Description, Normative Data, and Utility of the Hearing Aid Skills and Knowledge Test

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Gabrielle H. Saunders*†
Charlotte Morse-Fortier*
Daniel J. McDermott*
Jay J. Vachhani*
Leslie D. Grush*
Susan Griest*†
M. Samantha Lewis*†

Abstract

Background: The ability to manage hearing aids is crucial for successful outcomes and for maintaining hearing aid use. It is therefore important to have a tool that can effectively identify which hearing aid management skills are lacking so that the audiologist can provide additional education and training on that skill. Such a tool can also provide useful quantitative data for researchers.

Purpose: To collect normative data (Experiment 1) and assess inter- and intrarater reliability (Experiment 2) for a hearing aid management assessment tool known as the Hearing Aid Skills and Knowledge (HASK) test.

Study Sample: Two hundred thirty-six new hearing aid users recruited from the VA Portland Health Care System and 126 experienced hearing aid users recruited from the local Portland community participated in Experiment 1. The veteran participants were taking part in a larger hearing aid study, and the community participants were recruited at community events that took place around Portland, OR. Three clinical audiologists and two AuD students completing their fourth year externship participated in Experiment 2.

Data Collection and Analysis: In Experiment 1, HASK data were collected from the new hearing aid users at 4–8 wk and 6–8 mo after the fitting of their first pair of hearing aids, and from experienced users on a single occasion. In addition, self-reported hearing aid use, benefit, and satisfaction were assessed for all participants. The audiologists/students in Experiment 2 watched and independently scored videos of six individuals completing the HASK. Intraclass correlation coefficients (ICCs) across audiologists were computed for HASK scores. Three audiologists/students rated at least one video on two occasions to provide interrater reliability data.

Results: Mean performance on the HASK was about 70% for knowledge and 80% for skills for both the new and experienced hearing aid users. Performance did not change among the new users between the 4–8 wk and 6–8 mo administration. The specific skills lacking were associated with advanced management abilities (cleaning and troubleshooting). Experiment 2 revealed ICCs for inter- and intrarater reliability for HASK to range from 0.76 to 0.94, showing acceptable to excellent reliability.

Conclusions: The HASK is a quick and easy test with good-to-excellent inter- and intrarater reliability. It can effectively identify which hearing aid management skills are lacking so that the audiologist can pro-

*VA Rehabilitation Research and Development National Center for Rehabilitative Auditory Research, Portland VA Medical Center, Portland, OR; †Department of Otolaryngology, Oregon Health and Sciences University, Portland, OR

Corresponding author: Gabrielle H. Saunders, VA RR&D National Center for Rehabilitative Auditory Research; E-mail: gabrielle.saunders@va.gov

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vide additional education and training on those skills. Data show performance is ~70% for knowledge and 80% for skills and this does not change with hearing aid experience. The significant positive correlations between HASK scores and hearing aid use and satisfaction highlight the notion that ability to manage hearing aids successfully is integral to good hearing aid outcome.

Key Words: hearing aids, hearing aid management, hearing loss, rehabilitation

Abbreviations: ANOVA = analysis of variance; HAPRI = Hearing Aid Probed Recall Inventory; HASK = Hearing Aid Skills and Knowledge; ICC = intraclass correlation coefficients; IOI-HA = International Outcome Inventory for Hearing Aids; PHAST = Practical Hearing Aid Skills Test; VAPORHCS = VA Portland Health Care System

INTRODUCTION

The ability to manage hearing aids is crucial for successful outcomes and maintaining use of the hearing aids (Kumar et al, 2000; Lupsakko et al, 2005; Bertoli et al, 2009; Singh et al, 2013; Hickson et al, 2014; see McCormack and Fortnum, 2013 for a review). The issue is perhaps best illustrated by the study of Bertoli et al who obtained survey data from over 8,000 hearing aid users. They determined that regularity of hearing aid use was significantly associated with reported hearing aid management ability. Specifically, relative to individuals who reported very good management ability, those reporting "rather good" management were 1.76 times as likely to use the hearing aids nonregularly; these odds increased to 6.29 and 13.35 times if individuals reported "rather bad" or "very bad" management skills, respectively.

From a clinical perspective, it is important to have a tool that can effectively identify which hearing aid management skills are lacking so that the audiologist can provide additional education and training on that skill. From a research perspective, it is valuable to be able to assess management skills so they can be documented in a standardized manner. It is not necessarily appropriate to rely on self-report regarding management skills because studies in which reported ability and observed ability have been compared have shown that patients often inaccurately assess their skills (Pothier and Bredenkamp, 2006; Desjardins and Doherty, 2009; Doherty and Desjardins, 2012). Instead then, it is preferable to measure management ability.

There are two aspects to hearing aid management—knowledge about what needs to be done and the ability to do it. Published studies examining knowledge for hearing aid skills in a structured manner is sparse. Reese and Hnath-Chisolm (2005) used a multiple-choice inventory to assess knowledge and Reese and Smith (2006) used a quiz known as the Hearing Aid Probed Recall Inventory (HAPRI). Both of these measures assess multiple aspects of hearing aid management, but each has its advantages and disadvantages. The multiple choice inventory is easy for participants to complete and easy for raters to score, but studies show that it leads to artificially high scores relative to open-ended quizzes (Jansen et al, 2008). The HAPRI, on the other hand, provides a more realistic assessment of knowledge. It combines open-ended items such as "How do you clean your hearing aids?" and "What should you do if a hearing aid battery is accidentally swallowed by a person or pet?" with yes/no items such as "Should you use cleaners or chemicals on your hearing aids?" and "Are you supposed to sleep with your hearing aids in your ears?" Unfortunately, the authors provide little guidance regarding how the measure should be scored, and the mix of open-ended and closed-set responses results in some items holding greater weight than others in the final score. A tool that uses open-ended questions but has a clear approach to scoring would be most valuable as an outcome measure.

Likewise, there are few published studies describing standardized tools to assess ability to manage hearing aids. Desjardins and Doherty (2009) developed a measure known as the Practical Hearing Aid Skills Test (PHAST) that assesses how well an individual can manage their hearing aids in an ecologically valid way. The audiologist rates the hearing aid user on their ability to complete eight essential hearing aid skills: (a) hearing aid insertion, (b) hearing aid removal, (c) opening the battery door, (d) changing the hearing aid battery, (e) cleaning the hearing aid, (f) manipulating the volume control, (g) telephone use with the hearing aid, and (h) use of the hearing aid's noise program. The original version was scored on a 5-point scale ranging from "excellent" ability to "cannot perform" the skill. The scoring of the PHAST was later revised (PHAST-R; Doherty and Desjardins, 2012) and is scored on a 3-point scale: 2 points if the task was completed correctly with no prompts, 1 point if the individual required a single prompt for correct performance, and 0 points if the individual required more than one prompt to perform correctly or could not perform that task at all. Caposecco et al (2016) recently published a new measure called the Hearing Aid Management test that was adapted from the PHAST but the skills evaluated were developed to parallel a newly developed hearing aid management guide and thus are specific to the tasks required for the specific hearing aid for which the management guide as developed. It is also scored on a 3-point scale.

We propose that an ideal assessment tool would assess both knowledge and ability (or skills). Skill

assessment is useful for the majority of individuals who are responsible for managing their own hearing aids; knowledge assessment is useful for individuals who may be unable to manage their own hearing aids due to poor manual dexterity, haptic sensitivity, and/or vision, but have the knowledge to explain to a caregiver or family member what must be done. To this end, we developed the Hearing Aid Skills and Knowledge (HASK) test that assesses both the knowledge required for hearing aid management and the ability to manage hearing aids. The HASK was adapted from a combination of the HAPRI and the PHAST. In this article, we describe the HASK and two experiments: Experiment 1 was conducted to collect normative data from new and experienced hearing aid users and Experiment 2 was conducted to examine inter- and intrarater reliability for HASK scoring.

METHODS

Study Synopsis

In Experiment 1, normative performance on the HASK was collected to learn about the psychometric properties of the HASK. Data were obtained from new and experienced hearing aid users. The new users completed the HASK at 4–8 wk and 6–8 mo after their hearing aid fitting and the experienced users completed the HASK on one occasion. In Experiment 2, inter- and intrarater reliability across five clinical audiologists was examined. The audiologists watched videos of six new hearing aid users completing the HASK, and independently scored their performance.

Test Measures

HASK Test

The HASK assesses up to 11 categories of tasks associated with hearing aid management: (a) hearing aid removal, (b) battery management, (c) cleaning of hearing aids, (d) distinguishing left from right hearing aid, (e) hearing aid insertion, (f) volume adjustment, (g) telephone use, (h) program use, (i) feedback management, (j) troubleshooting, and (k) hearing aid storage. The HASK tasks were selected by members of the research team (four audiologists and two hearing researchers), all of whom were very familiar with hearing aids and hearing aid management. The team decided that all skills assessed by the PHAST should be included, along with additional skills absent in the PHAST that the team considered important for management of hearing aids (e.g., changing the wax trap). Team members independently proposed tasks which were then discussed and selected by the group. Once the study started, no tasks were added or removed, but after several administrations, the wording of three questions was revised slightly to improve clarity. Each task is scored for knowledge and/or skill. For example, regarding battery management, the individual is scored on their knowledge of the color/size of the battery their hearing aid requires, when it is necessary to change the battery, approximate battery life, and the need to aerate the battery for at least 1 min before inserting it into the hearing aid. The individual is then scored on their skill (i.e., ability) at removing a hearing aid battery from the aid, removing the battery tab on a new battery, and inserting a new battery into a hearing aid. The HASK was scored as follows. For knowledge items, 1 point was awarded if the individual responded correctly and 0 points were awarded if the individual responded incorrectly. For skill items, 2 points were awarded if the individual completed the task with no difficulty on the first attempt, 1 point was awarded if the individual completed the task with some difficulty (required more than one attempt, used a deviant method), and 0 points were awarded if the individual could not perform task at all. A 3-point scale, rather than a more finely graded scale, was used based on the rationale of Doherty and Desjardins (2012), who noted that additional levels of rating would not result in different clinical approaches. There were a total of 20 possible knowledge items and 18 possible skill items. Percent correct knowledge and skill scores were obtained by summing the total score in each scale, dividing by the total number of items and multiplying by 100. When HASK items were not applicable (e.g., the hearing aid did not have the volume control activated), the total number of items in a scale was adjusted when computing percent correct. Note that the tester did not objectively verify whether an item was not applicable; they assumed that the participant was correct. For example, if a participant stated that the volume control was not activated, the tester did not verify how the hearing aid was programmed. The HASK scoring template also provides a field for entering comments as the clinician/researcher sees fit. See Supplemental Appendices S1A and S1B, supplemental to the online version of this article, for the HASK script and scoring template, respectively.

Hearing Aid Use, Satisfaction, and Self-Reported Hearing Difficulties

For the new hearing aid users, this information was obtained from the International Outcome Inventory for Hearing Aids (IOI-HA; Cox and Alexander, 2002); for the individuals recruited from the community, this information was obtained through response to just three targeted questions. The difference in protocol arose because the new users completed the IOI-HA as a part of the larger study in which they were participating,

while we wanted to minimize testing burden on the users recruited from the community and thus considered it unnecessary to ask all seven IOI-HA items. New users completed the IOI-HA electronically, while experienced users responded in paper and pencil format. The IOI-HA assessed hearing aid outcomes on seven dimensions. There was an additional item that assessed self-reported hearing difficulties. For the analyses here, items 1, 4, and 8 that assessed use, satisfaction, and self-reported hearing difficulties, respectively, were used. For each item, respondents selected from one of five verbal descriptors, with the least use/poorest outcome/most problems scored as 1, and most use/best outcome/fewest problems scored as 5. The three targeted questions answered by the hearing aid users recruited from the community were the following: (a) How many hours each day do you wear your hearing aids? Response options: none/<1 h/1–4 h/4–8 h/8–16 h. (b) How satisfied are you overall with your hearing aids? Response options: 0 (completely dissatisfied) to 10 (completed satisfied). (c) How much difficulty do you have hearing when not wearing hearing aids? Response options: none/mild/moderate/severe. These questions are taken from the additional questions of the Abbreviated Profile of Hearing Aid Benefit (http://harlmemphis.org/files/5113/4618/0922/APHAB_A.pdf).

Experiment 1: Normative HASK Data

Participants

There were two groups of participants. One group was 236 new hearing aid users. All were veterans recruited from the VA Portland Health Care System (VAPORHCS) who were taking part in a comparative effectiveness trial of three supplemental forms of hearing aid orientation. All had received hearing aid(s) from the VAPORHCS audiology clinic within 8 wk of initial HASK testing. The other group was 126 experienced hearing aid users recruited from 22 different community events in the local Portland area. Seventeen of these events were at local retirement centers, two were at churches, and two were at community centers. All individuals were wearing their hearing aids at the time they were recruited. Table 1 provides demographic and self-report information about hearing aid use, experience, and satisfaction from both populations of participants separately. It is seen that the new hearing aid users were younger ($F = 446.2$, $p < 0.001$) and, although the scales are not directly comparable, they were more satisfied with their hearing aids than the experienced hearing aid users.

Table 1. Demographic Data for New and Experienced Hearing Aid Users Separately

	New Hearing Aid Users (n = 236)	Experienced Hearing Aid Users (n = 126)
Age (yr) mean (SD)	69.5 (7.0)	85.5 (7.4)
Range	51–87	64–99+
Gender (%)		
Male	97.9	42.9
Female	2.1	57.1
Unaided self-rated hearing difficulties (%)		
None	0.9*	
Mild	21.9	13.5†
Moderate	49.6	46.0
Moderately severe	24.6	
Severe	3.1	40.5
Lifetime HA experience	<8 wk: 100%	1–10 yr: 58.7%
		>10 yr: 41.3%
Daily hearing aid use (%)		
None	1.8	0
<1 h/day	4.9	3.2
1–4 h/day	11.6	8.7
4–8 h/day	23.6	17.5
>8 h/day	58.2	70.6
HA satisfaction		
Not at all	1.3%‡	1–2: 4.0%§
Slightly	1.3%	3–4: 1.6%
Moderately	11.9%	5–6: 31.5%
Quite	19.9%	7–8: 39.5%
Very much	65.5%	9–10: 23.4%

Notes: *IOI-HA item 8: How much hearing difficulty do you have when you are not wearing hearing aids?
†Degree of difficulty (without wearing a hearing aid) four-option response scale.
‡IOI-HA item 4: Considering everything, do you think your present hearing aid(s) is worth the trouble?
§Overall satisfaction with hearing aids on a rating scale of 0–10.

This study was approved by the VAPORHCS Institutional Review Board and Research and Development committees. Written informed consent was required for the veteran participants in the larger study. It was obtained prior to any data collection. The experienced hearing aid users from the community were required to provide verbal informed consent. To this end, they were read an information sheet by the tester and then provided verbal consent before completing the HASK and answering the self-report questions.

Payment

The new hearing aid user participants received $25 payment for each of the two laboratory visits they made for the larger study during which the HASK (among other tests) was completed. Experienced hearing aid users from the community received a $10 gift card to a local store.

Procedures

The new hearing aid users, who had completed the informed consent process earlier in the study, came to the National Center for Rehabilitative Auditory Research located at the VAPORHCS for testing 4–8 wk after having received a hearing aid from the VAPORHCS audiology clinic, and then again 6–8 mo later. These time frames were selected to assess hearing aid management ability very soon after initial hearing aid orientation, and then again once user behavior was established. There were 16 individuals who came in beyond the 8 wk time frame. The hearing aids of eight of these individuals required repair or replacement and were used for between 4 and 11 wk before testing. The other eight individuals came in beyond the 8-wk time frame due to illness or other scheduling issues. These individuals came in between 8 and 14 wk postfitting of the hearing aids. On both test occasions, the participants completed the IOI-HA in electronic format and then completed the HASK. The experienced hearing aid users from the community were invited to participate in the study by a member of the study team who had set up a table in a centrally located space at the test location (retirement home, church, or community center). Following provision of verbal informed consent, participants answered the self-report items in interview format, and then completed the HASK.

HASK Completion

The HASK was administered using identical procedures for both groups as follows. The participant was seated at a table opposite the tester. The participant was given access to several sizes of hearing aid batteries, a telephone handset, and a variety of hearing aid cleaning tools and wax trap replacements. The examiner used a script to conduct the test (see Supplemental Appendix S1A). The participant answered the questions and completed the tasks as required. For example, to assess hearing aid removal, the script said "Tell me, how do you turn your hearing aid off? Now please show me how you would do this." To assess feedback management, the script read "If your hearing aid was whistling, what would you check? (prompt until person says two things). Show me how you'd do this." The tester scored each item on the HASK scoring template (Supplemental Appendix S1B). Participants were not (re)instructed on hearing aid knowledge and skill if/when they responded/performed a task incorrectly because this was part of a larger interventional research study which was assessing different forms of hearing aid orientation on outcomes. In a clinical context, or during a different research protocol, (re)instruction during, or immediately following, HASK completion would be encouraged. Over the duration of the study, a total of six individuals administered the HASK. Four of these were audiologists with clinical experience between 1 and 20 yr (average 7 yr), and two were AuD students completing their fourth year externship. At the start of the study, one of the experienced audiologists was trained to administer the HASK. The remaining individuals were trained by observing this individual administer the HASK a minimum of three times.

Analyses

IBM SPSS v22 was used for all statistical analyses. Histograms and box plots were used to examine distribution of HASK responses, descriptive statistics and analyses of variance (ANOVAs) were used to compare HASK scores of each participant group, and repeated measures ANOVAs were used to compare change in HASK scores over time among the veteran participants. Finally, Pearson correlations were used to examine the relationships between HASK scores and other variables.

Results

Distribution of HASK Scores and Between-Population Comparisons

Figure 1 shows the distribution of HASK scores for the new and experienced hearing aid users separately. The scores of both are very similar and are normally distributed. Average performance is ~70% for knowledge and 80% for skills, and this does not change with hearing aid experience. It may seem counterintuitive that an individual could have a higher skill score than knowledge score, but because some knowledge items

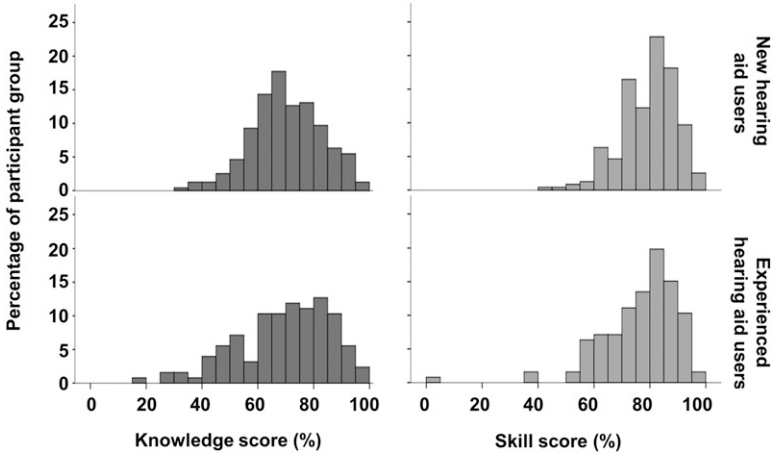

Figure 1. Histograms showing the distribution of HASK scores by hearing aid experience. The upper panels represent the new hearing aid users and the lower panels represent the experienced hearing aid users. Dark bars are knowledge scores and light bars are skill scores.

did not have a skill counterpart (e.g., how do you tell the left from the right hearing aid?) and vice versa (e.g., insert a battery into your hearing aid) this is possible. Table 2 shows means, standard deviations, and ranges of HASK scores for the new and experienced hearing aid users separately, and the results of one-way ANOVAs comparing the scores of each group. The groups did not differ significantly on either HASK score.

As mentioned earlier, for each participant, the HASK items that were not applicable to them were excluded from the computation of percent correct scores. The items that were least often applicable were skill for removing battery tab (not applicable to 94% of new users) because the hearing aid batteries provided by the Veterans Administration were packaged such that the battery did not have battery tab, skill for changing the volume setting (not applicable to 17% of new users and 29% of experienced users) because the hearing aids did not have a volume control, knowledge and skill for switching to the telecoil setting (not applicable to 92% of new users and 82% of experienced users) because either the hearing aids did not have a telecoil or they automatically switched into the telecoil mode when the telephone handset was brought to the ear, and knowledge and skill for switching between programs (not applicable to 80% of new users and 60% of experienced users) because again, program switching was automatic.

Change in HASK Scores over Time

Of the new hearing aid users, 169 completed the HASK twice: 4–8 wk post hearing aid fitting and then again 6 mo later. Table 3 shows these data and the results of repeated measures ANOVAs comparing scores at each administration. Mean knowledge scores did not differ between the two test occasions, while mean skill scores were significantly higher at the 6–8 mo test, although by just 1.7%. As seen from the box plots in Figure 2, the interquartile ranges of the data were small, ranging from −7.5% to +6.7% for knowledge scores and −5.1% to +7.5% for skill scores. In other words, 50% of change scores data were within 8% of the median change, suggesting that knowledge and skills remained fairly stable after a few weeks of hearing aid use. When scores changed to a larger extent, they tended to improve. This can be seen by examining Figure 2 in which the circles indicate participants whose HASK scores changed by more than twice the interquartile range. The HASK scores of seven of the eight individuals improved.

Relationships between HASK Scores and Other Variables

Pearson correlations were used to examine the relationships between HASK scores, age, and the hearing-related self-report variables for the new and experienced hearing aid users separately. The data are separated

Table 2. Percent Correct HASK Knowledge and Skills Score Separated by Hearing Aid Experience

Percent Correct	New Hearing Aid Users (n = 236)	Experienced Hearing Aid Users (n = 126)	Statistic
Knowledge	68.5 (12.6)	69.1 (16.8)	$F = 0.114$
	30–95	19–100	$p = 0.736$
Skills	79.7 (10.6)	77.2 (14.4)	$F = 3.569$
	40–100	3–100	$p = 0.060$

Table 3. HASK Knowledge and Skills Score for New Hearing Aid Users by Test Occasion

	4–8 Wk Post Hearing Aid Fitting (n = 169)	6–8 Mo Post Hearing Aid Fitting (n = 169)	Statistic
Knowledge	69.1 (12.6)	70.0 (12.0)	$F = 0.871$
	30–95	35–95	$p = 0.352$
Skills	80.2 (10.4)	81.9 (9.7)	$F = 4.328$
	47–100	43–100	$p = 0.039$

by user status because, as described in the "Methods" section, the tools used to measure each variable differed slightly. The results are shown in Table 4. To adjust for multiple analyses, only correlations with an associated $p < 0.005$ were considered to be statistically significant. In general, hearing aid use and satisfaction were significantly correlated with HASK scores, such that more knowledge and better skills were associated with more hours of hearing aid use and greater hearing aid satisfaction. Among new users only, being younger was associated with more knowledge and better skills, and worse reported hearing was associated with more knowledge.

HASK Individual Item Analyses

Table 5 shows individual HASK items to which >25% of participants (in one or both groups) did not know the answer and/or could not perform the skill. The data shown are the percentage of individuals who were correct on each item, thus a higher value indicates more participants knew the answer/demonstrated the skill. For new hearing aid users at 4–8 wk postfitting, two values are shown. Value 1 is from the complete data set (n = 236) and value 2 is from the subset of 169 participants who also had 6–8 mo postfitting data. Comparison of the 4–8 wk data shows the two values to be similar indicating that the subset of individuals with 6–8 mo data was representative of the whole population. The knowledge and skills most lacking were those associated with cleaning and troubleshooting the hearing aids. A comparison of data in columns 1 and 2 for the new users with both sets of data shows that performance remained stable (to within 5%) on most knowledge and skill items. There are two exceptions relative to 4–8 wk of hearing aid use: 11% no longer knew to check the battery door was closed when troubleshooting and almost 8% no longer knew how to change between programs. A comparison of data in columns 1 and 3 (new users at 4–8 wk versus experienced hearing aid users) shows a number of differences. First, with just two exceptions, the new users had better knowledge and skills than the experienced users. This is particularly striking with regard to knowing to aerate the battery before using it, knowing to clean the hearing aid tip, knowing and being able to change a wax trap when troubleshooting, and knowing and changing hearing aid programs. The two exceptions were that more experienced users knew to check the hearing aid was seated properly if the aid was feeding back and to check the battery door was closed when troubleshooting the hearing aid.

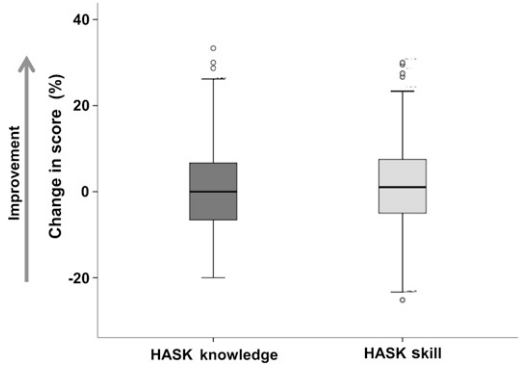

Figure 2. Boxplot of differences in HASK score between 4–8 wk and 6–8 mo postfitting of hearing aids. The median value is shown by the solid horizontal line with the lower and upper ends of the box showing the 25th and 75th percentiles, respectively, and the upper and lower ends of the whisker indicating the range of values within 1.5 times the interquartile range. Circles depict outliers that are >2 whisker lengths above or below the 75th or 25th percentiles, respectively.

Discussion

Performance on the HASK was normally distributed with mean scores at about 70% for knowledge and 80% for skills, although performance spanned almost the entire possible range (3–100). This level of performance is similar to that reported for performance on the PHAST and PHAST-R (Desjardins and Doherty, 2009; Doherty and Desjardins, 2012; Campos et al, 2014). It is noteworthy that the scores of new and experienced users did not differ significantly for the test as a whole, although as discussed below, there were a few specific tasks on which their performance differed. This finding is important in light of the fact that the experienced users were considerably older than the new users (mean age 85.5 versus 69.5 yr). It suggests that even with age-related declines in manual dexterity, vision, and cognition, once the ability to manage hearing aids is established, it can be maintained over time. To our knowledge, there have not been any studies that have specifically examined maintenance of hearing aid skills over time,

Table 4. Correlations between HASK Knowledge and Skills Scores and Other Variables

	New Hearing Aid Users		Experienced Hearing Aid Users	
	Knowledge	Skill	Knowledge	Skill
Age	**−0.21***	**−0.24***	−0.21	−0.14
Hearing difficulties	**−0.24***	−0.16	0.07	−0.01
Hearing aid use	**0.27***	**0.26***	**0.35***	**0.26***
Hearing aid satisfaction	**0.21***	0.14	**0.29***	**0.26***

Notes: *$p \leq 0.005$. Values in boldface indicate significant correlations. To adjust for multiple analyses, only correlations with an associated $p < 0.005$ are considered to be statistically significant.

although similar to our data, Campos et al (2014) showed no relationship between hearing aid management and age, and Salonen et al (2013) showed that although hearing aid use tended to decline with age, hearing aid management ability was not cited as a reason for decreased use. Also of relevance here is the work of Meister et al (2001; 2002) who found that ease of handling was a major consideration for older individuals when selecting features of hearing aids. It can be hypothesized that older individuals are aware of their handling limitations and thus adjust their choice of hearing aids to maintain the ability to manage the hearing aids over time.

Table 5 illustrates that there are a number of management abilities that the majority of individuals regardless of hearing aid experience do not know and/or cannot demonstrate. In particular, knowledge and skill for aerating the battery before inserting it in the hearing aid, cleaning the microphone, and when troubleshooting, checking whether the microphone is blocked or whether the battery door is open were lacking. Others have shown that these "advanced" hearing aid skills are the ones typically deficient among hearing aid users (Desjardins and Doherty, 2009). It is noteworthy that the HASK performance of the new hearing aid users remained stable between the 4–8 wk and 6–8 mo evaluation. This has both positive and negative implications. On a positive note, it implies that once established, skills and knowledge are not quickly forgotten. However, from a more negative perspective, it implies that users do not learn new knowledge and skills with time, or put another way, practice does not make perfect when it comes to hearing aid management. Additional intervention in the form of reeducation is therefore needed if change is to occur. There were a couple of items that were exceptions to this: knowledge for checking the battery door was closed when troubleshooting diminished with time as did skill for changing between hearing aid programs. In terms of the former knowledge, it might be that checking the battery door when troubleshooting had become standard practice so

Table 5. Performance on HASK Items on Which ≥25% of Participants in at Least One Study Group Lacked a Particular Knowledge and/or Skill

	New Users (4–8 Wk Postfitting)	New Users (6–8 Mo Postfitting)	Experienced Users
Knowledge—participant knows how to			
Aerate battery before use	39.0/41.7	39.9	10.8
Clean ear tip with loop or to wash it	94.5/94.7	97.0	73.8
Clean microphone with a brush	38.4/37.9	37.3	28.6
Clean hearing aid body with a cloth	40.1/39.1	42.9	46.8
Clean aid daily to weekly	86.5/86.4	89.9	73.0
Stop feedback by checking hearing aid is seated properly	21.9/19.5	17.3	84.4
Troubleshoot by checking battery door is closed	25.3/27.2	16.0	39.5
Troubleshoot by checking microphone for blockage	19.1/20.2	23.7	16.7
Troubleshoot by checking sound bore for blockage	52.8/54.7	59.5	49.2
Troubleshoot by checking changing wax trap	58.7/62.5	64.4	37.9
Change programs	91.5/89.2	84.1	70.6
Skills—participant correctly demonstrates how to			
Clean the ear tip	94.1/95.3	97.6	72.2
Clean the microphone	38.9/38.4	36.7	27.8
Clean the body of aid	39.3/37.9	43.5	46.8
Troubleshoot by checking whether microphone is blocked	18.6/19.1	23.7	15.9
Troubleshoot by changing the wax trap	63.8/68.4	72.3	36.9
Change programs	91.5/89.2	81.8	70.6

Notes: Data are the percentages of individuals with each knowledge/skill. For new users at 4–8 wk postfitting, the first value is from the complete data set (n = 236) and the second value is from individuals with 6-mo data (n = 169).

participants did not think to mention this as a troubleshooting technique. In terms of the latter skill, participants may not be routinely using multiple programs, and thus over time they forgot how to change between them. Indeed, fewer and fewer hearing aids require manual program switching, and many users find they are satisfied with just a single program, despite more than one being available in the aid (Better Hearing Institute, 2005).

The HASK items that were commonly not applicable (battery tab removal, use of volume control, and switching to telecoil and between programs) reflect changes in technology over time and likely explains why switching to the telecoil and switching between programs was less applicable to the new than to the experienced users. This also illustrates a limitation of the HASK—that over time some items will become obsolete, while it will also be necessary to introduce new items, such as use of a Bluetooth adapter or placing rechargeable devices in a charger. Although this will be a limitation if the HASK is to be used for a research outcome measure, it does not pose a problem for clinical use. In fact, the HASK should be considered a "living tool" that can be adapted by clinicians as the need arises, and indeed adaptation should be encouraged when it is being used as such. It should be noted that because the tester did not objectively verify whether an item was not applicable it is possible that some individuals were incorrect regarding the absence of a volume control, telecoil, or multiple programs. In instances when the participant was incorrect, his/her HASK scores would be elevated.

Experiment 2: HASK Inter- and Intrarater Reliability

Participants

Participants were three audiologists and two AuD students completing their fourth year externship. The audiologists had 3, 4, and 20 yr of clinical experience. The two students and two of the three audiologists had been trained to administer the HASK as a part of another experiment. The third audiologist had not received any training on the HASK at the time of participation. This was done so that we could examine the impact of training on HASK scoring.

The protocol received institutional review board exemption by the VAPORHCS Institutional Review Board and Research and Development committee. The new hearing aid users in the videos had provided written consent to be filmed.

Payment

Participants did not receive payment for taking part.

Procedures

Study participants were provided with a copy of the HASK script and six scoring templates. They watched, on a large television screen while seated alone in a quiet room, videos of six new hearing aid users completing the HASK. They scored each HASK item on the scoring template providing data on intrarater reliability.

Three of the participants here had administered the HASK in the videos. Interrater reliability could therefore be examined by comparing the HASK scores given during the original HASK administration with those given when scoring the videos. Note that in all cases, a minimum of 8 wk had passed between the original HASK administration and the scoring of the video.

Analyses

IBM SPSS v22 was used to obtain intraclass correlation coefficients (ICCs) using a two-way random model for absolute agreement.

Results

ICCs for interrater reliability when data from all five participants were included were 0.76 and 0.94 for HASK knowledge and HASK skill, respectively. When the scores from the audiologist who did not receive HASK training were excluded, ICCs for HASK knowledge and HASK skill were 0.96 and 0.90, respectively. ICCs for intrarater reliability were 0.94 and 0.86 for HASK knowledge and HASK skill, respectively.

Discussion

ICCs >0.7 are considered acceptable, >0.8 are considered good, and >0.9 are considered excellent. The data therefore indicate that both inter- and intrarater reliabilities are good to excellent when the tester has been appropriately trained on administering the HASK. It is somewhat surprising that training on scoring the Knowledge items appears to be more important for maintaining interrater reliability than does training on the Skill items—as illustrated by the increase in Knowledge ICCs when the untrained rater was excluded from the analyses—in that it would seem that interpreting a knowledge response would be less subjective than rating a skill. Regardless of this, the takeaway message here is that following training on HASK administration, both inter- and intrarater reliability are good to excellent. It is acknowledged that the number of participants (audiologists and students administering the HASK) in this experiment was small. As a result, these findings might be overly positive; that is with a bigger sample size inter- and intrarater reliability may decrease. This would have to be assessed in a further experiment.

GENERAL DISCUSSION AND CONCLUSIONS

This article describes the utility of and normative data for the HASK test that assesses knowledge and skills associated with managing hearing aids. As noted by Kumar et al (2000), Bertoli et al (2009), and Hickson et al (2014), and further supported by the statistically significant positive correlations between HASK scores and hearing aid use and satisfaction, the ability to manage hearing aids successfully is necessary for good hearing aid outcomes.

The HASK takes ~15 min to complete and has both clinical and research applications. From a clinical perspective it can be used as a patient-centered teaching tool. It efficiently determines which knowledge and skills a hearing aid user is lacking, which they are unsure about, and which they have mastered. This enables the clinician to quickly identify which management tasks need to be retaught or practiced during a hearing aid follow-up appointment. As a result, it has the potential to prevent ongoing frustration in patients and/or abandonment of the devices. Further, it can increase clinical efficiency by averting the need for clinical appointments to address issues such as cerumen occlusion of the wax guard that could be resolved by the patient. From a research perspective, the HASK can be used as an outcome measure to provide quantitative data about hearing aid handling.

The HASK is a quick and easy test with acceptable to excellent inter- and intrarater reliability. It can effectively identify which hearing aid management skills are lacking so that the audiologist can provide additional education and training on that skill. Data show performance is ~70% for knowledge and 80% for skills and that this does not change with hearing aid experience. The significant positive correlations between HASK scores and hearing aid use and satisfaction highlight the notion that ability to manage hearing aids successfully is integral to good hearing aid outcome.

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Appendix 1a. Hearing Aid Skills and Knowledge test (HASK) instructions, script and scoring

Materials needed:

- Batteries
- Telephone
- Cleaning tools
- Wax trap replacements
- Hearing aids

Script

I want you to show me some of the things you do to look after your hearing aids.

1. Take both hearing aids out of your ears.
2. Tell me, how you turn your hearing aid off? Now please show me how you would do this.
3. What size battery does your hearing aid use or what color is the packet the batteries are in? How would you order new batteries?
4. How do you know when it is time to change the battery in your hearing aid? About how long should your battery last? Tell me how you change the battery. Please show me how you'd do this.
5. What parts of your hearing aid should you clean? (prompt for 3 things). How often should you clean your hearing aids? Now please clean your hearing aid. Here are some tools you may use.
6. How do you know which hearing aid goes in which ear? Please put the hearing aid back into your ear.
7. How do you turn up the volume of your hearing aid? Show me how you would make the hearing aid louder.
8. Tell me what you do to use the phone when you are wearing your hearing aids. Now show me.
9. What would you do to your hearing aid if you wanted to change the program? Show me how you'd do this (if appropriate).
10. If your hearing aid was whistling, what things would you check? (prompt until person says two things). Show me how you'd do this.
11. If your hearing aids were not working, what things would you check? (prompt until person says four) Show me how you'd do this.
12. What should you do with your hearing aids each night before you go to sleep? (Prompt)

Skills Scoring:
2-points: Achieved with no difficulty on first attempt
1-point: Achieved with some difficulty (more than one attempt, used deviant method)
0-points: Could not perform task

Knowledge Scoring:
1-point: Knew the information
0-points: Did not know the information

Total score is adjusted for tasks that are not applicable

Appendix 1b. Hearing Aid Skill and Knowledge test (HASK)

Topic area	Skills tested	Knowledge Score (0,1)	Skills Score (0,1,2)	NOTES
1. Hearing aid removal	i. Removes from ear			
2. Opening of battery door	ii. Knows how to turn hearing aid off			
	iii. Opens battery door (or pushed the correct button appropriately.)			
3. Selection of correct battery	i. Knows appropriate battery size/color			
	ii. Knows how to order new batteries			
4. Changing of hearing aid battery	i. Knows when to change battery (hearing aid dead or battery warning tone)			
	ii. Knows battery duration (4 days to 2 weeks)			
	iii. Removes old battery			
	iv. Removes battery tab			
	v. Leaves battery aerate for at least one minute			
	vi. Inserts battery into aid			
5. Cleaning of hearing aids	i. Ear tip/sound bore (loop or wash)			
	ii. Microphone (with brush)			
	iii. Body of aid (with cloth)			
	iv. Knows how often to clean (daily to weekly)			
6a. Left versus right	i. Knows L vs. R			

6b. Hearing aid insertion	i. Inserts aid into right ear			
	ii. Body and canal tip/earmold are seated properly in the right ear			
	iii. Inserts aid into left ear			
	iv. Body and canal tip/earmold are seated properly in the left ear			
7. Volume increase	i. Increases volume			
8. Telephone use	i. Switches to telephone program /t-coil switch (if appropriate)			
	ii. Places phone in correct relation to hearing aid			
9. Program use	i. Goes through programs (if appropriate)			
10. Feedback troubleshooting	i. Checks hearing aid is seated properly			
11. Troubleshooting	i. Checks the battery door is closed			
	ii. Changes hearing aid battery			
	iii. Checks microphone for blockage			
	iv. Checks sound bore for blockage			
	v. Changes wax trap (if appropriate)			
12. Hearing aid storage	i. Open battery door			
	ii. Place hearing aid in case or dry-aid kit			
	SCORE TOTALS:	___ out of ___	___ out of ___	