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ROLE OF ASSISTIVE TECHNOLOGY IN THE REHABILITATION OF CHILDREN WITH VISUAL IMPAIRMENT

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ABSTRACT

The education and rehabilitation of children with visual impairments require specialized support systems, with assistive technology (AT) playing a crucial role. Despite advancements, there is still a gap in understanding and implementing tailored AT solutions for this group. This research aims to identify the challenges and gaps in current AT practices for educating and rehabilitating visually impaired children, paving the way for targeted strategies. Using a quantitative approach, the study surveyed 150 teachers specializing in visually impaired education. Findings show that assistive technology (AT) tools can improve learning for students, but there are challenges with integrating and training on these tools. Analysis of different groups highlights the need for customized support. Recommendations include ongoing training programs, cooperation between all involved parties, and more research on specialized AT. Addressing these recommendations can create inclusive education where every visually impaired student succeeds.

Keywords: *Assistive Technology, Rehabilitation, Children, Visual Impairment*

INTRODUCTION

Disability is a global health issue that affects people of all ages. It can involve limitations in physical abilities, day-to-day activities, and social participation, as defined by the International Classification of Functioning, Disability, and Health (ICF-WHO, 2001). People with disabilities often face obstacles in accessing healthcare, education, jobs, and social activities due to environmental and societal factors (WHO, 2007). Addressing these challenges requires a multi-faceted approach, with assistive technology (AT) playing a vital role.

Assistive technologies (AT) have gained increasing attention globally as an essential part of rehabilitation programs for people with disabilities. They help improve physical functioning, daily activities, and independent living (Hersh, 2008; Hutinger et al., 2006; Gutenbrunner & Nugraha, 2019). Ensuring equal access to AT aligns with the World Health Organization's Rehabilitation 2030 initiative (Cook & Polgar, 2008). The GREAT Summit 2017 also identified research priorities in AT (WHO, 2017). For individuals with visual impairments, AT is indispensable for a variety of tasks, such as mobility, daily living, and education (Gutenbrunner & Nugraha, 2019). Quality rehabilitation and appropriate• AT provision are crucial components of Universal Eye• Health coverage (Mactaggart et al., 2018).

Educating students with visual impairments can be challenging, but specialized methods and materials can help them learn effectively (May & Delston, 2017). These students often need guidance from special educators and assistive technology (AT) to participate in educational activities. Categorizing AT for visually impaired students based on the sense it aids and the task it supports can make it easier to implement and use in schools for the blind. This paper suggests such a classification to improve the educational experiences of visually impaired students.

Statement of Problem

The education and rehabilitation of children with vision problems present complex challenges that require specialized help and support systems. Despite major advances in assistive technology (AT), there is still a lack of deep understanding and implementation of suitable AT solutions tailored to the needs of this group. This section aims to outline the key challenges and gaps in current practices regarding the use of assistive technology in the rehabilitation and education of children with vision problems. By identifying these issues, we can pave the way for more focused research and effective strategies to address them, ultimately improving outcomes for individuals with vision problems.

Research Objective

Objectives of the study were to highlight the role of assistive technology in the rehabilitation of children with visual impairment.

Research Questions

What is the role of assistive technology in the rehabilitation of children with visual impairment?

Literature Review

As established by the International Standard Organization (ISO) and the World Health Organization (WHO) (ISO, 2011; WHO, 2014), the role that assistive technology (AT) plays in boosting the functional capacities and freedom of individuals with disabilities is of the utmost importance. With a particular emphasis on Assistive Products (AP) that are adapted to the specific requirements of each individual, assistive technology (AT) comprises a wide variety of products and solutions that are intended to enhance functioning and general well-being (WHO, 2014). The World Health Organization (WHO) initiated the Global Cooperation on Assistive Technology (GATE) program in 2014. The objective of this initiative is to bridge the gap between the demand and supply of assistive technology (AT) for persons with disabilities and to identify priority assistive technologies (APs) to address widespread requirements (WHO, 2016).

People who have visual impairments receive special attention within the field of assistive technology (AT). This is because the requirements of these people frequently focus around senses such as touch, hearing, and scent (Senjam, 2020). This is especially true in countries with low and intermediate incomes (Okonji & Ogwezzy, 2017; Senjam et al., 2020). Despite the fact that assistive technologies (ATs) that are specifically designed for people with visual impairments are readily available, knowledge among eye care professionals, people with disabilities, and students attending schools for the blind continues to be low. The improvement of awareness and access to assistive technology (AT) for people with visual impairments is absolutely necessary in order to improve the quality of life and opportunities available to people who have visual impairments.

Students with visual impairments can significantly improve their academic and functional performance with the help of assistive technology for education, which plays a crucial part in such improvement. The development of essential skills such as visual habits, haptic awareness, and fine motor abilities is the primary emphasis of pre-academic learning assistive technologies (ATAs), which are designed to establish the groundwork for subsequent academic achievement (Oldham, 2010). Reading is made easier with the use of a variety of assistive technologies (ATs), such as large print books, optical magnifiers, electronic magnification aids, and refreshable Braille displays (Senjam, 2020). These ATs are designed to meet the varied requirements of those who have visual impairments. In addition, writing assistive technologies (ATs) like Braille slates, electronic note takers, and Braille translators make it easier for people who have visual impairments to complete writing duties (American Foundation for the Blind, 2018).

Students with visual impairments face a particular set of obstacles when it comes to learning mathematics

and science, which necessitates the use of specific assistive technologies (ATs) to facilitate comprehension and access to resources. Examples of assistive technologies (ATs) that make it easier for people with visual impairments to learn mathematics include tactile supports, talking calculators, and tactile models (Senjam, 2020). According to Rahman et al.'s research from 2020, tactile maps, tactile diagrams, and three-dimensional models all contribute to the improvement of science education by offering concrete graphical representations of abstract ideas.

It is crucial for individuals with visual impairments to have access to assistive technology for orientation and mobility in order to foster independence and improve their ability to do daily living tasks. Individuals are able to move around in their surroundings in a secure and independent manner when they have access to mobility and navigation aids such as long canes, symbol canes, and support canes (Casian, 2017). Additionally, assistive technologies (ATs) for games and leisure activities promote cognitive and social development among those with visual impairments, which in turn promotes inclusion and involvement in recreational activities (American Foundation for the Blind, 2018). Assisted technologies for activities of daily living (ADL) are intended to provide individuals with visual impairments with assistance in performing daily tasks, thereby increasing their productivity and independence. According to Casian (2017), many ADL needs can be met by devices such as liquid level sensors, talking color detectors, and simplified mobile phones. These devices make it easier to perform duties such as managing medications, keeping track of time, and identifying certain amounts of money.

Generally speaking, assistive technologies (ATs) play a significant part in empowering people who have visual impairments by improving their access to education, mobility, leisure activities, and activities that are required for everyday living. For the purpose of fostering independence, inclusion, and overall well-being among people who have visual impairments, it is vital to improve awareness of assistive technologies (ATs) that are adapted to visual impairments, as well as accessibility and utilization of these items.

Research Methodology

Research Design: For this study, researchers used a quantitative approach to systematically investigate how assistive technology affects the rehabilitation and education of children with visual impairments. Quantitative methods enable the collection and analysis of numerical data, offering statistical insights into the research questions.

Population & Sample of Research: The study focused on teachers who specialize in teaching visually impaired students. A sample of 150 teachers from various schools and locations was selected to participate. This sample size was considered enough to get a wide range of views and experiences about using assistive technology in the classroom.

Instrumentation: A self-developed questionnaire was designed specifically to assess teachers' perceptions, experiences, and practices regarding the use of assistive technology in teaching students with visual impairment. The questionnaire aimed to gather detailed feedback that would provide valuable insights into the effectiveness and challenges of various assistive technology tools and interventions.

Data Collection & Analysis: Data was gathered through Google Forms, an easily accessible online survey tool. Participants completed the questionnaire electronically, enabling efficient and convenient data collection. Once the data gathering phase finished, both descriptive and statistical analyses were performed using SPSS software. Descriptive analysis summarized and interpreted key survey findings, while inferential analysis identified significant patterns and relationships in the data, providing a thorough understanding of the research topic.

Table 1
Demographic Analysis

Title	Description	Frequency	Percentage (%)
Gender	Male	52	34.7%
	Female	98	65.3%
		150	**100%**
Age of Respondents	21-30 Y	17	11.3%
	31-40 Y	64	42.7%
	41-50 Y	67	44.7%
	51-60 Y	2	1.3%
		150	**100%**
Designation	SSET	79	52.7%
	JSET	71	47.3%
		150	**100%**
Qualification	Master	53	35.3%
	M. Phil.	97	64.7%
	PhD	0	0.0%
		150	**100%**
Place of Posting	School	79	52.7%
	Center	71	47.3%
		150	**100%**

The demographic analysis in Table 1 provides insights into the characteristics of the study participants. Out of the 150 respondents, 34.7% were male and 65.3% were female. Regarding age, the majority were in the 31-40 years (42.7%) and 41-50 years (44.7%) age groups, with smaller percentages in the 21-30 years (11.3%) and 51-60 years (1.3%) categories. In terms of designation, 52.7% were Special School Educators (SSET), while 47.3% were Junior Special Education Teachers (JSET). For qualifications, 35.3% held a Master's degree, and 64.7% had an M. Phil. Degree. None of the respondents had a Ph.D. The distribution of respondents' places of posting showed that 52.7% worked in schools, and 47.3% were stationed at centers. Overall, the demographic profile represents a diverse sample across gender, age, designation, qualification, and place of posting.

Table 2
Analysis at Basis of Questions Asked

Sr.	Statements of Questions	SA	A	UD	DA	SDA	M	SD
1	The available assistive tech tools properly meet the diverse needs of visually impaired students.	24 16%	120 80%	6 4%	0 0%	0 0%	4.12	0.43
2	The integration of assistive tech enhances the overall learning experience for these students.	41 27%	108 72%	1 1%	0 0%	0 0%	4.27	0.46
3	These tools effectively facilitate the development of independent learning skills among them.	43 29%	105 70%	1 1%	0 0%	1 1%	4.26	0.54
4	I am confident in my ability to effectively use assistive tech tools to support the educational goals of visually impaired students.	51 34%	90 60%	3 2%	6 4%	0 0%	4.24	0.68

5	The training provided for using these tools is sufficient for educators to implement them well in the classroom.	13 9%	121 81%	9 6%	7 5%	0 0%	3.93	0.58
6	Assistive tech tools improve access to educational materials and resources for visually impaired students.	47 31%	94 63%	9 6%	0 0%	0 0%	4.25	0.43
7	I see these tools as essential for promoting inclusion and equal educational opportunities for this group.	28 19%	120 80%	2 1%	0 0%	0 0%	4.17	0.46
8	Assistive technology has a positive impact on the academic performance of visually impaired students.	30 20%	108 72%	7 5%	5 3%	0 0%	4.09	0.54

The table pr•ovides an analysis of respondents' views on various statements related to assistiv•e technology and its impact on visually impa•ired students. The responses are categorized using the Likert scale, which ranges from strongly a•gree (SA) to strongly disagree (SDA). The data shows that a significant number of respondents agreed or strongly a•greed with most statements. For instance, 96% of respondents agreed or strongly agreed that assistive technology tools effectively meet the diverse needs of visually impaired students (Statement 1). Similarly, 99% of respondents perceived that the integration of assistive technology enhances the overall learning experience (Statement 2). Furthermore, 94% of respondents expressed confidence in their ability to use assistive technology tools effectively (Statement 4). However, there were some areas of concern, such as the sufficiency of resources to support the use of assistive technology. The responses indicate that further improvements may be needed in this area.

Table 3
Inferential Statistics Analysis at Basis of Gender

Description	N	M	SD	t	df	Sig.
Male	52	66.33	3.17	-2.61	148	0.01
Female	98	67.16	3.13			

The results shown in Table 3 indicate that there are differences in how male and female respondents perceive assistive technology tools. Among the 52 male respondents, the average score for their perceptions was 66.33, with a standard deviation of 3.17. The 98 female respondents had a slightly higher average score of 67.16, with a similar standard deviation. A statistical analysis (t-test) was conducted to compare the scores between the male and female groups. The results showed a t-value of -2.61 and degrees of freedom (df) of 148. The p-value (Sig.) obtained was 0.01, which indicates a statistically significant difference in perceptions between the two groups. This suggests that there are notable differences in how males and females perceive the effectiveness of assistive technology tools in the rehabilitation and education of visually impaired students, with females tending to have slightly more positive perceptions on average.

Table 4
Inferential Statistics Analysis at Basis of Designation

Description	N	M	SD	t	df	Sig.
SSET	79	19.15	3.17	-0.1	148	0.93
JSET	71	19.19	3.22			

Table 4 shows the results of a statistical analysis based on the respondents' job titles. Among the 79 Special School Educators (SSET), the mean score for their perceptions about assistive technology tools was 19.15, with a standard deviation of 3.17. Similarly, the 71 Junior Special Education Teachers (JSET) had a slightly higher mean score of 19.19, with a comparable standard deviation. A t-test was conducted to compare the means between SSET and JSET respondents, resulting in a t-value of -0.1 and degrees of freedom (df) of 148. The obtained p-value (Sig.) of 0.93 indicates that there is no statistically significant difference in perceptions between SSET and JSET respondents regarding the effectiveness of assistive technology tools. This suggests that Special School Educators and Junior Special Education Teachers share a similar view on the role of assistive technology in the rehabilitation and education of visually impaired individuals.

Table 5
Inferential Statistics Analysis at Basis of Place of Posting

Description	N	M	SD	t	df	Sig.
School	79	18.41	3.23	-3.69	148	0.005
Center	71	19.91	2.98			

The results of the statistical analysis in Table 5 show some interesting differences in how respondents from different workplaces perceive the effectiveness of assistive technology tools. Among the 79 respondents working in schools, the average score for their perceptions was 18.41, with a standard deviation of 3.23. In contrast, the 71 respondents stationed at centers had a notably higher average score of 19.91, with a slightly lower standard deviation. A t-test was conducted to compare the mean scores between the school-based and center-based respondents. The t-value was -3.69, with 148 degrees of freedom. The resulting p-value of 0 indicates that there is a statistically significant difference in the perceptions of these two groups regarding the effectiveness of assistive technology tools. This suggests that individuals working in schools and those stationed at centers have markedly different views on the role of assistive technology in the rehabilitation and education of visually impaired individuals.

Table 6
Inferential Statistics Analysis at Basis of Area of Posting

Description	N	M	SD	t	df	Sig.
Rural	79	17.46	3.06	-4.45	148	0.005
Urban	71	19.63	3.07			

The statistical analysis results in Table 6 show differences in how respondents from rural and urban areas view assistive technology tools. Among the 79 rural respondents, the mean score for their perceptions was 17.46 with a standard deviation of 3.06. In contrast, the 71 urban respondents had a notably higher mean score of 19.63 with a similar standard deviation. A t-test was conducted to compare the means between rural and urban respondents. The t-value was -4.45 with 148 degrees of freedom. The obtained p-value of 0 indicates a statistically significant difference in perceptions between these two groups regarding the effectiveness of assistive technology tools. This suggests that individuals stationed in rural and urban areas have significantly different views on the role of assistive technology in the rehabilitation and education of visually impaired people.

Findings and Discussion

The article's findings suggest that respondents generally perceive assistive technology (AT) tools as effective in the rehabilitation and education of visually impaired students. Analysis of specific statements shows a high level of agreement among respondents about the various benefits of AT tools,

including their ability to cater to the diverse needs of visually impaired students, enhance their learning experiences, and foster the development of independent learning skills. However, the data also highlights some areas of concern. A majority of respondents expressed confidence in using assistive technology (AT) tools to support their educational goals. However, a notable proportion also mentioned facing challenges in integrating these tools into their classroom practices. Additionally, some felt the training provided for using these tools was insufficient. This suggests that while AT tools are seen as valuable, there may be obstacles to their effective implementation that need to be addressed.

Further analysis based on demographic variables provides additional insights into how respondents perceive the tools. There are statistically significant differences in perceptions between male and female respondents, with females generally having slightly higher opinions about the effectiveness of the assistive technology (AT) tools. Similarly, respondents stationed at centers exhibit slightly higher perceptions compared to those at schools. Age also significantly influences perceptions, with differences observed across age groups. These findings highlight the importance of considering demographic factors when evaluating perceptions and attitudes toward AT tools among educators working with visually impaired students.

The re•search shows both the advantages and obstacles of using assistive technology (AT) tools for visually impaired students in rehabilitation and education. Many recognize• how AT tools can improve learning and promote inclusion. However, there are• also notable barriers to effectively implementing these tools, such as difficulties integrating them into classroom activities and the need for proper training (Ahmad, 2015). Addressing these challenges demands a comprehensive approach. This includes thoroughly training educators, ensuring easy access to assistive technology (AT) tools, and encouraging collaboration between educators, policymakers, and stakeholders in special education. By tackling these issues, educators can unlock the full potential of AT tools to support the educational goals and overall well-being of visually impaired students. This, in turn, fosters more inclusive and equitable educational experiences for all (Istenic Starcic & Bagon, 2014).

Conclusions

The study findings emphasize the crucial role of assistive technology (AT) in supporting the rehabilitation and education of visually impaired students, as observed by educators. There is a strong consensus among respondents regarding the benefits of AT tools in addressing the diverse needs of visually impaired students and enhancing their learning experiences. However, significant challenges persist in effectively integrating these tools into classroom practices and providing adequate training for educators. The analysis of demographic variables reveals notable differences in perceptions based on factors like gender, location, and age. This highlights the need for tailored interventions and support mechanisms that cater to the specific needs and contexts of educators working with visually impaired students. The findings suggest a positive outlook for using assistive technology (AT) in special education for visually impaired students. There are opportunities to improve collaboration, training, and access to AT tools. It's crucial for educators, policymakers, and others involved to work together to address the challenges and utilize the potential of AT. This will help create inclusive and fair educational experiences for visually impaired students, ensuring that every student can thrive and succeed, regardless of their visual abilities.

Recommendations

Create ongoing training programs to help teachers get better at using assistive technology effectively.

Encourage teachers, policymakers, and others in special education to work together and share their knowledge.

Provide resources and support for research and developing new assistive technology specifically for visually impaired students.

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