

<https://doi.org/10.48047/AFJBS.6.14.2024.13110-13124>



African Journal of Biological Sciences

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

ANALYZING THE RELATIONSHIP BETWEEN ASSISTIVE TECHNOLOGY AND THE LEVEL OF CONFIDENCE IN VISUALLY IMPAIRED STUDENTS

**Syed Rahat Hussain, Muhammad Zeerak Hussain, Mahnoor Irshad,
Zeeshan Hussain, Sadaf Sattat Abbassey**

Chief Executive Officer Omair Sana Foundation Karachi drahathussain@gmail.com

Medical Officer Naimat Begum Hospital Hamdard University, Karachi
zee.lived@gmail.com

M.Phil Scholar Department of Special Education, Karachi University
Mahnoorirshad776@gmail.com

Associate Professor Hamdard University, Karachi zeeshan.hussain@hamdard.edu.pk

Women Medical Officer Services Hospital, Karachi drsadafsattar.dmc@gmail.com

Volume 6, Issue 14, Sep 2024

Received: 15 July 2024

Accepted: 25 Aug 2024

Published: 05 Sep 2024

doi: [10.48047/AFJBS.6.14.2024.13110-13124](https://doi.org/10.48047/AFJBS.6.14.2024.13110-13124)

Abstract

Visually impaired students encounter unique challenges in their academic journey, requiring specialized tools and technologies to facilitate their learning experience. One crucial aspect of their educational development is the level of confidence they attain in navigating academic tasks and social interactions. The objective of this research was to determine the frequency of confidence levels of visually impaired students. The data for this study were collected through convenient sampling method from BINAI School for Blind, Government school of special education and rehabilitation center, IDARIO School for blind. The researcher has already conducted multiple trials and this data has been collected in 3 month of period 1st Sep to 30th Nov, 2023. Nearly half of the respondents use screen readers (45.8%) which is the most and is followed by text-to-speech software (40.7%) followed by miscellaneous (6.8%) and magnifiers (4.2%). A small percentage (2.5%) uses braille display however most of the individuals find the assistive technology very easy to use around (71.2%) followed by finding it somewhat easy (12.7%), neither easy nor difficult (10.2%), very difficult (3.4%), and lastly somewhat difficult (2.5%) which is the lowest. Nevertheless, challenges persist as some respondents reported encountering technical difficulties, and a minority expressed dissatisfaction with the support received from educational institutions. Addressing these challenges is crucial to ensuring a seamless and supportive experience for visually impaired individuals utilizing assistive technology.

Keywords

Visual Impairment, Assistive Technology, empowerment of visual impairment student

Introduction

According to the World Health Organization there are 285 million visually impaired people of all ages worldwide, of which 39 million people are blind. Eighty-two percent of blind people are beyond the age of fifty. (1) Despite those high figures, current advancements in information and communication technologies have made it easy for blind and visually impaired people, particularly students, to use assistive technologies to meet their educational, social, communication, and mobility needs .(2)

In the realm of education, the integration of assistive technology has emerged as a transformative force, especially for individuals with visual impairments. Visually impaired students encounter

unique challenges in their academic journey, requiring specialized tools and technologies to facilitate their learning experience .(3) One crucial aspect of their educational development is the level of confidence they attain in navigating academic tasks and social interactions. (4) Assistive technology, defined as "any item, piece of equipment, or product system, whether acquired commercially, off-the-shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" .(5) Assistive Technology Act encompasses a wide array of tools tailored to meet the specific needs of visually impaired individuals. These tools range from screen readers and braille displays to electronic magnifiers and tactile graphics, all designed to bridge the gap between the visual world and the learning environment for visually impaired students. (6)

The significance of assistive technology in empowering visually impaired students is underscored by the words of Jim Fruchterman, founder of Benetech, a technology company focused on social impact: "Technology levels the playing field for people with disabilities". (7) Fruchterman's statement emphasizes the democratizing potential of technology in ensuring equal access to education for individuals with visual impairments.(8) This sentiment is echoed by another renowned expert in universal design for learning, who asserts that, "The power of technology to individualize education is nowhere as important as in the case of those who have difficulty seeing, hearing, and modifying printed materials".(9) The perspective underscores the transformative role of technology in tailoring educational experiences to the unique needs of visually impaired students.

As the utilization of assistive technology becomes increasingly prevalent in educational settings, it is imperative to assess its impact on the psychological and emotional well-being of visually impaired students, particularly in relation to their confidence levels .(10) The psychological dimension of disability, as articulated by sociologist Carol Thomas, emphasizes the significance of addressing the subjective experiences of individuals with disabilities, including their self-perception and confidence. (11)

In navigating this uncharted territory, the study draws inspiration from the words of Helen Keller, a pioneering advocate for the visually impaired: "Alone we can do so little; together we can do so much". (12) Keller's insight underscores the collaborative efforts required to empower visually

impaired individuals, emphasizing the importance of technological interventions as catalysts for enhanced educational experiences and increased confidence. (13)

This research seeks to contribute to the existing body of knowledge on assistive technology and its implications for the confidence levels of visually impaired students. By exploring complex dynamics of this relationship, educators, policymakers, and technology developers can gain valuable insights to further enhance the educational landscape for visually impaired individuals. The objective of this research was to determine the frequency of confidence levels of visually impaired students.

Methodology

This cross sectional analytical study was conducted at the BINA School for the Blind, Government School of Special Education and Rehabilitation Center and IDATIO School for Blind for a period of three months (September 2023 to November 2023). Data collection was carried out using convenient sampling technique. Visually impaired students that were above 18 years of age, in at least 10th grade and technically aware of using different electronic gadgets were included in the study. Students refusing to give consent for the study were excluded. A self-designed questionnaire was formulated through which data of 123 participants were collected from various blind institutions. For calculation of sample size, Epi Info software was used for estimation. Due to scarcity of low prevalence and difficulty in finding visually impaired participants, the sample size was limited.

Data Analysis

Data was analyzed using SPSS v 23.0. For discrete variables, mean and standard deviation was reported and for continuous variables, frequency and percentages were reported.

Results

A total of 123 visually impaired students participated in the study. The majority of participants (63, 54.3%) were aged between 18-25 years, followed by 13 participants (16.4%) aged 26-35 years, and 13 participants (11.2%) aged 36-45 years. Participants aged 46-55 years constituted 7 individuals (6.0%) and those over 55 years represented 14 individuals (12.1%). The gender distribution was 74 males (62.7%) and 44 females (37.3%). Regarding educational attainment, 10 participants (8.8%) had completed matric, 28 (24.8%) had an intermediate degree, 32 (28.3%) held a bachelor's degree, 29 (25.7%) held a master's degree, and 14 participants (12.4%) had a doctoral degree. [Table I]

In terms of assistive technology usage, 66 participants (56.9%) had been using assistive technology for more than five years, while 23 participants (19.8%) had used it for 2-5 years. Only 15 participants (12.9%) had used it for less than one year. The most commonly used devices were screen readers (54 participants, 45.8%) and text-to-speech software (48 participants, 40.7%). Most participants (103, 87.3%) reported using assistive technology daily, and 84 participants (71.2%) found it very easy to use. Additionally, 110 participants (94.0%) reported that assistive technology had improved their academic performance, and 92 participants (78.6%) felt very confident using these devices. However, only 26 participants (22.8%) felt very confident completing academic tasks without assistive technology. [Table II]

Regarding the impact of assistive technology on confidence, 110 participants (94.0%) felt that it had improved their confidence. Moreover, 82 participants (70.7%) had received training on how to use these devices and 77 participants (71.3%) were very satisfied with the training they received. Furthermore, 107 participants (92.2%) reported that assistive technology had improved their overall quality of life, and 115 participants (97.5%) would recommend its use to other visually impaired individuals. [Table III]

Table I: Demographics of participants included in the study (n=123)

Variables		N	(%)
Age (years)	18-25	63	54.3
	26-35	13	16.4
	36-45	13	11.2
	46-55	7	6.0
	> 55	14	12.1
Gender	Male	74	62.7
	Female	44	37.3
Education	Matric	10	8.8
	Inter	28	24.8
	Bachelor's Degree	32	28.3
	Master's Degree	29	25.7
	Doctoral Degree	14	12.4

Table II: Participants' Response to questions related to use of Assisted Technology (n=123)

Questions		N	(%)
How long have you been using assistive technology?	< 1 year	15	12.9
	1-2 years	12	10.3
	2-5 years	23	19.8
	> 5 years	66	56.9
Which of the following assistive technology devices do you use?	Screen readers	54	45.8
	Magnifiers	5	4.2
	Braille displays	3	2.5
	Text-to-speech software	48	40.7
	Other	8	6.8
How often do you use your assistive technology device(s)?	Daily	103	87.3
	A few times a week	7	5.9
	A few times a month	2	1.7
	Rarely	6	5.1
How easy is it to use your assistive technology device(s)?	Very easy	84	71.2
	Somewhat easy	15	12.7
	Neither easy nor difficult	12	10.2
	Somewhat difficult	3	2.5
	Very difficult	4	3.4
Do you feel that assistive technology has improved your academic performance?	Yes	110	94.0
	No	7	6.0
How confident do you feel when using assistive technology devices?	Very confident	92	78.6
	Somewhat confident	17	14.5
	Neither confident nor unconfident	4	3.4
	Somewhat unconfident	2	1.7
	Very unconfident	2	1.7

How confident do you feel when completing academic tasks without assistive technology devices?	Very confident	26	22.8
	Somewhat confident	21	18.4
	Neither confident nor unconfident	16	14.0
	Somewhat unconfident	13	11.4
	Very unconfident	38	33.3

Table III: Participants' Response to questions related to impact of Assisted Technology on Confidence (n=123)

Questions		N	(%)
Do you feel that using assistive technology devices has improved your confidence?			
	Yes	110	94.0
	No	7	6.0
Have you received any training on how to use your assistive technology device(s)?			
	Yes	82	70.7
	No	34	29.3
How satisfied are you with the training you received on how to use your assistive technology device(s)?			
	Very satisfied	77	71.3
	Somewhat satisfied	14	13.0
	Neither satisfied nor dissatisfied	12	11.1
	Somewhat dissatisfied	2	1.9
	Very dissatisfied	3	2.8
How satisfied are you with the level of support you receive from your school/college/university in using assistive technology devices?			
	Very satisfied	48	42.9
	Somewhat satisfied	26	23.2
	Neither satisfied nor dissatisfied	15	13.4
	Somewhat dissatisfied	5	4.5
	Very dissatisfied	18	16.1
How often do you encounter technical difficulties with your assistive technology device(s)?			
	Never	37	31.9
	Rarely	35	30.2
	Occasionally	30	25.9
	Frequently	10	8.6
	Always	4	3.4

How satisfied are you with the technical support you receive for your assistive technology device(s)?			
	Very satisfied	78	66.7
	Somewhat satisfied	27	23.1
	Neither satisfied nor dissatisfied	8	6.8
	Somewhat dissatisfied	2	1.7
	Very dissatisfied	2	1.7
Do you feel that the use of assistive technology devices has improved your overall quality of life?			
	Yes	107	92.2
	No	9	7.8
Would you recommend the use of assistive technology devices to other visually impaired individuals?		115	97.5

Discussion

The finding of the use of assistive technology Every participant in the research

was visually impaired. The frequency of years of usage shows that the majority (56.9%) have been using assistive technology for more than 5 years, followed by 2-5 years (19.8%), less than 1 year (12.9%) and 1-2 years (10.3%). Screen readers (45.8%) and text-to-speech software (40.7%) are the most often used assistive devices, with braille displays accounting for only 2.5% (14). In terms of frequency of usage, the majority of survey participants (87.3%) use assistive technology on a daily basis, followed by a few times per week (5.9%), infrequently (5.1%) and a few times per month (1.7%). The vast majority of consumers (71.2%) find utilizing. Furthermore, the study indicates a high level of satisfaction with the training received on assistive technology usage (71.3%) and the support extended by educational institutions (42.9%). Technical difficulties are infrequent, with 31.9% reporting never encountering them, and satisfaction with technical support is high (66.7%). Overall, the majority (92.2%) believes that the use of assistive technology has improved their overall quality of life and is willing to recommend it to other visually impaired individuals (97.5%).

Research studies provide substantial evidence supporting the fact that assistive technology plays a pivotal role in supporting visually impaired students, enhancing their access to education and boosting their confidence levels .(15) The positive relationship between assistive technology and the level of confidence in visually impaired students has been highlighted in several studies .(16) The research also outlines assistive technology's defining role in promoting visually impaired students' educational attainment and personal growth. These findings are consistent with previous research that has highlighted the transformative potential of assistive technology in empowering visually impaired students. For example, a study by AlMeraj Z et al, found that the use of assistive technology significantly improved the academic performance and confidence levels of visually impaired students .17) Similarly, a study by Chen found that the use of assistive technology was positively associated with academic achievement and self-esteem among visually impaired students in Taiwan. (18) Yilma also highlighted the positive impact of assistive technology tools and devices in education for students with visual impairment .(19)However, the implementation of assistive technology can be hindered by external factors such as societal stigma and availability, leaving educators unprepared to navigate these challenges .(20) Al-Zboon E delved into the complex challenges faced by visually impaired individuals who use or require assistive technology and highlight the significant barriers and social stigma surrounding assistive technology use. They recommend careful consideration of factors such as aesthetics, gender and age appropriateness, social acceptability, sublimation and professional deference, as well as teacher's acceptance of disability when selecting appropriate assistive technology. (21)

Fernández-Batanero reported the positive impact of assistive technology on academic performance has been supported by various studies. A systematic literature review reported that the focus on assistive technologies is successful in increasing the inclusion and accessibility of students with disabilities, with specific studies highlighting improvements in academic performance and language development. (22) Despite the encouraging findings from the trials, there remains an important research gap in understanding the complex cognitive effects of assistive technology .(23) While some studies address cognitive components, more in-depth research is needed to determine how various technologies affect memory, attention and problem-solving skills among visually impaired people .(24)

The study's findings on visually impaired individuals in Pakistan provide critical insights that can significantly improve the quality of life and educational experiences for this group. It is critical to tailor educational programs to the specific needs of the 18-25 age range, which is characterized by a high proportion of visually impaired people. This includes using accessible learning materials, adapting instructional methods, and creating a supportive learning atmosphere. Furthermore, assuring the availability and affordability of a wide range of assistive devices, such as screen readers and braille displays, is essential. Collaborations with technology companies can help visually impaired people gain access to cutting-edge technologies, promote inclusivity and improve their educational experiences. Addressing gender inequities in the visually impaired community is a top priority for progress. Awareness campaigns, scholarships, and mentorship programs can motivate and empower female visually impaired people to pursue education and assistive technologies, thereby promoting equality. Furthermore, the favorable link between thorough training programs and higher academic achievement emphasizes the importance of continued investment in empowering visually impaired people to properly use assistive technologies. The study underlines the relevance of institutional support, accessibility improvements and psychosocial support mechanisms, such as confidence-building efforts, in creating a more inclusive and friendly educational environment for visually impaired people in Pakistan.

Conclusion

In conclusion, this study offers valuable perspectives on the demographics, experiences and perceptions of individuals with visual impairments regarding the utilization of assistive technology devices. The majority of participants fell within the 18-25 age brackets, indicating a noteworthy presence of individuals relying on assistive technology for over five years. This suggests a growing familiarity and dependence on these devices within the visually impaired community.

References

1. Vision Loss Expert Group of the Global Burden of Disease Study. Global estimates on the number of people blind or visually impaired by diabetic retinopathy: a meta-analysis from 2000 to 2020. *Eye*. 2024 Aug;38(11):2047.
2. Bin Tuwaym ST, Berry AB. Assistive technology for students with visual impairments: A resource for teachers, parents, and students. *Rural Special Education Quarterly*. 2018 Dec;37(4):219-27.
3. Forbes MR. Experiences of using intelligent virtual assistants by visually impaired students in online higher education. University of South Florida; 2019.
4. Kim MM, Kutscher EL. College students with disabilities: factors influencing growth in academic ability and confidence. *Research in Higher Education*. 2021 May;62(3):309-31.
5. Abbott C. Defining assistive technologies-a discussion. *Journal of Assistive Technologies*. 2007 Oct 1;1(1):6-9.
6. Bausch ME, Mittler JE, Hasselbring TS, Cross DP. The Assistive Technology Act of 2004: What Does It Say and What Does It Mean?. *Physical Disabilities: Education and Related Services*. 2005;23(2):59-67.
7. Fruchterman JR. Raising the Floor: Providing Accessible Technology and Content to the Disabled. In *Disability Rehabilitation Management Through ICT 2022 Sep 1* (pp. 3-13). River Publishers.
8. Fruchterman J. Developing Information Technology to Meet Social Needs (Innovations Case Narrative: Benetech). *Innovations: Technology, Governance, Globalization*. 2008 Jul 1;3(3):83-99.
9. French S. *Visual impairment and work: Experiences of visually impaired people*. Routledge; 2017 Feb 17.
10. Ferreira R, Sefotho MM, Bornman J, Botha K, Diale BM, Ferreira-Prevost J, et al. Understanding education for the visually impaired. AOSIS; 2020.

11. Thomas C. Disability and impairment. Disabling barriers-enabling environments. 2014:9-16.
12. McMahon BT, Leslie MJ, Li GW, Rumrill Jr PD, Simpson PE, Grover JM. The Helen Keller question applied to workplace discrimination: hearing loss vs. visual loss. Rehabilitation Research, Policy, and Education. 2021 Oct 1;35(3):201-21.
13. Mulyatno CB, Costa SB. Experiences of Educating Blind and Deaf Children in The Study of Interpretive Phenomenological Analysis. ENDLESS: International Journal of Future Studies. 2022;5(2):30-42.
14. Argyropoulos V, Sideridis G, Nikolarazi M, Martos A, Padeliaadu S, Gkyrtis K, et al. Refreshable braille displays and reading fluency: A pilot study in individuals with blindness. Education and Information Technologies. 2020 Sep;25:3613-30.
15. Boot FH, Owuor J, Dinsmore J, MacLachlan M. Access to assistive technology for people with intellectual disabilities: a systematic review to identify barriers and facilitators. Journal of Intellectual Disability Research. 2018 Oct;62(10):900-21.
16. Meshram VV, Patil K, Meshram VA, Shu FC. An astute assistive device for mobility and object recognition for visually impaired people. IEEE Transactions on Human-Machine Systems. 2019 Aug 15;49(5):449-60.
17. AlMeraj Z, Abu Doush I, Alhuwail D, Shama S, AlBahar A, Al-Ramahi M. Access and experiences of arabic native speakers with disabilities on social media during and after the world pandemic. International Journal of Human-Computer Interaction. 2023 Feb 25;39(4):923-48.
18. Chen HF. Case study of information searching experiences of high school students with visual impairments in Taiwan. 2013
19. Yilma TM, Mekonone ST, Alene BM, Kibret AK, Alemayehu Z, Addis BM, et al. Assistive technology use and its associated factors among university students with disabilities: A case study in a developing country-mixed study design. Disability and Rehabilitation: Assistive Technology. 2024 May 18;19(4):1748-57.

20. Khan A, Khusro S. An insight into smartphone-based assistive solutions for visually impaired and blind people: issues, challenges and opportunities. *Universal Access in the Information Society*. 2021 Jun;20(2):265-98.
21. Al-Zboon E. Perceptions of assistive technology by teachers of students with visual impairments in Jordan. *Journal of Visual Impairment & Blindness*. 2020 Nov;114(6):488-501.
22. Fernández-Batanero JM, Montenegro-Rueda M, Fernández-Cerero J, García-Martínez I. Assistive technology for the inclusion of students with disabilities: a systematic review. *Educational technology research and development*. 2022 Oct;70(5):1911-30.
23. McNicholl A, Casey H, Desmond D, Gallagher P. The impact of assistive technology use for students with disabilities in higher education: a systematic review. *Disability and rehabilitation: assistive Technology*. 2021 Feb 17;16(2):130-43.
24. Dos Santos AD, Ferrari AL, Medola FO, Sandnes FE. Aesthetics and the perceived stigma of assistive technology for visual impairment. *Disability and Rehabilitation: Assistive Technology*. 2022 Feb 17;17(2):152-8.