

## Introduction

At least 37.5 million Americans report trouble hearing, yet only approximately 17% of those adults who may benefit from hearing aid use wear hearing aids (NIDCD, 2016; WHO, 2020). As affordable alternatives to traditional hearing aids and services arrive on the market, it is of interest to understand public perceptions surrounding these devices and services, and what factors might impact an individual's willingness to use or recommend a traditional or non-traditional direct-to-consumer (DTC) hearing device. This study attempted to evaluate these questions. The following questions were asked:

1. What are perceptions of some current hearing devices on the market when cost is not provided?
- 2a. When approximate costs were considered, which devices did the public rate as most likely to recommend or purchase?
- 2b. What influenced these decisions?
3. What factors affected a person's reason to use or recommend a traditional hearing device versus a non-traditional hearing device?

## Methods

**Design:** Non-intervention cross-sectional survey.

**Recruitment:** An invitation to participate in an online survey was shared to social media.

**Survey:** Following questions about demographics and hearing status and experience, the survey presented images of 6 different types of hearing devices. Each device was described in terms of how to obtain, set up, and use it, as well as the advertised Sound Features for each device. The order of device presentation was randomized. Participants evaluated each device in terms of the attributes listed in Table 2. Following these evaluations, the advertised prices were presented, and participants were asked to rank them in order of likelihood to purchase, use, or recommend the devices. Finally, they were asked to rank the top three features that would influence their decisions to use or recommend a specific type of device.

**Participants:** 203 participants began the online survey. Of these, 102 completed at least 60% of the survey, which was deemed adequate for inclusion in the final analysis. 77 participants were from the United States, 25 participants represented at least 14 different countries. Outcomes were not significantly different for those in the US compared to mean responses from those in other countries; thus, all participants were included in these analyses. Complete demographic information, can be found using the QR code at right (Figure 2). Those characteristics that were salient to our final predictor model are presented below.

Table 1. Demographic Characteristic	n	%	n	%
Race/Ethnicity			Experience/Familiarity with Hearing Devices	
Non-Hispanic, White, or European	82	80.4	24	23.5
Black, Afro-Caribbean, or African American	5	4.9	14	13.7
Hispanic, Latinx, or Spanish	2	2.0	39	38.2
East Asian or Asian	3	2.9	6	5.9
South Asian or Indian	3	2.9	18	17.6
Native Hawaiian or other Pacific Islander	1	1.0	Experience with Hearing Healthcare Professionals	
Other	3	2.9	74	72.5
Choose not to report	3	2.9	28	27.5
Age			Have you or anyone that you know ever been to an audiologist or other hearing professional (YES)	
18-24	24	23.5	28	27.5
25-39	35	34.3	Have you or anyone that you know ever been to an audiologist or other hearing professional (NO)	
40-49	19	18.6		
50-59	16	15.7		
60-69	7	6.9		
70-79	1	1.0		



Figure 1. This QR code redirects to additional demographics, raw data, and final rankings.

## Results

### 1. What are perceptions of some current hearing devices on the market when cost is not provided?

Participants' ratings of each attribute were averaged. These means were ranked in order of Best (1) to Worst (6) and are presented in the table below. Traditional devices are highlighted in yellow differentiation from direct-to-consumer devices.

Rank 1 (1=Best, 6=Worst)	Appearance/Attractiveness	Ease of purchase	Ease of getting professional help to use the device	Ease of using the device	Customizability	Sound quality	Cost-effective	Comfort (physical)	Comfortable being seen wearing the device	Ease of use for a person with hearing loss	Willingness to pay, \$ US, X, (sd) (largest to smallest price)
1	Signia Silk	Bose	Phonak Audeo	Bose	Phonak Audeo	Phonak Audeo	CVS	Phonak Audeo	Signia Silk	Phonak Audeo	Phonak 1086.13 (1009.17)
2	Hear Bloom	Hear Bloom	Signia Silk	Signia Silk	Signia Silk	Signia Silk	Bose	Signia Silk	Hear Bloom	Signia Silk	Signia 1068.92 (1025.79)
3	Phonak Audeo	Otofonix	Otofonix	Phonak Audeo	Bose	Bose	Hear Bloom	Hear Bloom	Phonak Audeo	Otofonix	HearBloom 678.93 (924.56)
4	Bose	CVS	Hear Bloom	Otofonix	Otofonix	Otofonix	Otofonix	Otofonix	Otofonix	Hear Bloom	Otofonix 371.50 (432.69)
5	Otofonix	Signia Silk	Bose	Hear Bloom	Hear Bloom	Hear Bloom	Phonak Audeo	CVS	CVS	Bose	Bose 264.38 (481.15)
6	CVS	Phonak Audeo	CVS	CVS	CVS	CVS	Signia Silk	Bose	Bose	CVS	CVS 97.51 (141.73)

### 2. When approximate costs are considered, which devices do the public rate as most likely to recommend or purchase?

#### What influences these decisions?

Counts of participants' top-rated device are presented below. For each Device Preference Group, the top three most frequently indicated features that the group reported would influence their decisions to recommend or use a device are also presented below.

Top-rated device (cost/device, \$US)	N	Table 3. Top 3 factors		
CVS Amplifier (\$40)	32	Professional help	Reviews	Appearance
Phonak Audeo (\$1649)	24	Professional help	Cost	Independent Adjustments
HearBloom (\$399.95)	15	Cost	Independent Adjustments	Reviews
Bose Hearphones (\$499.95)	14	Cost	Independent Adjustments	Rechargeable
Otofonix (\$399)	9	Cost	Independent Adjustments	Reviews
Signia Silk (\$1599)	9	Reviews	Rechargeable	Bluetooth



### 3. What factors affect a person's decision to use or recommend a traditional hearing device versus a non-traditional hearing device?

A standard binary logistic regression was performed to examine how various factors predicted the likelihood of choosing a traditional device over a non-traditional hearing device as a first choice. Factors such as race/ethnicity, gender, socioeconomic factors, and experience with hearing devices and professionals were included in the regression. This model explained 43% of the variance in first choice and correctly classified 76% of cases. Only those factors that were significant predictors ( $p < .05$ ) or approached statistical significance ( $p < .1$ ) are presented below. Increasing age was associated with a 1.76% greater likelihood ( $\beta = 0.57$ ,  $s.e. = 0.29$ ,  $p = 0.04$ ), and previous experience with hearing professionals was associated with a 5.4% greater likelihood of preferring a traditional device ( $\beta = 1.69$ ,  $s.e. = 0.86$ ,  $p = .04$ ). White, Non-Hispanic race and knowing someone that wears a hearing device were both associated with a greater likelihood of preferring a non-traditional device; however, these trends did not achieve statistical significance.  $* = p < .05$ .

	$\beta$ (s.e)	Wald	Odds Ratio (95%)
Age	.57* (.29)	3.91	1.76 (1.0, 3.09)
Experience with hearing professionals	1.7* (1.0)	3.88	5.42 (1.01, 29.11)
Race (Non-Hispanic, White, or European)	-1.83 (1.0)	3.70	.16 (.03, 1.05)
Knows someone who wears one or more devices, does not personally use a hearing device	-1.76 (.93)	3.55	.17 (.28, 1.08)

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## Q&A:

### 1. What were perceptions of some current hearing devices on the market when cost was not provided?

- Participants with and without hearing loss perceived traditional device exemplars as having better customizability, sound quality, physical comfort, ease of use, and access to professional assistance. Traditional hearing devices were rated toward the top in terms of attractiveness and comfort being seen wearing the device, however, a non-traditional in-the-canal device was rated slightly higher for these categories than the traditional behind-the-ear device. On average, participants were willing to pay (WTP) nearly \$1,100 for the traditional devices, though these WTP indicators were extremely variable. Non-traditional devices were ranked highest in terms of ease of obtaining the device and cost effectiveness. Participants indicated an average WTP of less than \$1,000 for these devices (again with great variability).

### 2a. When approximate costs were considered, which devices did the public rate as most likely to recommend or purchase?

- The top-rated device varied substantially across participants, regardless of the approximate costs. The least expensive non-traditional device was most frequently the top choice followed by the most-expensive traditional hearing aid.

### 2b. What influenced these decisions?

- We counted how often members of each device-preference group reported that certain device features were important to their decisions to use or recommend a device. See Table 3. Some factors were not surprising. For example, those who chose traditional devices frequently indicated that professional services and high-level technical features were important to them; whereas those who selected non-traditional devices frequently indicated that cost and independent adjustments were of primary importance.
- One interesting finding was that assistance from a professional was reported as an important factor for those who ultimately ranked the CVS Amplifier highest. This might indicate that consumers expect professional assistance from pharmacists and pharmacy assistants when devices are purchased from a pharmacy such as CVS. These data should be interpreted with some caution as important features were not always consistent with participants' final top choices. For example, "rechargeable" and "waterproof" features were both indicated as important to 9 members of the group that chose the CVS Sound Amplifier Kit as their top choice; yet this device does not have either of these features. Reasons for these inconsistencies are not clear.

### 3. What factors affected a person's reason to use or recommend a traditional hearing device versus a non-traditional hearing device?

- Older participants and those with prior experience with hearing healthcare professionals were more likely to use or recommend a traditional device over a DTC device. There was a nonsignificant trend for participants who self-identified as Not-Hispanic, White or European racial background and those who had been exposed to someone with hearing aids in the past to prefer non-traditional hearing devices as their top choice. Socioeconomic factors such as income, education level, and job status were not significant predictors for top selection of a traditional or non-traditional hearing device.

## Discussion

Overall, perceptions of hearing devices and decisions about whether to use, purchase, or recommend them varied substantially among individuals in this group. Traditional devices were perceived as superior for most attributes, but DTC devices were generally perceived as easier to obtain and more cost-effective. Seventy percent of these participants indicated that a DTC device would be their top choice despite the overall perceptions that traditional devices were superior. This suggests that when consumers consider the relative costs and benefits of different types of hearing devices, ease of access and financial cost have greater weight in final purchasing decisions. These findings support the notion that traditionally underserved individuals might be more willing to obtain assistance for their hearing difficulties through DTC options. That said, older adults and those with previous professional experience tended to prefer traditional devices. These individuals might have greater awareness of differences in hearing devices and of the added value of professional hearing health services. This finding highlights a need for increased publicity about professional hearing care services.

### References

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