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Awareness and Use of Assistive Technology Devices for Children With Autism Spectrum Disorder: *A Case of Open Doors Special Education Center, Jos*

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Abstract
The study investigated the awareness and use of assistive technology devices for children with autism spectrum disorder by staff of Open Doors Special Education Centre, Jos. The study population consisted of thirteen teaching staff of the centre. Questionnaire was used for data collection. Descriptive statistics such as frequencies, percentages, means and standard deviation were used for data analysis. The results showed that the respondents were aware of assistive technology devices such as activity schedule (92.3%), pencil grip (76.9%), turn-taking cards (76.9%), communication boards (76.9%), adapted paper (76.9%), tape recorder (100%), electronic tablet (100%), smartphone (100%), computer (92.3%), audio books (76.9%) and software (69.2%). Workshops (69.2%), seminars (84.6%) and social media (69.2%) were the respondents' major sources of information on assistive technology. Audio books, activity schedule, visual calendar and rule cards among others were not used often by the respondents. The low utilization was attributed to the identified barriers such as epileptic power supply (3.69), high cost of devices (3.62), negative learners' attitude (2.54) and dearth of adaptable software (2.85) among others. There was high awareness, low availability and low utilization of assistive technology devices in the study area. It was recommended that government should ensure that assistive technology devices and enabling environment for their use are made available to special education centres in the country.

Keywords: Children, Autism, Assistive technology, Special education

Introduction

Technology is a tool that can be used in many different ways; to inform, explore, play, initiate conversation, share ideas, read, respond to messages and research subject matter (Parsons, 2018). The benefits of technology have led to technological innovations that, it can be used in different forms for different groups of people. The use of technology in education especially for people with special needs has been attracting attention in recent times. This implies that technology has become infused in the life and curriculum of individuals with learning disabilities, developmental problems and physical impairments (Habash, 2005). The 2008 National Policy on Education emphasizes that education should be made accessible to all children irrespective of their abilities or disabilities, however, access to education for all children would not be possible for children with special needs without assistive technology (Abani, 2015).

Assistive technology is used to describe a variety of devices and services that help ensure that individuals with disabilities are included in a full range of social experiences and are able to function more independently, thus improving their quality of life (Abani, 2015). The Convention on the Rights of Persons with Disabilities (CRPD) defined assistive technology as technology designed to

improve the performance and quality of life for individuals with disabilities (Alkahtani, 2013). Assistive technology serves two major purposes: to augment an individual's strength, thereby counterbalancing the effect of the disability, and to provide an alternative mode of performing a task. Thus, the use of technology allows children to compensate for their disability or circumvent it entirely (Daud, Maria, Shahbodin, & Ahmad, 2018). Assistive technology allows learners with disabilities to increase their accessibility to the curriculum and the quality of learning experience (Alkahtani, 2013). This implies that learning for children with special needs becomes a big problem if not impossible without assistive technology devices.

Assistive technology devices according to Individuals with Disabilities Education Act (IDEA) are items or pieces of equipment that are used to increase, maintain, or improve the functional capabilities of individuals with disabilities (Stokes, 2000; Sula & Spaho, 2014; Abani, 2015). Addison (2017) opined that these devices can help children with special needs to work around their challenges while playing to their strength. Some of these devices are magnifying glass, braille machine, canes, walkers, wheel chairs, pencil grips, picture communication book, electronic communication devices, adapted computer equipment and specialized software programs (Sula & Spaho, 2014; Abani, 2015). Assistive technology devices have a tremendous amount of unrealized potential for enhancing the learning of students with disabilities such as physical disability, learning disability as well as neurological disorders such as autism.

Autism, also known as Autism Spectrum Disorder (ASD), is a lifelong condition that affects how a person communicates and interacts with others (House of Lords Library, 2019). Individuals with Disabilities Education Act (IDEA, 2004) defined Autism, as a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age three, and adversely affects a child's educational performance (Addison, 2017). It is a neurological disorder which means it affects the functioning of brain and commonly three to four times higher in male compared to female (Sula & Spaho, 2014; Daud et al., 2018). According to Centre for Disease Control and Prevention, about one in sixty-eight children are diagnosed with autism (Daud et al., 2018). An autistic child often has difficulty and lack of motivation understanding as well as communicating effectively with other people. Unwillingness to contact with people may be evident in their inability to interpret social behaviour and in the way they fail to make eye contact (Senjam, Foster, Bascaran, Vashist, & Gupta, 2019). Autism is associated with other mental health problems, learning disabilities and behavioral disorders.

Autistic children mostly do not respond to auditory information or pay attention to it, however, autistic children often pay attention and appreciate visual materials. Consequently, visual assistive technology devices are frequently used to get access to their minds and support children in expressing themselves (Habash, 2005; Wojciechowski & Al-Musawi, 2017). Children with ASD require assistive devices for a wide range of activities including daily living and education (Senjam et al., 2019). Various modes of technology can be used for children with autism to improve their communication, attention, motivation, organization, academic and self-help

skills (Stokes, 2000; Daud et al., 2018). Many children with autism are highly interested and motivated by smart devices such as computers, touch screen tablets, interactive videos, mobile phones and robotics. By using these types of assistive technology devices children with autism can interact, make choices, respond, gain new skills and become more independent (Sula & Spaho, 2014). It is therefore important that guardians, especially teachers, of these children have proper knowledge of these devices and how to use them.

Awareness of the usefulness of assistive technology by teachers of autistic children is the basic step to utilizing it (Okonji & Ogwezzy, 2017). It is the responsibility of the government, according to the National Policy on Education (2008) to provide these assistive technology devices for children with disabilities to help them function well in school. For effective use of the devices, teachers need the skills in the selection and use of the technology for different interventions (Abani, 2015). In many countries, assistive technology is integrated into the teacher training program so that teachers will graduate with awareness, knowledge and skills that will result to competent use of the technology (Abani, 2015). When assistive technology is properly integrated into the classroom, children are provided with multiple means to complete their work and focus on achieving academic standards (Abani, 2015). Senjam et al. (2019) also reported that cognitive benefits associated with assistive technology use include understanding of the cause-effect relationship, increased attention span, and problem-solving ability.

Statement of the Problem

Due to a rise in the number of children with diagnosis of autism spectrum disorder, schools are finding it difficult to cope with the increased demands upon an already stretched resources, while a variety of assistive technology products exist, these are often neither customized nor utilized across the individual's environment (Parsons, 2018). Copley and Ziviani (2004) equally reported shortcomings in the current application of these devices despite the potential benefits that comes with their use. According to Parsons (2018), early years are a critical time for the development of social skills. During this critical developmental period of early childhood, it is important to investigate the assistive technology devices being used with children with ASD (Parsons, 2018). Although technology tends to be a high interest area for autistic children, the varied use of technology continues to receive limited attention (Stokes, 2000). There is also a strong indication, that assistive technology (AT) is currently implemented within educational environments in a less than optimal manner (Copley & Ziviani, 2004). Nigeria has recorded a low number of institutions for children with special needs and nothing is known of the assistive technology devices available for use in the existing centers. The study therefore investigated teachers' awareness and use of assistive technology devices for children with autism. The perceived barriers to the use of assistive technology for autistic children by the teachers were also identified. This is to provide data based on which government and relevant bodies will do the needful.

Objectives of the Study

The broad objective of the study was to determine the awareness and use of assistive technology devices for children with autism spectrum disorder by the staff of open doors special education

center, Jos. Specifically, the study;

1. determined teachers' awareness of assistive technology devices for autistic children
2. identified teachers' source of information on assistive technology devices for autistic children
3. determined teachers' extent of use of assistive technology devices for autistic children
4. identified challenges to the use of assistive technology devices for autistic children

Methodology

Research design: The study adopted a descriptive survey research design. Survey is a suitable research design to gather information on specific topics and allows the investigator to obtain numerical information from particular populations (Alkahtani, 2013). The aim is to draw concrete conclusions about the traits and behaviors of the subjects. It could also be used to understand from a respondent, their attitude, or opinion about a particular phenomenon (Survey software, 2021). Result of a descriptive survey can be generalized to a larger population.

Area of the study: The study was carried out in Open Doors Special Education Centre located at off Liberty Boulevard in Giring, Jos, Plateau State. The center was established in 1999 by Joanne Umolu, a retired professor of Special Education. It is a non- profit, charitable non-governmental organization with enrolment of about 90 children. The center curriculum is designed to develop the potential of everyone with emphasis on acquisition of basic literacy and numeracy skills, ability to communicate and development of daily living skills, pre-vocational and vocational skills (Open Doors for Special Learners, 2019).

Population: The study population was made up of 13 teaching staff of open doors special education center, Jos. Staff are mostly aged 31-40years, more than half have master's degree with over 5years teaching experience.

Sample and sampling techniques: There was no sampling done since the study had small population size. Therefore, the sample is 13 teaching staff of Open doors Special Education Centre, Jos.

Method of data collection: The instrument for data collection was questionnaire on the awareness and use of assistive technology devices for autistic children. The questionnaire was developed by the researchers after extensive literature review. It is made up of sections A-E. The instrument was validated by lecturers in the department of Home Science and Management, University of Nigeria, Nsukka. The researchers distributed and retrieved thirteen questionnaires from the respondents on the spot.

Data analysis techniques: Descriptive statistics such as frequencies, percentages, means, and standard deviation were used for data analysis. Percentages of 50% and above were regarded as aware, while below 50% were regarded as not aware. Since items on extent of use and perception on barriers were on a 4-ponit scale, the cut-off point was decided by finding the mean of the four categories of the responses. This yielded the cut-off point of 2.50. Therefore, means of 2.50 and above were regarded as often and agreed while means of below 2.50 were regarded as not often and disagreed.

Results

Table 1 shows respondents' awareness of assistive technology devices for autistic children. Majority of the respondents were aware of devices such as activity schedule (92.30%), visual calendar (76.90%), pencil grip (76.90%), social stories (76.90%), turn-taking cards (76.90%), communication boards (76.90%), adapted paper (76.90%), rule card (69.20%), highlighter tape/pen (69.20%), tape recorder (100.00%), overhead projector (100.00%), electronic tablet (100.00%), smartphone (100.00%), digital camera (100.00%), calculator (100.00%), computer (92.30%), audio books (76.90%) and software (69.20%) among others. Most of them were not aware of 'all done' cards (69.20%), tactile ruler (69.20%), pogo board (69.20%), big Mack (69.20%) and talk pads (69.20%). Multiple responses are allowed.

Table 1: Respondents' Awareness of Assistive Devices for Autistic Children

S/N	Assistive technology devices	Aware F (%)	Not aware F (%)
1	Activity schedule	12 (92.30)	1 (7.70)
2	Visual calendar	10 (76.90)	3 (23.10)
3	Rule cards	9 (69.20)	4 (30.80)
4	Choice cards	8 (61.50)	5 (38.50)
5	'All done' cards	4 (30.80)	9 (69.20)
6	Pencil grip	10 (76.90)	3 (23.10)
7	Social stories	10 (76.90)	3 (23.10)
8	Turn-taking cards	10 (76.90)	3 (23.10)
9	Wait cards	6 (46.20)	7 (53.80)
10	Picture/object communication boards	10 (76.90)	3 (23.10)
11	Graphic organizer	8 (61.50)	5 (38.50)
12	Highlighter tape/pen	9 (69.20)	4 (30.80)
13	Tactile ruler	4 (30.80)	9 (69.20)
14	Pogo board	4 (30.80)	9 (69.20)
15	Adapted paper	10 (76.90)	3 (23.10)
16	Tape recorder	13 (100.00)	0 (0.00)
17	Overhead projector	13 (100.00)	0 (0.00)
18	Computer with touch window, alternative keyboard and big keys	12 (92.30)	1 (7.70)
19	Electronic tablet (iPad, iPod, Kindle, Samsung tablet etc.)	13 (100.00)	0 (0.00)
20	Smartphone	13 (100.00)	0 (0.00)
21	Software e.g. word prediction, text to speech and speech to text	9 (69.20)	4 (30.80)
22	Digital camera	13 (100.00)	0 (0.00)
23	Audio books	10 (76.90)	3 (23.10)
24	Portable word processor	6 (46.20)	7 (53.80)
25	Big Mack	4 (30.80)	9 (69.20)
26	Talk pads	4 (30.80)	9 (69.20)
27	Calculator	13 (100.00)	0 (0.00)

Table 2 shows respondents' source of information on assistive technology devices for autistic children. Majority of the respondents get information on assistive technology devices during seminars (84.60%), followed by workshops and social media (69.20%), conferences (38.50%), the television (30.80%) and friends (15.40%).

Table 2: Respondents' Source of Information on Assistive Technology Devices

S/N	Source	Response F (%)
1	Conferences	5 (38.50)
2	Workshops	9 (69.20)
3	Seminars	11 (84.60)
4	Social media	9 (69.20)
5	Television	4 (30.80)
6	Radio	0 (0.00)
7	Friends	2 (15.40)

Table 3 shows respondents' extent of use of assistive technology devices for autistic children. Social stories with mean 2.69, communication boards (3.30), highlighter pen (2.62), computer (3.15), electronic tablet (3.54), smartphone (3.08), tape recorder (2.69) and calculator (3.92) were the devices that were used often by the respondents. Activity schedule, visual calendar, rule cards, graphic organizer, tactile ruler, overhead projector, digital camera, audio books and portable word processor were not used often by the respondents.

Table 3: The Extent to Which Respondents Utilize High-Tech Assistive Technology Devices

S/N	Assistive technology devices	Mean	SD	Remark
1	Activity schedule	2.23	1.23517	Not often
2	Visual calendar	2.38	1.04391	Not often
3	Rule cards	2.15	.98710	Not often
4	Choice cards	2.46	.87706	Not often
5	'All done' cards	1.61	.96077	Not often
6	Pencil grip	2.08	1.32045	Not often
7	Social stories	2.69	1.03155	Often
8	Turn-taking cards	2.69	1.03155	Often
9	Wait cards	2.23	1.09193	Not often
10	Picture/object communication boards	3.30	.75107	Often
11	Graphic organizer	2.23	1.23517	Not often
12	Highlighter tape/pen	2.62	1.19293	Often
13	Tactile ruler	1.39	.65044	Not often
14	Pogo board	1.00	.00000	Not often
15	Adapted paper	2.31	1.31559	Not often
16	Tape recorder	2.69	.63043	Often
17	Overhead projector	2.46	.66023	Not often
18	Computer with touch window, alternative keyboard and big keys	3.15	.89872	Often
19	Electronic tablet (iPad, iPod, Kindle, Samsung tablet etc.)	3.54	.51887	Often
20	Smartphone	3.08	.75955	Often
21	Software e.g. word prediction, text to speech and speech to text	2.08	1.18754	Not often
22	Digital camera	1.46	.96742	Not often
23	Audio books	2.23	1.09193	Not often
24	Portable word processor	1.15	.55470	Not often
25	Big Mack	1.46	1.12660	Not often
26	Talk pads	1.00	.00000	Not often
27	Calculator	2.92	.86232	Often

Table 4 shows respondents' perception on the barriers to the use of assistive technology for autistic children. The respondents agreed that epileptic power supply (3.69), high cost of devices (3.62), poor funding (3.23), dearth of adaptable software (2.85) and unavailability of skilled personnel (3.00) were some of the barriers to the use of assistive technology. On the other hand, they disagreed to negative attitude of teachers and time constraint as barriers.

Table 4: Respondents' Perception on the Barriers to the Use of Assistive Technology Devices

S/N	Barriers to the use of assistive technology	Mean	SD	Remark
1	Epileptic Power Supply	3.69	.48038	Agree
2	High Cost of Assistive Technology Devices	3.62	.86972	Agree
3	Negative attitude of teachers	2.00	.70711	Disagree
4	Poor funding for provision of assistive technology devices	3.23	.43853	Agree
5	Poor Remuneration of teachers	3.08	.64051	Agree
6	Inadequate Infrastructure such as buildings and transportation	3.31	.94733	Agree
7	Negative learners' Attitude towards Assistive Technology	2.54	.87706	Agree
8	Teachers' Lack of Competence in Assistive Technology	3.00	.70711	Agree
9	Dearth of Adaptable Software	2.85	.55470	Agree
10	Unavailability of Skilled Personnel	3.00	.70711	Agree
11	Limited or no access to needed assistive technology devices	3.08	.64051	Agree
12	Poor staff training on the use of assistive technology devices	3.23	.59914	Agree
13	Time constraint	2.15	.37553	Disagree

Discussion

Awareness of the usefulness of assistive technology by teachers of autistic children is the basic step to utilizing it (Okonji & Ogwezzy, 2017). Finding one showed that majority of the respondents were aware of assistive technology. Abani (2015) discovered that teachers in both regular and special schools had awareness of assistive technology devices even though some of the regular teachers claimed they were not aware of assistive technology devices but the number of those who said they were not aware was not significant. Okonji and Ogwezzy (2017) also showed that the participants were aware of assistive technology devices. In contrast, Heuvel, Jowitt, and Mcintyre (2012) reported a lack of awareness of assistive technology devices.

From the objective two, majority of the respondents got information on assistive technology devices during seminars, followed by workshops and social media, conferences, the television and friends. According to a study by Visagie et al. (2017), over fifty percent of the participants received information on how to use the devices from family and friends. Similarly, Ehrlich, Carlson, and Bailey (2003) identified many sources of information about assistive technology including family and friends, counsellor, health professionals, television and radio, print media and the internet.

Teachers' use of assistive technology refers to how often or regular teachers employ assistive technology devices to teach children with ASD (Abani, 2015). Finding four showed that social stories, turn-taking cards, communication boards, highlighter tape/pen, computer, electronic tablet, smartphone, tape recorder and calculator were the assistive technology devices that are often used by the teaching staff of the center. This is in line with the findings of Carmen (2015), which showed that the participants make use of the following assistive technology devices: highlighters, pencil grip, electronic worksheet, tablets, smartphones and interactive online tools.

The barriers to use of assistive technology for autistic children identified included epileptic power supply, high cost of devices, poor funding, poor remuneration, inadequate infrastructure, negative learners' attitude, dearth of adaptable software and unavailability of skilled personnel among others. Copley and Ziviani (2004) discussed lack of appropriate staff training and support, negative staff attitudes, inadequate assessment and planning processes, insufficient funding, difficulties

procuring and managing equipment, and time constraints as barriers to the use of assistive technology for children with disabilities.

According to Abani (2015), despite the benefits of Assistive Technology in the education and rehabilitation of autistic children, some problems that hinder teachers from effectively using it are poor power supply; high cost of technology; lack of acceptance of ICT by teachers; poor funding of education; poor remuneration of teachers; lack of infrastructure; and teachers' lack of competence in the use of assistive technology.

Conclusion and recommendations

Assistive technology is a necessary tool in the teaching and learning situations of children with disability especially autism. Teachers' awareness of the versatility and functions of these devices are critical to the acquisition of life skills by the children. Based on the findings of the study, the following recommendations were made.

1. Government and voluntary agencies should find ways of eliminating or reducing the problems faced by teachers in the use of assistive technology devices through training and re-training of teachers. Government and proprietors of special education centres should provide the necessary devices needed by special needs children for effective learning.
2. Children resource centres especially for special needs children should be properly equipped by donor agencies and funding partners and the centre should be patronised by families with special needs children.

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