



Assistive Listening Devices for Individuals with Hearing Impairment

Ekpete, O.H.

Department of Educational Psychology, Guidance and Counselling/Special Education,
Ignatius Ajuru University of Education, Rumuolumeni Port Harcourt, Nigeria.

Corresponding author email: hekpete@gmail.com

Abstract

This paper examined assistive listening devices for individuals with hearing impairment. Assistive listening devices (ALDs) play a vivacious role in enhancing communication for persons with hearing impairment. Several intervention methods and technologies, including assistive listening devices, hearing aids, auditory rehabilitation, cochlear implants, and personalized educational interventions, are explored as means to address an individual's specific needs. This paper delves into the multifaceted realm of hearing impairment, addressing its prevalence, categorization, diagnostic procedures, and management strategies. It underscores the crucial role of comprehensive assessment conducted by audiologists and otolaryngologists in guiding treatment decisions. It emphasizes the significance of ALDs in addressing the obstacles encountered by those with hearing impairment. Furthermore, the paper highlights the significance of increased awareness and early intervention processes to foster inclusivity for individuals with hearing impairment and alleviate the impact of hearing impairment.

Keywords: Assistive Listening Device, Hearing Impairment, Availability Assessment, Audiologists

Introduction

Children with hearing impairment have the utmost hurdle in communicating with others. Many researches indicate that the academic outcome of hearing-impaired students is way below their peers. According to Agyire-Tettey et al. (2017), if individuals do not access early intervention services such as speech therapy or hearing devices, along with early testing, and timely diagnosis, then hearing loss can lead to difficulty perceiving the sounds normally, thus affecting speech and resulting in a lag in their daily routine, social play, or academic performance. Individuals living with disabilities are characterized as a group of vulnerable people. An impairment in the human body function, participation restrictions, and activity limitations is known as disability (WHO & World Bank, 2011). Persons with hearing impairment are classified as either deaf or hard of hearing based on the severity of their condition, which can be permanent or fluctuating in range from mild to profound. Hearing loss denotes a decrease in the ability to hear sounds at 25 decibels or less. Hearing impairment refers to a partial or total incapability to hear sounds in one or both ears as it involves an eclectic range of auditory disorders, ranging from mild to profound deafness, which could result from various factors, including ageing processes, congenital conditions, genetic predisposition, ototoxic medications, infections, accidents, and noise exposure (World Health Organization, 2021). According to the World Health Organization (2021), significantly 466 million people globally live with hearing loss, with the prevalence likely to rise due to population ageing and growing exposure to environmental noise. Hearing impairment can disturb and affect individuals of all ages, from infants to older adults, and can have weighty implications diagonally in various domains, including language development, social interactions, academic achievement, and employment opportunities. American Speech-Language-Hearing Association (2018) opined that those with hearing impairment possibly will experience difficulties in distinguishing speech, localizing sound sources, and understanding conversations, which can significantly influence their communication abilities and value of life.

The diagnosis, management, and treatment of hearing impairment usually entail a detailed evaluation conducted by audiologists, otolaryngologists, and other medical healthcare professionals. Treatment and management approaches can encompass a variety of interventions such as assistive listening devices, cochlear implants, hearing aids, auditory rehabilitation, and educational approaches tailored to the precise needs, requirements, and choices of the individual

(World Health Organization, 2021). By understanding the sources, consequences, and available interventions for hearing loss, healthcare professionals can successfully support persons with hearing impairment in maximizing their communication abilities and quality of life.

Hearing impairment is a predominant sensory disability affecting millions of people worldwide. Communication barriers associated with hearing loss can significantly impact an individual's participation in various activities, social interactions, and quality of life. Assistive listening devices (ALDs) serve as technological solutions invented to ease these barricades associated with disability by improving accessibility and availability of technologies to enhance communication for individuals with hearing impairment. ALDs involve a wide range of systems and devices that work in unification with hearing aids or cochlear implants to improve comprehension and speech perception in various listening environments. Assistive learning devices (ALDs) are particular apparatuses designed to boost accessibility and facilitate learning for individuals with diverse learning needs, as well as those with disabilities or specific learning difficulties. These devices incorporate a wide range of devices, strategies, and technologies aimed at providing support, alternative methods of accessing information, and accommodations and participating in educational activities (National Center on Universal Design for Learning, 2021).

Center for Parent Information and Resources (2021) suggested that ALDs are personalized to address various blockades to learning, such as communication difficulties, cognitive challenges, physical limitations, and sensory impairments. Examples of ALDs include augmentative and alternative communication (AAC) devices, speech recognition programs, tactile graphics, screen readers, alternative keyboards, adaptive seating, and text-to-speech software. By using ALDs, educators can create inclusive learning atmospheres that accommodate the diverse needs and abilities of all learners, endorsing equal access to educational opportunities and fostering academic success. ALDs permit students with disabilities to contribute actively to classroom activities, express their ideas and preferences, engage with curriculum materials, and demonstrate their knowledge and skills (National Center on Universal Design for Learning, 2021). Also, ALDs empower individuals with disabilities to develop self-advocacy, independence, and self-confidence skills, enabling them to pursue their academic and career goals effectively and navigate educational settings. Parents, educators, and other stakeholders play critical roles in recognizing appropriate ALDs, executing effective strategies, and providing constant support to make the best use of the benefits of assistive technology for learners with diverse needs (Center for Parent Information and Resources, 2021).

Types of Assistive Listening Devices

ALDs can be categorized into numerous types based on their applications and functionalities.

1. **Personal Amplification Systems:** These devices, such as personal infrared systems and FM systems, amplify sound straight into the user's hearing aids or cochlear implants, reducing background noise and enhancing speech clarity.
2. **Induction Loop Systems:** Induction loop systems use electromagnetic signals to convey sound directly to telecoil-equipped hearing aids, allowing users to hear clearly in environments equipped with loop technology, such as lecture halls, churches, and theatres.
3. **Wireless connectivity and Bluetooth-enabled Devices:** Wireless ALD systems offer amplified convenience and flexibility, allowing users to connect to multiple audio sources at once and switch between devices smoothly. Bluetooth technology enables seamless connectivity between cochlear implants or hearing aids and compatible devices such as televisions, tablets, and smartphones, permitting users to stream audio directly to their hearing devices.
4. **Alerting Devices:** Alerting devices, such as doorbell signallers, vibrating alarm clocks, and smoke detectors, make available visual or tactile alerts to individuals with hearing impairment, ensuring their awareness of important environmental cues and safety.
5. **Captioning Systems:** Captioning systems show real-time descriptions of spoken dialogue or audio content, enabling individuals with hearing loss to access information in various settings, including conferences, classrooms, and public events.

Assistive learning devices (ALDs) involve a diverse range of tools and technologies designed to aid individuals with disabilities in participating in learning activities, accessing educational materials, and demonstrating their knowledge and skills such as:

1. **Text-to-Speech (TTS) Software:** Text-to-speech (TTS) software translates written text into spoken language, enabling individuals with reading difficulties or visual impairments to access digital content. Users

can pay attention to web pages, text-based documents, and electronic books read aloud in natural-sounding speech, enhancing accessibility and comprehension (National Center on Universal Design for Learning, 2021).

2. **Screen Readers:** Screen readers are software programs that vocalize and interpret the content displayed on a computer screen. They make available navigation assistance and auditory feedback to individuals who are blind or have low vision, allowing them to communicate with websites, software applications, and multimedia presentations through keyboard gestures or commands (Center for Parent Information and Resources, 2021).
3. **Speech Recognition Programs:** Speech recognition software permits users to input text or dictate spoken commands using their voice, which is executed as computer commands or converted into written text. This technology aids individuals with physical disabilities or conditions that affect manual dexterity, enabling the hands-free operation of smartphones, computers, and tablets (National Center on Universal Design for Learning, 2021). Advanced signal processing algorithms in modern ALDs aid in adjusting speech intelligibility by enhancing sound quality, reducing feedback, and overpowering background noise in challenging listening environments. Many ALDs now offer compatibility with smartphone apps, letting users adjust volume levels, control device settings, and customize audio preferences directly from their mobile devices.
4. **Augmented and Alternative Communication (AAC) Devices:** AAC devices are specialized tools that aid persons with communication impairments or disorders in expressing their preferences, needs, and thoughts. These devices range from low-tech communication boards and picture cards to high-tech speech-generating devices fortified with customizable communication grids and synthesized speech output (Center for Parent Information and Resources, 2021).
5. **Tactile Graphics:** Tactile graphics are maps, raised-line diagrams, and images designed for individuals with visual impairments to explore through the sense of touch. These tactile representations make available access to spatial concepts and visual information, easing learning in subjects such as mathematics, geography, and science (National Center on Universal Design for Learning, 2021).
6. **Alternative Keyboards and Input Devices:** Alternative input devices and keyboards are designed to accommodate persons with physical disabilities. These devices include one-handed keyboards, ergonomic keyboards, joystick controllers, and adaptive switches, permitting users to input text and navigate computer interfaces more easily, comfortably, and efficiently (Center for Parent Information and Resources, 2021).

Effectiveness of ALDs

Numerous studies have demonstrated the effectiveness of ALDs in improving communication outcomes, speech perception, and overall quality of life for individuals with hearing impairment. Research findings indicate that ALDs increase listening effort, enhance speech intelligibility, and increase comprehension in noisy environments, leading to improved academic performance, social interactions, and workplace productivity for users.

The effectiveness of assistive learning devices (ALDs) in enhancing educational outcomes for persons with disabilities has been broadly studied and documented in research literature:

1. **Enhanced Access to Educational Materials:** ALDs, for instance, screen readers and text-to-speech software, have been revealed to improve accessibility to educational materials for students with reading difficulties or visual impairments. Research study indicates that these technologies develop students' ability to grasp, comprehend, and engage with digital content, leading to better academic performance (Edyburn, 2013).
2. **Enablement of Communication:** Augmented and Alternative Communication (AAC) strategies enable individuals with communication disorders to express themselves effectually, and efficiently and participate enthusiastically in classroom discussions. AAC devices encourage academic engagement, language development, and social interaction among students with language and speech impairments (Light & McNaughton, 2014).
3. **Enhanced Writing and Note-Taking Skills:** Speech development programs support students with writing challenges or physical disabilities in constructing written text using their voices. Speech-to-text technologies improve students' writing productivity, accuracy, and fluency, qualifying them to complete writing assignments and take notes more proficiently (Higgins et al., 2017).
4. **Self-Advocacy and Promotion of Independence:** ALDs empower persons with disabilities to advocate for their needs and take charge of their learning. By providing accessibility to assistive technologies personalized

to their unique challenges and strengths, students develop independence, self-confidence, and self-advocacy skills, which are crucial for academic and personal success (Bouck & Satsangi, 2019).

5. **Inclusive Learning Environments:** Integrating ALDs into educational settings promotes inclusion and diversity by guaranteeing that all students have equal opportunities to participate and succeed. By eliminating barriers to learning and accommodating students' diverse learning needs, educators strive to create inclusive learning environments that foster respect, equity, and academic excellence (Rose & Meyer, 2002).

Conclusion

Hearing impairment is a partial or total incapability to hear or comprehend sounds in one or both ears. Individuals with hearing impairment are likely to experience difficulties in assimilating speech, and understanding conversations, which can significantly impact their communication abilities and all aspects of life. Hearing impairment embodies a significant public health concern disturbing millions of people worldwide. By understanding the origin, causes, consequences, and available interventions for hearing loss, healthcare specialists can effectively aid persons with hearing impairment in making the best use of their communication abilities and well-being. Thus, to overcome most of the challenges related to hearing impairment, assistive listening devices (ALDs) are needed. Assistive Listening Devices (ALDs) are this day and age smaller, lighter, and more discreet, allowing handlers to assimilate them effortlessly into their daily lives without drawing attention to their hearing impairment. ALDs play a vital role in addressing the communication barricades confronted by persons with hearing impairment. By providing accessibility to intelligible and clear speech, ALDs allow handlers to participate more fully in educational, social, and professional activities, hence promoting equality and inclusion for people with hearing loss. Continued advancements in ALD technology, coupled with increased awareness and accessibility initiatives, are essential to ensure that individuals with hearing impairment have equal opportunities to participate in all aspects of life and foster academic success. Assistive learning devices play a crucial role in promoting access, participation, and success for individuals with disabilities in educational settings by connecting the power of technology and innovation, ALDs empower students to maximize their potential, overcome challenges, and achieve their educational goals.

References

- Agyire-Tettey, E. E. M., Cobbina, M., & Hamenoo, E. S. (2017). Academic challenges of students with hearing impairment (SHIs) in Ghana. *Disability, CBR & inclusive development*, 28(3), 127-150.
- American Speech-Language-Hearing Association. (2018). Hearing loss and older adults. Retrieved from <https://www.asha.org/public/hearing/hearing-loss-and-older-adults/>
- Bouck, E., & Satsangi, R. (2019). Self-advocacy interventions for individuals with disabilities: A systematic review of the literature. *Remedial and Special Education*, 40(1), 21-34.
- Center for Parent Information and Resources. (2021). Assistive technology. Retrieved from <https://www.parentcenterhub.org/assistive-tech/>
- Edyburn, D. L. (2013). Would you recognize universal design for learning if you saw it? Ten propositions for new directions for the second decade of UDL. *Learning Disability Quarterly*, 36(1), 2-14.
- Higgins, E. L., Raskind, M. H., Goldberg, R. J., & Herman, K. L. (2017). The relationship between speech recognition software and the written composition of postsecondary students with dyslexia. *Journal of Postsecondary Education and Disability*, 30(1), 5-20.
- Light, J., & McNaughton, D. (2014). Communicative competence for individuals who require augmentative and alternative communication: A new definition for a new era of communication? *Augmentative and Alternative Communication*, 30(1), 1-18.
- National Center on Universal Design for Learning. (2021). Assistive technology for individuals with disabilities. Retrieved from <https://www.cast.org/our-work/research-and-development/projects/national-center-universal-design-for-learning#.YiyG4JNByUI>
- Rose, D. H., & Meyer, A. (2002). Teaching every student in the digital age: Universal design for learning. Association for Supervision and Curriculum Development (ASCD).
- World Health Organization, & World Bank. (2011). World report on disability. Geneva, WHO press.
- World Health Organization. (2021). Deafness and hearing loss. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>