

User Awareness and Perspectives Survey on Privacy, Security and Usability of Auditory Prostheses

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Motivation

"Over **466 million** people worldwide suffer from disabling hearing loss, including approximately **34 million** children (World Health Organization). [1]"

- Prior work [2] extensively examined the impact of the cochlear implant (CI) and hearing aids (HA) on quality of life, evaluating factors such as auditory satisfaction, social engagement, and psychological stress.
- As these devices become more advanced and interconnected with digital networks, issues surrounding **data privacy and security** have become increasingly pertinent.
- Studies [3, 4] have highlighted **the lack of cybersecurity** in private medical practices, indicating increased risks of cyberattacks and security breaches involving sensitive personal information.
- This work **contributes** to the field by **addressing gaps** in user perceptions of HA and CI usability, identifying key factors in consumer purchasing decisions, and highlighting the need for improved privacy and security awareness and education among users.

Demographics

Figure 1: Participants demographics. Gender (left) and age groups of the participants (right)

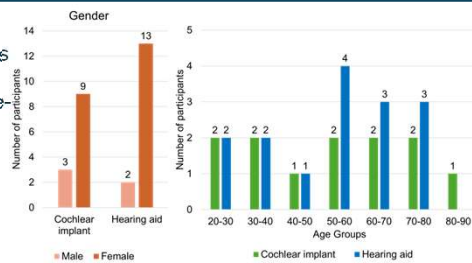
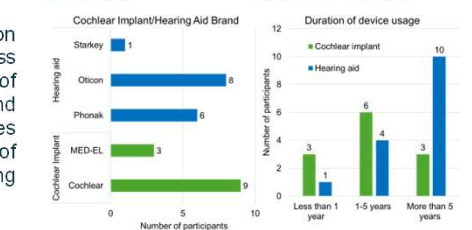


Figure 2: Distribution of participants across various brands of cochlear implants and hearing aid devices (left) and duration of device usage among participants (right).



Results: Device Satisfaction and Purchase Decision

44% participants reported complete satisfaction with performance, while 48% expressed complete dissatisfaction with flexibility.

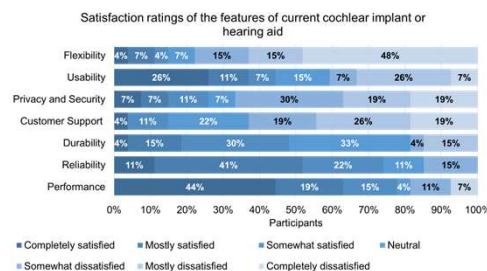


Figure 3. (RQ1) Survey participants' responses when asked: *How satisfied are you with the features of your current cochlear implant or hearing aid?*

48% of participants considered performance to be most important while price (30%) & recommendations from healthcare professionals (22%) were perceived as least important

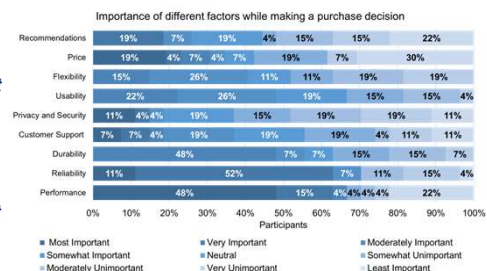


Figure 4. (RQ2) Participants' responses when asked: *When deciding to purchase a cochlear implant or hearing aid, what factors are most important to you?* Factors were ranked in order of importance on Likert scale with each option assigned a unique rank.

Results: Data Privacy and Security Awareness

"Encryption is not an often-discussed topic with CI apps but will be very important as remote care options become more prevalent." - Quote from participant

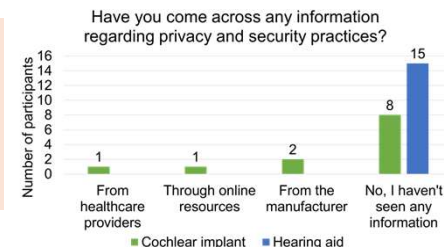


Figure 5: (RQ3) Participants' responses when asked: *Have you come across any information regarding privacy and security practices (like usage of passwords, and information on data protection) associated with your cochlear implant or hearing aid?*

Most participants (18/27) suggested receiving regular email updates to enhance privacy and security awareness.

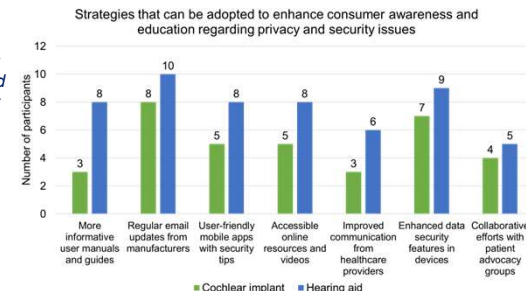


Figure 6: (RQ4) Participants' responses when asked: *What do you believe could be done to enhance consumer awareness and education regarding privacy and security issues associated with cochlear implants or hearing aids?*

Conclusion

- CI and HA users are most satisfied with performance and consider performance while making purchase decision.
- A significant gap in awareness regarding privacy and security practices was evident.
- Future work could involve creating educational programs to enhance user knowledge of privacy and security practices, studying the impact of this awareness on device adoption and usage, and designing more secure and user-friendly features.

References

[1] World Health Organization. (2021). Deafness and hearing loss.
 [2] Cox, Robyn M et al. "Impact of Hearing Aid Technology on Outcomes in Daily Life I: The Patients' Perspective." *Ear and hearing* vol. 37,4 (2016).
 [3] Dykstra, Josiah et al. "Cybersecurity in Medical Private Practice: Results of a Survey in Audiology." *2020 IEEE 6th International Conference on Collaboration and Internet Computing (CIC)* (2020): 169-176.
 [4] Katrakazas, Panagiotis et al. (2018). A (Lack of) Review on Cyber-Security and Privacy Concerns in Hearing Aids. 223-226. 10.1109/CBMS.2018.00046.

Research Questions

RQ1: How satisfied are consumers with their current cochlear implants or hearing aids?

RQ2: What is the perceived level of importance of different factors like performance, durability, and price while making a purchase decision?

RQ3: How informed are users about privacy and security practices?

RQ4: What strategies might be helpful to increase consumer awareness about privacy and security features?

Methods

- Survey completed on the Research Electronic Data Capture (REDCap) platform.
- Survey queried participant demographics, device details, usage satisfaction, app security, privacy, cybersecurity awareness, improvements, and purchase decisions.

