently an idea only and does not yet exist in real life. Participants then completed a questionnaire probing their perception of the concept and what they thought might be the advantages and disadvantages of such a device (Appendix B).

The study appointment, which also included other tasks that involved the participation of a partner (see Convery, Hartley, Keidser, Caposecco, et al., 2011), was approximately 1.5 hr in length. Both participants and their partners were paid a small cash gratuity for their time.

Results

Perception of Benefit

In the perception questionnaire, participants were asked whether they liked the general idea of a self-fitting hearing aid and whether they thought such a device would benefit them in particular. Eighty-three percent of participants liked the concept, while 60% thought that a self-fitting hearing aid would benefit them specifically. When the responses of aided and unaided participants were compared, the same proportion of responses was found. Participants correctly interpreted these questions as targeting two different facets of their opinion of the self-fitting hearing aid, as evidenced by the lack of a significant correlation between the responses ($\rho = 0.19, p > .05$). As shown in Table 1, the remaining participants were more likely to be unsure about the concept and its potential benefit than they were to dislike it outright.

Participants who felt that a self-fitting hearing aid would be of personal benefit were asked to list one or more reasons in support of their belief. The 48 participants in this group cited 67 reasons why they felt a self-fitting hearing aid would be superior to a traditional hearing aid. As the reasons they provided were given in response to an open-ended question and not chosen from a predetermined list, the reasons were then grouped into the following five categories: (a) can be self-adjusted, (b) will save time and be more convenient, (c) will provide an increased sense of control and independence, (d) is more economical, and (e) is simple to use. As shown in Figure 1, the majority of participants (52%) cited the ability to program or adjust the hearing aid on their own as a reason for believing a self-fitting hearing aid would be beneficial. Thirty-eight percent of participants thought that such a device, since it does not require visits to an audiology clinic, would save time and travel, while an increased feeling of independence and control was reported by 25% of participants. The expected lower cost of a self-fitting device was cited by 15% of the participant group and its relative simplicity by 10% of the participants.

Perception of Ability to Self-Fit

When participants were asked whether they thought they could successfully assemble a self-fitting hearing aid, 65% of participants thought they could do the task independently, while 25% thought they would be able to do it with some form of assistance. One participant said he did not think he could accomplish the task at all, and the remaining participants were unsure. Of the 80 participants, half (51%) expressed a positive attitude to all three questions, while two participants were uncertain on all three points. No one rejected the concept outright. Due to the skewed distribution of responses to the perception questionnaire, with the vast majority of participants responding positively to the self-fitting hearing aid concept, and the remaining participants expressing uncertainty rather than rejection, the idea of

Figure 1. Distribution of reasons given by participants who believed that a self-fitting hearing aid would be of personal benefit. Some participants provided more than one reason

Table 2. The Advantages of a Self-Fitting Hearing Aid as Reported by the Participant Group. Not All Participants Were Able to Cite Advantages and Some Participants Listed More Than One

	Number of participants reporting (N = 65)
Ability to self-adjust	29
Increased convenience	15
Lower cost	11
Suited to rural and/or remote areas	11
Increased control and/or independence	9
Suitable for individuals with agoraphobia	1

predicting candidacy for the device on the basis of various personal, functional, and audiometric parameters was abandoned.

Perceived Advantages

All participants, including those who did not like the self-fitting concept and/or did not believe it would provide them with personal benefit, were asked to specify potential advantages and disadvantages of a self-fitting hearing aid. Not all participants were able to cite specific benefits and/or drawbacks, while some participants provided more than one. As shown in Table 2, 76 advantages were listed by 65 of the study participants, which were grouped into six categories. The advantages that were suggested by the participants overlapped to some extent with the reasons they provided for believing a self-fitting hearing aid would provide personal benefit. The ability to self-adjust the device, the expected increase in convenience, the lower financial cost, and the increase in control and

Table 3. The Disadvantages of a Self-Fitting Hearing Aid as Reported by the Participant Group. Not All Participants Were Able to Cite Disadvantages and Some Participants Listed More Than One

	Number of participants reporting (N = 60)
Prefer professional guidance	21
Outcome inferior to traditional fit	15
Contraindicated by cognitive and/or dexterity impairments	13
Tasks too difficult or complex	10
Higher cost	1

independence were mentioned both as reasons participants felt a self-fitting device would provide them with personal benefit and as overall advantages of the general concept. However, since the advantages question was more broad, and enabled participants to also consider how a self-fitting hearing aid might benefit people other than themselves, participants also cited the device's potential suitability for people living in remote areas and in parts of the world where no other audiological services were currently available. One participant suggested that a self-fitting device might be appropriate for hearing aid users with agoraphobia.

Perceived Disadvantages

Fifty-eight participants listed 60 perceived disadvantages of a self-fitting hearing aid. Table 3 outlines the categorization of disadvantages into the following six groups: (a) would prefer the guidance of a hearing health care professional, (b) would not yield settings that are as appropriate as a professionally fitted hearing aid, (c) would be contraindicated by such issues as cognitive impairment and/or poor manual dexterity, (d) will be too difficult or complex for a layperson to manage and (e) is less economical.

Discussion

As with previous studies that explored perceptions of and reactions to a novel amplification device (Keidser et al., 2007), a high proportion of participants both liked the idea of a self-fitting hearing aid and felt that it would provide personal benefit. Other factors may have also contributed to this result. First, it is difficult to provide candid, honest feedback about an idea or product to a representative of the organization with which the idea is perceived to be associated. Second, there is a natural tendency to think positively about a new idea, particularly if it appears to solve a current problem

or meet a need. Third, participants were introduced to the self-fitting concept through a written description only (Appendix A) and were immediately asked for their opinion. It is possible that use of a third party to introduce the concept and obtain feedback may have resulted in more candid judgments. Although every attempt was made to use a neutral tone when writing the description, with a balance of positive and negative points about the self-fitting concept, a third-party interviewer may have been able to present the idea in a more objective manner. In addition, if participants had been given more time to consider the implications of a self-fitting hearing aid (e.g., the time and effort it would take to assemble and fit the device), it is possible that a larger proportion of the participant group would have selected a traditionally fit hearing aid as the preferred option. An accompanying diagram, or even a sample of the device, may have provided additional information on which to base an opinion.

Forty-eight participants in our study felt that a self-fitting hearing aid was likely to be personally beneficial. The most popular reason in support of this opinion, cited by 52% of these participants, was the fact that such a device would afford them the opportunity for self-adjustment. Many participants specifically mentioned the appeal of being in control of their own settings, particularly with the goal of making the adjustments to suit their own daily listening situations. Previous research supports these findings. In a survey of individuals with hearing impairment who had chosen not to pursue amplification, 19% reported that the availability of self-fitting or self-adjustable devices would persuade them to purchase a hearing aid (Kochkin, 2007).

The theoretical idea of involving hearing aid users in the selection and adjustment of their own settings has also been explored in the audiology literature. Schweitzer, Mortz, and Vaughan (1999) suggest that two conditions must be met for user adjustment to be successful, the first of which is the desire on the part of users to adjust their own hearing aids. The results of a questionnaire are reported in their article, in which the vast majority of respondents indicated an interest in the idea of user adjustments as well as the belief that this capability would improve fitting outcomes. Similarly, in an exploration of people's perception of a trainable hearing aid, a device that "learns" preferred settings based on the user's own adjustments, 91% of those surveyed liked the concept and 66% felt that such a device would be personally beneficial (Keidser et al., 2007). The results of our current investigation into the perception of a self-fitting hearing aid are in agreement with these earlier findings.

The second condition mentioned by Schweitzer et al. (1999) is the requirement that users be able to make adjustments that are reliable. To this we would add "desirable"; that is, in addition to being able to make adjustments reliably, hearing aid users should also be able to achieve settings that are consistently preferred over the baseline. Elberling and Hansen (1999) reported the results of a study in which participants were given an equalizer with three controls

(bass, mid, and treble) and asked to adjust the settings of a master hearing aid in response to a variety of simulated listening situations. They found that their participants were both able to improve the settings relative to the baseline, and to make repeated, reliable adjustments. Their participants reported that they found the adjustment process both easy and enjoyable, and that they appreciated the opportunity to act directly on, and to experiment with, their listening preferences without having to explain them to a hearing health care professional. Similar results were reported by Dreschler, Keidser, Convery, and Dillon (2008) even though participants were asked to make adjustments using controllers with a range of available functions and button arrangements. As in the Elberling and Hansen (1999) study, participants reportedly enjoyed the task of personalizing their own settings, bolstering the idea that a device that allows wearers to control and adjust their own settings will be well-received by at least a proportion of the hearing-impaired population. An additional finding of the Dreschler et al. (2008) study was that the baseline gain/frequency response had a significant influence on the settings at which participants arrived after making their desired adjustments. This effect has been borne out in field trials with commercially available, trainable hearing aids (Mueller, Hornsby, & Weber, 2008). In a device such as the self-fitting hearing aid, self-adjustments should therefore probably be reserved for the fine-tuning stage, with the starting point determined by the application of a prescriptive algorithm to the results of the aid-administered hearing test, as proposed in Convery, Hartley, Keidser, & Dillon, (2011).

The proportions of aided and unaided participants who felt that the convenience and time-saving aspect of a self-fitting hearing aid constituted an advantage differed substantially. Of the 62 participants with previous hearing aid experience, seven (11%) cited this reason, while eight (44%) of the 18 participants who had never been aided did so. In light of this finding, it is possible that the unaided participants' perception that a traditional hearing aid fitting requires a substantial investment of time, or would otherwise inconvenience them in some way, may be why they have never pursued amplification.

Of the participants who reported liking the idea of a self-fitting hearing aid, 36% did not feel that such a device would provide them with personal benefit, or were unsure. The reasons cited by these participants were primarily related to their perception that the assembly and fitting task would be too difficult for a layperson to successfully complete. Overall, this group of participants felt that a hearing aid fitting was better left in the hands of a qualified hearing health care professional. When these participants were asked whether they thought they could accomplish the self-fitting task themselves, however, only five were unsure and none said no. It is possible that although these participants may have seen themselves as capable of assembly and programming a self-fitting

hearing aid, they were not necessarily willing to do so, or felt that a professional would be even more capable of completing these tasks. Several participants also commented that while they felt they would be able to follow the self-fitting procedure as written, they did not have confidence in their ability to troubleshoot or to improve the settings if they encountered difficulties. In contrast, the participants who thought that a self-fitting hearing aid would be personally beneficial cited reasons such as independence, a greater degree of control, and a belief that they would prefer settings to which they could effect their own changes. The contrast between the two participant groups could relate to the concept of locus of control, which refers to the extent to which individuals believe they can personally control events that affect them. People who believe that the outcome of events result predominantly from their own behavior and actions are said to have an internal locus of control, while those who believe that “powerful others,” chance, or fate are the primary determinants of events have an external locus of control (Rotter, 1966).

An individual's locus of control intersects with his or her self-efficacy, or his or her belief that he or she is capable of behaving in a way that will produce the desired result (Bandura, 1977). However, because self-efficacy is more situational than intrinsic, it is possible for a person with an internal locus of control to simultaneously display a low degree of self-efficacy. For example, a hearing aid user may not only believe that a self-fitting hearing aid would yield more benefit than would a device fitted by an audiologist (internal locus of control) but also believe that he is not personally capable of completing the steps necessary to assemble and fit such a device (low self-efficacy).

Two participants in this study illustrate these concepts. Neither participant thought that a self-fitting hearing aid would provide them with personal benefit, nor did they like the general concept. However, despite sharing the same opinion, each participant cited different underlying reasons. Participant A thought that while a self-fitting hearing aid may benefit those people unable to access traditional audiology services, the majority of people were unlikely to have the requisite skill level to accomplish the task. When Participant A was asked whether she felt she could assemble such a device herself, she felt that she would be able to do it independently, suggesting that her beliefs about the concept's value related more to a judgment of others' ability and less to a perception of her own. With respect to the self-fitting hearing aid and its associated tasks, Participant A demonstrated a high degree of self-efficacy.

In contrast, Participant B's reasons for a lack of interest in the self-fitting concept stemmed from a belief that a hearing aid fitting is “better left to the professionals.” He also reported that he did not believe he would be able to assemble a self-fitting hearing aid at all, even with assistance and a set of written instructions. Based on other spontaneous comments made by Participant B throughout the course of the study appointment, he appeared to have both an external locus of

control as well as a low degree of self-efficacy regarding the tasks associated with the self-fitting hearing aid. Interestingly, when asked later in the appointment to follow a set of instructions to assemble two hearing aid samples (see Convery, Hartley, Keidser, Caposecco, et al., 2011), Participant B was able to do so independently and with very few errors. Although it was not part of the study protocol, Participant B was asked again, informally, at the end of the appointment whether or not he felt he would be able to successfully complete the tasks associated with a self-fitting hearing aid. Based on his experience assembling the device samples, he reported that he now felt confident he could.

Participant B's change in perception supports what is known about self-efficacy; namely, that it can be affected by external sources (Bandura, 1977). The most important factor that influences an individual's self-efficacy is experience with the task or situation in question, with successful task completion associated with an increase in self-efficacy and failure leading to a decrease in self-efficacy. While potential users of the self-fitting hearing aid, regardless of their level of self-efficacy, are unlikely to have the opportunity to test their ability to assemble and program the device, other methods have also been shown to improve self-efficacy. Positive modeling, in which individuals are able to observe another person succeeding at a task, is particularly effective when individuals identify with, or perceive that they have relevant characteristics in common with, the person they are observing. For example, if a person with a hearing loss observes or learns about another person with a hearing loss successfully assembling and programming a self-fitting hearing aid, such a person's self-efficacy may increase and he or she may therefore be more likely to seek out such a device for himself or herself. Negative modeling is already a powerful force in the world of hearing aid dispensing. Among the individuals surveyed by Kochkin (2007), almost 20% of those who had chosen not to pursue a hearing aid fitting said that they were dissuaded from doing so after hearing about the experiences of a dissatisfied hearing aid user. Social encouragement is another contributor to self-efficacy. The importance of the role of the partner in successful assembly of the self-fitting hearing aid has been highlighted (Convery, Hartley, Keidser, Caposecco, et al., 2011). For those individuals with low self-efficacy, support and encouragement from a partner or assistant can serve to increase the individual's confidence in his or her perceived ability to complete the self-fitting task.

The theoretical advantages and disadvantages of a self-fitting hearing aid are outlined in Convery, Hartley, Keidser, & Dillon, 2011). Developed by hearing health care professionals who are involved in the research and development of the self-fitting hearing aid, these advantages and disadvantages may be compared to those identified by the participants in the current study. Both the professional and participant groups cited the expected lower cost of a self-fitting hearing aid as a potential advantage. As the device does not yet exist and no mention of price was made during the study appointment, it is likely both

groups believe a self-fitting hearing aid would be less expensive than a traditionally fitted device because there would be no fees to pay to a hearing health care professional. Both groups also mentioned the fact that users would be able to perform the fitting and adjustment tasks on their own, although the wording used by each group was slightly different and reflected their own role in the fitting process. The professional group said that a user of the self-fitting hearing aid would not require input from a clinician, while the participants tended to use words like control, independence, and self-sufficiency. The use of real-world listening situations in the fitting process was seen as an advantage by both the professional and participant groups, particularly in the context of being able to self-adjust existing settings throughout the day in response to changes in the acoustic environment. One theoretical advantage, the feeling of psychological ownership of the end result due to direct user participation in the fitting, was not mentioned by any of the participants. The abstract concept of psychological ownership is likely more familiar to clinical professionals than to lay users of hearing aids, leading to a preponderance of more practical factors among the participants' list of advantages.

Potential benefits mentioned only by the participant group included the device's simplicity and the expected savings in clinical time that a self-fitting hearing aid is expected to provide. Simplicity was not considered a theoretical advantage by the professional group as it is unknown whether the self-fitting hearing aid will actually be simpler to use than a traditionally fitted device. Similarly, some users of a self-fitting hearing aid may spend just as much time assembling, programming, and fine-tuning the device as would a professional, so there is no guarantee that the self-fitting hearing aid will be a time-saver for all users.

In terms of disadvantages, only two were cited by both the professional and participant groups: the risk of an inappropriate fitting, and the need for a reasonable level of cognitive functioning to complete the self-fitting tasks successfully. The professional group additionally mentioned the risk of aid-induced hearing loss if gain and/or maximum power output levels were set too high. As this is a risk that is primarily of concern to people with severe and profound hearing loss (Macrae, 1991), it makes sense that this is a risk of which our predominantly mild-to-moderately hearing-impaired participants were not aware. With respect to the need for a certain level of cognitive function to manage a self-fitting hearing aid, participants additionally mentioned the need for good manual dexterity to assemble the device and the importance of high literacy levels to read and follow the instructions. Interestingly, participants mentioned these factors before they were asked to participate in tasks that measured these parameters.

Disadvantages that were mentioned only by the participants included the potential for the self-fitting task to be too difficult to manage (sometimes qualified with a comment that this was more likely among people who have cognitive, dexterity, or literacy difficulties), the possibility that such a hearing aid may be more expensive than a traditionally fitted

device, and individual preference for a professional's guidance. The last point should not be overlooked, as it is important to remember that there will always be a proportion of hearing aid users who, even if they are physically and cognitively capable of completing the tasks associated with a self-fitting hearing aid, will be unwilling to undertake them or uninterested in doing so. The self-fitting hearing aid is not, therefore, to be thought of as a replacement for traditionally fitted devices; rather, it is considered an option for those hearing aid users in developed countries who are interested in becoming more independent, or those in other parts of the world who are not able to access professional hearing health care services.

Summary

Perception of and reaction to the concept of a self-fitting hearing aid among older, urban-dwelling adults were explored in this investigation. Eighty participants with hearing impairment were provided with a written introduction to the self-fitting hearing aid and had the opportunity to discuss the concept with an audiologist. Attitudes toward the self-fitting hearing aid were probed with a structured questionnaire, and participants were asked for the potential advantages and disadvantages of such a device.

Half the participant group fully endorsed the concept of a self-fitting hearing aid and two participants expressed uncertainty. No participant rejected all aspects of the concept. The majority of participants responded positively to the general idea of a self-fitting hearing aid (83%) and their perceived ability to execute the tasks necessary to assemble and manage the device (90%). A smaller proportion of participants (60%) felt that they would derive personal benefit from a self-fitting hearing aid. The perceived advantages and disadvantages of a self-fitting hearing aid overlapped to some extent with those factors considered by hearing health care professionals to be theoretical advantages and disadvantages; differences could often be traced to the different perspectives of the user of a hearing aid and the fitter of a hearing aid. In particular, the ability to make self-adjustments to the device settings and the convenience of not having to visit an audiology clinic were considered advantageous by 33% and 20% of participants, respectively. On the other hand, 25% of participants reported a preference for fitting guidance from a hearing health care professional, a result that reinforces the likelihood that the self-fitting hearing aid will be launched in developed countries as an alternative product. Acceptance of the self-fitting concept among individuals with a hearing loss in developing countries and remote areas is an area for further exploration. An examination of individual responses to the perception questionnaire also suggested that an individual's locus of control and degree of self-efficacy may influence interest in a self-fitting hearing aid. It is recommended that these two factors be examined in more detail in future research.

Appendix A. Description of the Self-Fitting Hearing Aid

When a person needs hearing aids, he or she must visit an audiologist or other hearing health care professional. Often the process of obtaining a hearing aid requires several visits during which the audiologist tests your hearing, takes ear impressions, and programs the settings of your hearing aids based on the results of your hearing test.

In the future, it may be possible to obtain a behind-the-ear hearing aid that you can program and manage yourself, without the assistance of an audiologist. We refer to this kind of hearing aid as a self-fitting hearing aid.

The self-fitting hearing aid is designed to be assembled by the user from a small set of parts. Some of these parts come in different sizes to suit different ears, and you will need to select the correct size for your ear without the assistance of an audiologist.

When the assembled hearing aid is placed into your ear, you press a button on the device to begin an assessment of your hearing. The results of your hearing test are stored in the device and are used to automatically program the hearing aid to your individual needs. You may then be able to use the hearing aid's volume control to make further adjustments to the settings.

Please note that the self-fitting hearing aid exists as an idea only. It is not currently available to purchase.

Appendix B. Perception Questionnaire

1. Do you like the general idea of a hearing aid that people can fit to themselves? Yes/no/unsure
2. Do you think that a self-fitting hearing aid could benefit you, specifically? Yes/no (go to Question 4)/unsure
3. In what way(s) do you think a self-fitting hearing aid could benefit you?
4. If you were given a self-fitting hearing aid and a set of instructions for its use, do you think you could successfully fit yourself with it? Yes, on own/yes, with help/no/unsure
5. Can you think of some advantages of a self-fitting hearing aid compared to a traditional hearing aid?
6. Can you think of some disadvantages of a self-fitting hearing aid compared to a traditional hearing aid?

Authors' Note

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