Background

Hearing aids have evolved considerably over time. As early as the 13th century, hearing loss was addressed with sound-amplifying animal horns. Man-made ear trumpets arrived in the 17th century, and analog hearing aids arrived in the early 20th century. The first digital hearing aid arrived at the end of the 20th century and within a decade, the market was dominated by digital hearing aids. The technology has advanced rapidly, with today’s digital hearing aids having numerous features and functionalities that were unimaginable in the analog age.

These advancements are fueled by developments in technology as well as evolving consumer needs. Modern hearing aids have a wide range of functionalities including bilateral connectivity, digital wireless streaming, rechargeability, and specialized programs for various conditions.
aspects including music. And hearing aids increasingly rely on artificial intelligence and machine learning to provide a personalized listening experience. In addition, some new hearing aids also have general health features such as step counting and fall detection—and a newly-announced hearing aid from Phonak will deliver heart rate monitoring.

The features and functionalities available in modern hearing aids are influenced by a variety of factors. Features developed for consumer electronics are often adopted by hearing aid manufacturers (e.g., wireless streaming). Emerging trends in general healthcare, like the shift from specific-disease focus to focus on holistic health and well-being, influence hearing aid features (e.g., heart rate monitoring). Perhaps most importantly, evolving consumer preferences have a big influence on what features and functionalities are included in hearing aids. Information on what patients or consumers desire (or don’t) can be very useful information for manufacturers. Hearing aid professionals can also benefit from this information, using it as a guide to help choose appropriate devices for contemporary patients.

Only a few studies to date have examined the patient perspectives on hearing aid features. Meister et al. (2002) examined the importance of fundamental hearing aid attributes in a sample of 175 experienced hearing aid users in a university hospital. Of the six attributes studied, the two with the highest ratings concerned speech perception (i.e., speech in quiet and speech in noise). People rated these speech perception attributes as being more important than the other attributes, which included sound quality, handling, feedback, and localization.

In another study, Zhu et al. (2020) examined preferences for hearing aid attributes among 125 rural Chinese adults with moderate or greater hearing loss. The study results suggested that cost, effectiveness in quiet, water and sweat resistance, and battery life were associated with choosing a hearing aid.

These studies were limited by two primary issues. First, the sample sizes were relatively small. Second, these studies looked at only a few traditional attributes (e.g., speech perception, sound quality, battery life).

**Hearing Tracker Research** To gain a better understanding of the features and attributes consumers find desirable, we recently addressed these issues by examining preferences of consumers (n=14,993) on a range of modern hearing aid attributes (Manchaiah et al., 2022). This data was generated from the HearingTracker website (www.hearingtracker.com) through their “Help Me Choose” tool. This is a decision aid that was developed to empower hearing aid consumers by suggesting a most suitable hearing aid based on their preference for various attributes.

**Most and Least Desirable Hearing Aid Attributes** Study participants rated 21 unique attributes of modern hearing aids on a 5-point Likert scale (i.e., 5=extremely important and 1=not at all important). These attributes focused on seven domains:

- **general hearing** (i.e., hearing friends and family in quiet, hearing friends and family in noise),
- **music and audio streaming** (i.e., hearing music, audio broadcast by hearing loop, stream audio from TV, stream multimedia audio from non-Apple device),
- **phone call** (i.e., hearing on landline, hearing on mobile phone, stream audio from landline, hands free mobile phone calls),
- **device preferences** (i.e., physical comfort, visibility, rechargeability),
- **reliability** (i.e., reliability, water resistance, dust resistance),
- **accessories** (i.e., control hearing aid volume and settings from smartwatch, pick up distance voices and beam them to hearing aid using remote microphone), and
- **other** (i.e., override automatic volume control and program, remote hearing aid adjustment from home).

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Additionally, the study also gathered data on:

- perceived hearing loss (i.e., mild, moderate, severe, profound, or unsure),
- preference towards technology level (i.e.,
  - advanced technology [most expensive],
  - mid-range technology,
  - essential technology [least expensive],
  - show me the best matches, regardless of price), and
- mobile phone type (i.e., iPhone, Android).

Figure 1 presents the descriptive of desirable user ratings (i.e., extremely important or important in a 5-point scale) for all the attributes studied. Over 60% of the users rated the following attributes as desirable:

- hearing in noise,
- hearing in quiet,
- reliability,
- physical comfort, and
- hearing on mobile phone.

On the contrary, hearing aid attributes users rated as least desirable (i.e., 30% or less participants rating as extremely important or important) included:

- controlling hearing aid using smart watch,
- streaming audio from landline,
- audio broadcasting by hearing loop,
- picking up distant voices and beaming them to hearing aid, and
- streaming multimedia audio from non-Apple devices.

These results confirm that the most important aspects of hearing aids continue to be related to speech perception.

Examining the association between type of hearing loss and preference to attributes provided some interesting findings. Those with severe to profound hearing loss reported that hearing on a mobile phone was very desirable. Individuals with mild hearing loss were more likely to report visibility as most desirable, whereas visibility was rated as least important by individuals with severe to profound hearing loss.
Moreover, individuals with severe to profound hearing loss were more likely to desirably rate hearing loop attribute. When examining the association between degree of hearing loss and technology level, it was found that individuals who had mild to moderate loss had preference to mid-level technology, whereas those who had unsure hearing loss category were likely to ask for best match of hearing aid regardless of technology level.

Sub-Groups Based in Preferences to Hearing Aid Attributes
We also performed cluster analysis to identify sub-groups of users based on their preferences to hearing aid attributes. This analysis resulted in two unique sub-groups, which we named “Selective” and “Indiscriminate.” The Selective group included 64.3% of participants; they were individuals who reported wanting their best hearing aid match, regardless of the price and/or hearing aids with advanced technology. They had distinct preferences, rating some attributes as more desirable than others. For instance, most users in this group rated “physical comfort” as extremely important and “stream audio from landline” as “not important.”

Conversely, the Indiscriminate subgroup, which included 35.7% of participants, included users who wanted most advanced hearing aids and rated all of the attributes in the questionnaire as being desirable. They generally did not rate any attributes as being undesirable. It is noteworthy that the sub-groups found here were not based on the degree of hearing loss, but rather their preferences for various hearing aid features and functionalities.

Practice Implications and Future Directions
These results have immediate and direct practice implications. The hearing instrument manufacturers could use consumer preferences when designing new products and technologies. More importantly, the study results can be of use to hearing care professionals when making hearing aid recommendations to their patients. For instance, it may be more appropriate to recommend hearing devices that are smaller and look more like audio electronics when compared to traditional hearing aids, especially for people with perceived mild or moderate hearing loss.

Also, when recommending hearing aids to individuals with severe to profound hearing loss, the focus should be to enhance hearing using important features, such as hearing on a mobile phone and in a looped room, instead of focusing on the look and feel of hearing aid. Moreover, those with unsure hearing loss were more likely to rely on a hearing care professional’s recommendations on technology levels. Of course, the hearing aid selection process is highly individualized, as these recommendations are intended to serve as a general guide and a starting point for the process.

As highlighted earlier, hearing aids are evolving constantly with new features and functionalities being added each year. Some of the newest hearing aid features such as fall detection, artificial intelligence, and machine learning have not been examined in the current and previous studies. Future studies should aim to include these modern features. In addition, it is likely that preferences will change over time. For instance, the attribute
“hearing aid adjustment from home” was rated as not very desirable, but the data were gathered before 2020. We might see a change in the acceptance and desire for at home adjustments in the upcoming years as the consumer preferences may have shifted with the onset of the pandemic. For this reason, it is important to examine trends over time that could help us all continue to make informed clinical decisions.

In the meantime, hearing care professionals should continue to focus on fittings that emphasize speech perception and fitting comfort, as well as facilitate connections to other technologies so hearing aid users can communicate and stay connected to their auditory worlds.

ABOUT THE AUTHORS

Vinaya Manchaiah, AuD, MBA, PhD, serves as the Professor of Otolaryngology-Head & Neck Surgery at the University of Colorado School of Medicine and as the Director of Audiology at the University of Colorado Hospital (UCHealth). His research focuses on improving accessibility, affordability, and outcomes of hearing healthcare services by promoting self-management and also the use of digital technologies. He is the Principal Investigator at the Virtual Hearing Lab (www.virtualhearinglab.org).

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REFERENCES


Hearing Tracker Research: Consumer Preferences on Hearing Aid Attributes, article on page 14.

1. Hearing care professionals should
   a. focus on fittings that facilitate
c      connections to other
techologies.
b. provide fitting comfort.
c. emphasize speech perception.
d. All of the above.

2. Individuals who are unsure of their hearing loss are less likely to rely on a hearing aid specialist’s recommendation on technology level.
   a. true
   b. false

3. Digital hearing aids dominated the market by the end of the 20th Century.
   a. true
   b. false

4. The emerging trend in healthcare is shifting away from holistic health and towards specific-disease focus.
   a. true
   b. false

5. According to the Hearing Tracker study:
   5.1. individuals with severe-to-profound hearing loss
       a. were less likely to desirably rate hearing aid looping.
b. viewed visibility as a most important attribute.
c. viewed hearing on a mobile device as very desirable.
d. all of the above.

6. More than 60% of users rated the attribute of hearing on a mobile device as desirable.
   a. true
   b. false

7. People with mild-to-moderate hearing loss
   a. Are likely to be pleased with traditional looking hearing aids.
b. Are likely to be most attracted to more modern-looking hearing aids.
c. Aren’t likely to be concerned with the size of the hearing aid.
d. None of the above

8. The results of this study prove
   a. Trends don’t help us make informed clinical decisions.
b. The hearing aid selection process is highly personalized.
c. There is a definitive formula for selecting the best hearing aid for each category of hearing loss.
d. None of the above

9. Advancements in hearing aids are fueled solely by evolving customer needs.
   a. true
   b. false

10. An individual's preferences of hearing aid attributes are not likely to change over time.
    a. true
    b. false

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**HEARING TRACKER RESEARCH: CONSUMER PREFERENCES ON HEARING AID ATTRIBUTES QUIZ**

**For continuing education credit, complete this test and send the answer section to:**

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**Answer Section**
(Circle the correct response from the test questions above.)

1. a b c d
2. a b
3. a b
4. a b
5. a b c d
6. a b
7. a b c d
8. a b c d
9. a b
10. a b