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Boosting Learner Independence: Adaptive Technology for Students with Cerebral Palsy in Primary Schools Across Busia District, Uganda

Okello Robert[1], Prof. Oracha Peter Adoyo[2], Dr. Okutoyi Joel[3]

[1]Lecturer, Africa Renewal University, Uganda
[2,3]Special Needs Education, Maseno University

Abstract
This study aims to identify the factors influencing the utilization of adaptive technology (AT) to promote independence among learners with cerebral palsy in primary schools within Busia District, Uganda. The specific objectives include assessing attitudes, determining training levels, evaluating proficiency in AT use, and scrutinizing environmental adaptations. Using a descriptive survey design, data was collected from a sample of 297 participants, including parents, children with cerebral palsy, teachers, and rehabilitation officers. The findings highlight positive attitudes toward AT, inadequate training levels, varying proficiency in AT use, and the need for environmental adaptations. Recommendations include comprehensive caregiver training, targeted interventions for specific challenges, and collaboration between stakeholders to create supportive environments for learners with cerebral palsy using AT. This study contributes to bridging gaps in existing research, aligning with Uganda's commitment to inclusive education and lifelong learning.

Key words: Adaptive Technology, Cerebral Palsy, Students, Schools

1.0 INTRODUCTION

The quest for independence is a vital element in every individual's life, requiring the adaptation of local environments and the incorporation of adaptive technology. For learners with disabilities, particularly those with cerebral palsy, achieving independence involves active participation, decision-making, and self-management with minimal external assistance. The United Nations (UN) and the World Health Organization (WHO) have, since 2015, collaborated globally to enhance the independence of students with disabilities through research, public policy, health services, community education, support services, and adaptive technology. Disability, as per the World Health Organization, is a complex interplay between an individual's impairment and their socioeconomic surroundings. To ensure equal opportunities, treatment, prevention, inclusion, and rehabilitation, the UN and WHO advocate for collaborative efforts. Educational Rehabilitation, a component of Community-Based Rehabilitation (CBR), addresses the rehabilitation, equalization of opportunities, and social inclusion of learners with disabilities. Adaptive technology (AT), categorized into low-tech, mid-tech, and high-tech gadgets, plays a crucial role in this process. AT, defined as any device or system facilitating tasks otherwise challenging, aims to enhance functional capabilities. Its evolution is rooted in legislative acts such as the Telecommunications Act of 1966, Rehabilitation Act (1973), Assistive Technology Act (1988), and Individuals with Disabilities

Education Act (IDEA) (1990). Cerebral palsy, resulting from brain damage affecting motor control, presents challenges in motor skills and cognition. The UN Convention on the Rights of Persons with Disabilities (2006) aims to eliminate barriers and ensure equal rights, emphasizing full participation, accessibility, and human dignity.

In spite of global initiatives, learners with cerebral palsy in Busia, Uganda, face challenges in achieving independence, relying on caregivers despite having adaptive technology. Attitudes toward AT, often shaped by educators, are crucial in fostering inclusion. Positive attitudes, as demonstrated in studies in Botswana and the USA, encourage the adoption of assistive technology. Skills and competencies are essential for effective AT use. Studies in England and Uganda assessed the training levels and activity performance of students with disabilities, emphasizing the role of instruction in fostering independence. The physical environment, including school structures and amenities, significantly influences AT usage. Inclusive schools, following competency-based curricula, should ensure barrier-free environments for students with cerebral palsy. Research in Turkey and Ghana highlighted the impact of the physical environment on AT use, urging modifications for enhanced accessibility. The surrounding environment, as emphasized by studies in Norway and South Western Uganda, can either facilitate or hinder AT utilization. In Busia, Uganda, a comprehensive study assesses the attitudes of learners with cerebral palsy toward AT and evaluates the training skills of caregivers. The goal is to bridge gaps in existing research, focusing on a larger population and considering both home and school environments. With approximately 10% of learners in Uganda having cerebral palsy, the study aligns with the country's commitment to inclusive education and lifelong learning.

Adaptive Technology (AT) serves as a crucial tool for learners with disabilities, fostering independent living within primary schools. Specifically, AT empowers students with Cerebral Palsy to actively engage in a spectrum of school activities, encompassing both curricular and co-curricular pursuits. In alignment with international and national legal policy frameworks, such as the Sustainable Development Goals (SDG 4), the government of the Republic of Uganda is dedicated to implementing an inclusive education policy. This policy aims to ensure that all learners, irrespective of their disabilities, receive equitable access to quality education and lifelong learning opportunities. A particular emphasis has been placed on the production, accessibility, and utilization of AT to maximize benefits for all learners. Notwithstanding these proactive measures, a preliminary survey conducted in Busia District has unearthed a concerning reality. Out of the 1,923 learners with Cerebral Palsy who have been provided with AT, only a meager 20% (N=385) exhibit the capability to independently perform school activities. This stark discrepancy prompts a critical inquiry into the factors contributing to the dependence of a significant portion of learners with cerebral palsy who possess AT. Notably, there is a dearth of evidence regarding a similar study conducted in Busia District, specifically investigating the reasons behind the lack of independence among school users of AT.

In light of this, this study aimed to identify the factors influencing the utilization of Adaptive Technology (AT) to promote independence among learners with Cerebral Palsy in primary schools within Busia District, Uganda. The specific objectives were delineated as follows: (i) assess the attitudes of learners with Cerebral Palsy towards the use of AT for independent living; (ii) determine the training levels of teachers in educating learners with Cerebral Palsy on the appropriate use of AT for independent living;

(iii) evaluate the proficiency of learners with Cerebral Palsy in utilizing AT for independent living; and (iv) scrutinize the environmental adaptations necessary to facilitate independent living for learners with Cerebral Palsy.

2.0 LITERATURE REVIEW

2.1 Attitudes of learners with CP towards use of Adaptive Technology

The concept of attitude is multifaceted, encompassing cognitive, emotional, and psychometric dimensions in the context of learning. Definitions vary among scholars; some limit it to the preference or aversion towards a subject like biology, while others extend it to include perspectives, aptitude, and practical applications (Owoeye & Agbaje, 2019). Students' attitudes are influenced by variables such as perceptions, beliefs, learning capacities, prior performance, and their ranking in the classroom (Lang'at, 2015). Attitude reflects an individual's inclination, favouring or disfavouring something based on their beliefs. It is a subjective assessment of people, things, events, actions, or concepts in the surrounding context. A positive attitude enhances thinking, feeling, and reacting components, fostering improved performance, whereas a negative attitude, rooted in limiting beliefs, hampers motivation and academic success (Oluwatelure, 2015). Numerous studies have explored students' attitudes toward different subjects. For instance, in Birninkebbi Metropolis, Nigeria, Hussaini, Foong, and Karmamr (2015) found that most students exhibited a favorable attitude toward biology. Gender differences were observed in attitudes toward biology in Botswana (Hinneh, 2017) and Nigeria (Oluwatelure, 2015), and private school students generally showed a more positive attitude than their public-school counterparts. Attitudes have been found to impact academic performance in subjects like chemistry and physics (Omwirhiren & Anderson, 2019; Godwin & Okoronka, 2015). Though, there is a noticeable gap in the literature regarding students' attitudes toward Adaptive Technology (AT). Given the lack of evidence in this specific context, it becomes imperative to investigate how students with cerebral palsy perceive the use of AT in Busia Municipality, Uganda.

2.2 Training Levels on use of AT

The utilization of Assistive Technology (AT) is proposed as a means to enhance the independence of students with dementia while concurrently improving caregiving efficiency. However, there is a dearth of understanding regarding how caregivers and students with dementia employ AT in their daily activities. The qualitative methodology employed in this study revealed that formal health and social care services inadequately provide information or assistance about AT, emphasizing the crucial role of skills in accessing and utilizing AT for its effective impact on users' lives. Mohammed (2011) investigated the skill levels and utilization of AT for autism, highlighting the importance of parental and professional expertise. The study implies that learners with cerebral palsy can achieve independence when caregivers and AT trainers possess relevant skills and knowledge. However, contrasting findings by Gibson et al. (2015) suggest the need to assess the skill levels regarding AT use in Busia, Uganda.

Legal frameworks, such as the Individuals with Disabilities Education Act (IDEA) of 2011 and Section 160-4-7-.02 Free Appropriate Public Education (FAPE) of the State of Georgia Rules and Regulations for Special Education (2015), mandate the provision of AT devices and services. The Universal Primary Education (UPE) policy (1997) underscores the importance of stakeholders being knowledgeable about the needs of learners with special needs, crucial for creating an enabling environment. Kuefeller's (2019)

study on older adults with cerebral palsy in the USA reveals difficulties in daily living activities due to a lack of skills in using AT. Russell (2017), Campbell and Elizabeth (2017), and Gitlin (2015) also suggest a lack of skills among older adults. This highlights the necessity to examine the skillfulness of caregivers in Busia regarding the use of AT among learners with cerebral palsy. Zeinab et al. (2017) investigated the abilities and activity performance of students with cerebral palsy in English schools, revealing notable skill disparities. However, the study did not account for AT use or proficiency levels. Ntenzimaana's (2019) study on learners with visual impairment in Uganda showcased skills in mobility and white cane techniques. Differences in geographical locations and experiences suggest the need to assess training skills for learners with cerebral palsy using AT in Busia, Uganda.

2.3 Abilities for using AT

Anthony (2017) emphasizes the importance of the Upper-hand-and-forearm technique for learners with cerebral palsy, providing protection for the head and chest against potential hazards such as tree limbs. This technique, involving stretching the arm at shoulder height with a slightly bent elbow, ensures safety during activities like searching for items under a desk or table. Ntege (2018) highlights the challenges faced by individuals with impaired eyesight, emphasizing the difficulty in freely navigating and interpreting social cues. Acquiring proper social skills becomes crucial for success in various aspects of life, including homes, friendships, and careers. Brickfield (2011) identifies areas where learners with cerebral palsy may require instruction, including self-advocacy, interaction skills, social skill development, recreation, and knowledge of oneself and others. Speech and language therapists play a significant role in providing direct instruction in these areas. Martinez (2017) underscores the facilitation of learning through movement, especially for students with cerebral palsy who are visually impaired. Orientation and mobility training (O&M) become essential for these students, aiding in navigating their environment and promoting independence from an early age. Parette et al. (2015) emphasizes the role of Orientation and Mobility Specialists in developing O&M programs. While mobility specialists lead O&M training, collaboration with family, early intervention experts, occupational therapists, physical therapists, and vision teachers is essential. The study by Odaverdi, Abbas, and Anoshivern (2015) in Iran links improved motor skills with competency in performing physical activities among girls. However, there is a gap in understanding the motor competencies of learners with cerebral palsy in using assistive technology (AT) for independence. The proposed study in Busia, Uganda, aims to explore these competencies, encompassing both girls and boys with cerebral palsy. The cited literature highlights the significance of specific techniques, social skills, and mobility training for learners with cerebral palsy. This study sought to contribute to this body of knowledge by focusing on the motor competencies of learners with cerebral palsy in utilizing AT for enhanced independence in the unique context of Busia, Uganda.

2.4 Environmental Adaptations

Regulations governing the use of assistive technology (AT) and the corresponding environmental conditions are essential for ensuring independence among AT users. Changes in policies or the physical environment can significantly impact users' behavior concerning adaptive technology (Miller, 2015). Physical adaptations play a crucial role in enhancing the living conditions of individuals with disabilities. Dashler and Schumaker (2017) emphasize the importance of home improvements, ranging from installing grab rails and ramps to constructing specially designed facilities. These adaptations contribute to

autonomy, improved orientation, and effective management of challenges. Universal design principles, benefiting all facility users, are integral in creating comfortable and effective spaces for individuals who are blind or visually impaired (Little, 2014). Simple adjustments during the initial design phase, considering accessibility, can make programs, activities, and facilities safe and accessible for senior participants with visual impairments.

Effective environmental design requires a comprehensive understanding of factors such as lighting, colour contrast, and glare reduction, as noted by Scherer (2019). Rehabilitation specialists can further evaluate surroundings and provide recommendations for modifications that enhance safe and autonomous functioning for visually impaired individuals. Classroom accommodations and modifications are essential for students with various disabilities. Parette, Brotherson, and Huer (2015) suggest different seating arrangements and modifications to reduce visual clutter, creating an inclusive environment. Tailoring the classroom setting can significantly aid students with special needs, promoting engagement and academic success (Scherer, 2019). A school's physical environment plays a crucial role in supporting students' learning. Inclusive schools must undergo comprehensive access audits to ensure safety and accessibility for all students (Walton, 2011). The physical setting directly impacts academic performance, as demonstrated by Şahin, Erden, and Akar (2011) in their study in Turkey.

The study by Chimwanza (2019) in Malawi identified factors such as inadequately trained teachers and negative attitudes affecting inclusive education. Ackah and Danso (2019) found that many inclusive schools in Ghana had poor-quality environments, emphasizing the need for changes in layout and infrastructure to improve accessibility. Shami and Hussein (2005) demonstrated the positive impact of the physical environment on learners' performance and extracurricular activities. While previous studies have explored various aspects of the physical environment in relation to inclusive education, the current study aims to bridge existing gaps. By focusing on the adaptability of the physical environment in Busia, Uganda, and its role in facilitating the use of assistive technology for independence among children with cerebral palsy, this research contributes valuable insights to the existing body of knowledge.

3.0 METHODOLOGY

To investigate the population's stance on various variables, a descriptive survey design, specifically a self-report study, was employed to collect quantifiable data from the sample (Mugenda & Mugenda, 2019). Surveys were chosen due to their suitability for long-term research, quick data gathering, and their ability to provide insights into a population from a sample, utilizing both quantitative and qualitative methodologies.

The research was conducted in the Busia district (situated between 1° 12' 42" North and 30° 29' 40" East), covering 11,040 square kilometers with a population of 659,600 students (Uganda Bureau of Statistics, 2015). Selected for its high number of learners with disabilities, particularly cerebral palsy, Busia has 137 primary schools, with this study focusing on five government-aided primary schools: Dabani, Masafu, Buhehe, Busitema, and Western Division primary schools.

The target population comprised parents of students with cerebral palsy (n = 60), students with cerebral palsy (n = 60), teachers (n = 100), and rehabilitation officers (ROs) (n = 10) responsible for supporting activities in schools and the community, totalling 230 participants (N = 230).

Table 1: Population and Sample Size

Respondents	Total population	Sample size
Parents	60	54
Children with CP	60	54
Teachers	100	90
Rehabilitation officers	10	09

A saturated sampling technique was utilized due to the small sample size, with a total of 297 participants included in the study (Anastas, 2015), each chosen for their role in the rehabilitation of students with cerebral palsy.

Data collection instruments included questionnaires, interview schedules, and focus group discussions. The questionnaires, guided by Mugenda & Mugenda (2019), gauged learner attitudes toward assistive technology (AT), skills in AT use, and environmental adaptations. Observation schedules and interview guides facilitated qualitative data collection, while focus group discussions involved teachers and rehabilitation officers to explore opinions on AT use. Validity was ensured through expert review, and reliability was determined through a pilot study, resulting in reliability coefficients exceeding 0.70. Ethical considerations involved obtaining research permits, seeking permission from relevant authorities, and ensuring confidentiality, impartiality, and the absence of monetary incentives for participants. Data analysis included descriptive statistics for quantitative data and verbatim analysis for qualitative data. The key categorizes responses into five levels of agreement on a scale. A score between 1.00 and 1.4 represents a strong agreement, while scores falling between 1.5 and 2.4 indicate agreement. The range of 2.5 to 3.4 is considered neutral, scores from 3.5 to 4.4 signify disagreement, and a strong disagreement is denoted by scores ranging from 4.5 to 5.00. This scale provides a structured framework for interpreting the degree of consensus or divergence in responses. Overall, ethical standards were maintained throughout the research process.

4.0 RESULTS

4.1 Assess learners with cerebral palsy (CP) on the use of adaptive technology (AT)

Table 2: Attitudes of Children with Cerebral Palsy towards the use of Adaptive Technology

Attitudes	SA f(%)	A f(%)	N f (%)	D f(%)	SD f(%)	Mean
Children with CP like using AT always	8 (10.0)	24 (30.0)	16 (20.0)	24 (30.0)	8 (10.0)	**3.0**
Children ask for AT when doing daily living activities	4 (5.0)	32 (40.0)	0 (0.0)	40 (50.0)	4 (5.0)	**3.1**
Friends help children with CP to use AT	12 (15.0)	20 (25.0)	16 (20.0)	12 (15.0)	20 (25.0)	**3.1**

Children with CP show interest in using AT	8 (10.0)	8 (10.0)	12 (15.0)	20 (25.0)	32 (40.0)	**3.75**
Children with CP are happy using AT	8 (10.0)	16 (20.0)	8 (10.0)	36 (45.0)	12 (15.0)	**3.35**
Children with CP do not often forget their AT	16 (20.0)	20 (25.0)	0 (0.0)	24 (30.0)	20 (25.0)	**3.15**
Children with CP often do not care for their AT	20 (25.0)	28 (35.0)	4 (5.0)	12 (15.0)	16 (20.0)	**2.7**
Children with CP are not happy to use AT	12 (15.0)	40 (50.0)	0 (0.0)	16 (20.0)	12 (15.0)	**2.7**
Children with CP do not show interest in using AT	36 (45.0)	16 (20.0)	8 (10.0)	12 (15.0)	12 (15.0)	**2.5**
Friends do not help children with CP to use AT	24 (30.0)	8 (10.0)	16 (20.0)	12 (15.0)	20 (25.0)	**2.95**
Average mean						**3.0**

The table 2 provides insights into the attitudes of children with cerebral palsy (CP) toward adaptive technology (AT). Notably, a significant percentage expresses a consistent liking for using AT (30%), suggesting a positive inclination. However, challenges emerge, as a considerable number (50%) do not ask for AT during daily living activities, indicating potential barriers or reluctance. While friends assist in using AT (25%), the need for more peer support is evident. The overall interest in using AT is positive, with a notable mean score of 3.75, signifying a generally favourable attitude.

Despite a high level of happiness among children while using AT (45%), concerns arise regarding forgetfulness (25%), suggesting potential issues with device management or memory. Additionally, some children exhibit a lack of care for their AT devices (35%), highlighting a need for increased awareness and responsibility. The dissatisfaction among a significant percentage (50%) of children who are not happy to use AT may stem from insufficient friend support during usage. Moreover, a substantial portion (45%) of children does not show interest in using AT, underlining potential motivational and awareness challenges.

Generally, while there is an overall positive attitude toward AT usage, specific concerns related to peer support, forgetfulness, and a lack of interest need targeted interventions to enhance the effectiveness of adaptive technology for children with CP. The importance of positive attitudes and interest in using AT for achieving independence is supported by George (2017), who asserts that individuals facing challenges in using AT may experience frustration, leading to increased difficulties.

In addition to the quantitative findings, qualitative findings from the interviews were presented.
"Our children with CP get excited shortly after receiving AT from rehabilitation officers but thereafter, they reduce o the frequency of using these AT because some devices are too big for them. These children fear to use the AT especially when their peers are not around them to support, for example one fell down in attempt to use wheel chair and yet there was no body to help" ***said one parent.***

"Since the introduction of AT to my child in this home, I have not seen positive improvement in the way my child with CP use and relate to AT. I have not cultivated an environment of acceptance since I believe this child is just not like me. I make sure I don't discriminate him but try to include him in all my activities but still doesn't like the device" ***Said one other parent.***

The study revealed that children with CP displayed a negative attitude towards using assistive technology for enhancing their independence. This contradicted findings in Lesotho by Johnstone & Chapman (2017), emphasizing teachers' unfavorable views towards students with special needs, unlike the supportive attitude observed by Rori (2017). Aligning with Kuyini, Desai, and Sharma's (2018) study in Ghana, teachers' unpreparedness and fear were evident, leading to frustration and a negative attitude. In contrast, parents valued students with CP, opposing the perception that inclusion would lower academic standards. This study's insights concur with Salovita's (2018) findings in Finland, emphasizing the importance of changing educators' attitudes for successful inclusive education (Peters, 2019). The study's methodology, employing descriptive statistics, differs from previous research's use of t-tests and correlations. To foster a positive attitude in children with CP towards assistive technology, the researcher recommends building stronger connections between parents and rehabilitation officers, who can operate both in classrooms and at home (Peters, 2019).

4.2 Establish training levels of care givers to learners with CP on suitable use of AT.

Table 3: Training level of caregivers of children with CP on the use of Adaptive Technology

Training Levels of caregivers	SA f(%)	A f(%)	N f (%)	D f(%)	SD f(%)	Mean
Children with CP are trained on use of AT	12 (15.0)	4 (5.0)	4 (5.0)	40 (50.0)	20 (25.0)	**3.65**
Children with CP have knowledge on care of device	16 (20.0)	12 (15.0)	32 (40.0)	20 (25.0)	0 (0.0)	**2.7**
Children with CP do not have knowledge on care of device	44 (55.0)	12 (15.0)	0 (0.0)	24 (30.0)	0 (0.0)	**2.05**
Children with CP can repair the device	0 (0.0)	4 (5.0)	4 (5.0)	16 (20.0)	56 (70.0)	**4.55**
Care givers knows the dangers of AT	12 (15.0)	28 (35.0)	12 (15.0)	16 (20.0)	12 (15.0)	**2.85**
Caregivers understand regulation for use of AT	20 (25.0)	8 (10.0)	4 (5.0)	48 (60.0)	0 (0.0)	**3.3**
Caregivers know different types of devices for CP	8 (10.0)	20 (25.0)	0 (0.0)	32 (40.0)	20 (25.0)	**3.45**
Parents and care givers have not received training on the use of AT	56 (70.0)	8 (10.0)	4 (5.0)	4 (5.0)	8 (10.0)	**1.75**
Children with CP do not receive training on the use of AT	64 (80.0)	12 (15.0)	0 (0.0)	0 (0.0)	4 (5.0)	**1.35**
CBR volunteers do not induct parents on the repair of AT	24 (30.0)	44 (55.0)	0 (0.0)	8 (10.0)	4 (5.0)	**2.05**

Parents and caregivers are not trained for 3 months on the use of AT	12 (15.0)	40 (50.0)	4 (5.0)	8 (10.0)	16 (20.0)	**2.7**
Average Mean						**3.04**

Table 3 outlines the training levels of caregivers for children with cerebral palsy (CP) regarding the use of adaptive technology (AT). Notably, only 15% of caregivers affirm that children with CP receive training on AT, indicating a potential gap in educational initiatives. Moreover, a significant 55% of caregivers assert that children with CP lack knowledge about caring for AT devices. The ability to repair devices is minimal, with caregivers reporting a mean of 4.55. Additionally, there is a concerning lack of training for both parents and caregivers, with 70% not receiving training on AT use. The overall average mean of 3.04 suggests a need for more comprehensive training programs to enhance caregivers' proficiency in supporting children with CP and their use of AT. In addition to the quantitative findings, qualitative findings from the interviews were presented.

"It's true, I went for training for only two days about the use and repair of Assistive Technology and personally feel that was not sufficient time for us to get enough knowledge because there were many devices and yet we were coming from home which didn't give us ample time to exhaust care, use and repair of AT for our children" ***said parent X.***

"I remember attending the training just for one day when they were distributing AT to children and teachers on that day taught us how to make, repair and use assistive devices but the problem was that, on the day of training, they trained us in different devices yet me I would have loved to be trained on what was given to my child. So I got little." ***Said one other parent.***

The study's findings underscore the insufficient training received by parents of children with cerebral palsy (CP) in using assistive technology (AT). In contrast to a Lesotho study indicating teacher bias against special needs students, Mohammed (2011) notes a positive shift in educators' attitudes toward students with special needs. A Ghanaian study aligns with the current research, revealing teacher apprehension and frustration towards students with disabilities, contrasting with parents' positive outlook on CP students. These findings diverge from the belief in decreased academic standards, as parents in the present study argue that CP students use AT less effectively and do not develop independence. Complementing the Finnish study by Salovita (2018), this research emphasizes the necessity of a mindset shift for effective inclusive education, recommending stronger collaboration between parents and rehabilitation officers in both educational and home environments (Peters, 2019).

4.3 Establish skills of children with cerebral palsy in using AT.

Table 4: Children' ability in using Adaptive Technology

Factor	SA	A	N	D	SD	Mean
Children with CP can hold the device firmly	16 (20%)	24 (30%)	0 (0.0)	20 (25%)	20 (25%)	**3.0**

Children with CP makes steps to walk	8 (10%)	8 (10%)	4 (5.0%)	20 (25%)	40 (50%)	**4.0**
Children with CP can stand alone	16 (20%)	24 (30%)	0 (0.0)	24 (30%)	16 (20%)	**3.0**
Children with CP can stand with support	28 (35%)	32 (40%)	0 (0.0)	16 (20%)	8 (10%)	**2.5**
Children with CP can sit alone	32 (40%)	8 (10%)	0 (0.0)	28 (35%)	12 (15%)	**2.6**
Children with CP can see properly	24 (30%)	4 (5%)	8 (10%)	24 (30%)	20 (25%)	**3.2**
Children with CP can speak without difficult	16 (20%)	12 (15%)	0 (0.0)	8 (10%)	44 (55%)	**3.7**
Children with CP can't balance on two limbs	48 (60%)	8 (10%)	4 (5%)	12 (15%)	8 (10%)	**2.05**
Children with CP cannot stand with support	28 (35%)	24 (30%)	12 (15%)	16 (20%)	0 (0.0)	**2.2**
Children with CP cannot sit alone	12 (15%)	32 (40%)	4 (5%)	12 (15%)	20 (20%)	**2.95**
Average mean						**2.92**

The analysis of Table 4 indicates varying levels of physical abilities among children with cerebral palsy (CP). Most children can take steps to walk (50% strongly agree, 10% agree), showcasing positive mobility aspects. A significant proportion struggles with balance, as 60% cannot balance on two limbs. Motor skills like standing alone (20% strongly agree) and sitting alone (40% strongly agree) display diverse capabilities. Communication abilities present mixed results, with 55% struggling to speak without difficulty. The average mean of 2.92 suggests an overall moderate level of physical functioning, emphasizing the diverse challenges faced by children with CP in their daily activities.

4.4 Establish environmental adaptations for Adaptive Technology

Table 5: Environmental adaptations for Adaptive Technology users

Factor	**SA** *f* **(%)**	**A** *f* **(%)**	**N** *f* **(%)**	**D** *f* **(%)**	**SD** *f* **(%)**	**Mean**
There are covered pot holes in the environment	24 (30.0)	28 (35.0	4 (5.0)	12 (15.0)	12 (15.0)	**2.5**

Ramps are not available in school and home compound	5 (25.0)	1 (5.0)	2 (10.0)	4 (20.0)	8 (40.0)	**3.5**
Land marks are not available in the compound	28 (35.0)	8 (10.0)	4 (5.0)	12 (15.0)	4 (5.0)	**2.0**
There are no wide paths for AT user	8 (10.0)	4 (5.0)	4 (10.0)	16 (20.0)	44 (55.0)	**4.1**
Door-ways are not wide to allow free movement	40 (50.0)	8 (10.0)	4 (5.0)	24 (30.0)	4 (5.0)	**2.3**
There is enough space for movement	32 (40.0)	20 (25.0)	0 (0.0)	20 (25.0)	8 (10.0)	**3.0**
There is good lighting	56 (70.0)	16 (20.0)	0 (0.0)	4 (5.0)	4 (5.0)	**2.0**
Guide rails are provided in latrines and toilets	20 (25.0)	8 (10.0)	4 (5.0)	12 (15.0)	36 (45.0)	**3.5**
Sitting arrangement in class is wide enough	40 (50.0)	4 (5.0)	0 (0.0)	16 (20.0)	20 (25.0)	**3.0**
Displayed instructional materials are in large print	8 (10.0)	12 (15.0)	4 (5.0)	4 (5.0)	52 (65.0)	**4.0**
Average mean						**2.99**

Table 5 outlines the environmental adaptations for children with cerebral palsy (CP) who use Adaptive Technology (AT). Notably, the presence of covered potholes receives a positive response (30% strongly agree). Crucial facilities like ramps are lacking in school and home compounds (40% strongly disagree), hindering accessibility. Landmarks are insufficient (35% strongly agree), and doorways are often too narrow (50% strongly disagree), restricting free movement. Nevertheless, good lighting is prevalent (70% strongly agree), and guide rails in latrines receive positive feedback (45% strongly agree). The overall average mean of 2.99 suggests a moderately adapted environment, indicating the need for enhancements to ensure better accessibility and mobility for AT users with CP.

Some responses from two parents who were interviewed are as shown in the quotes below:
"We have tried to work on the environment but generally speaking, it does not favour children bearing in mind that we have those with CP. To some percentage, the doors to classrooms and toilets are not wide enough to be used by learners who use wheel chairs; however, we support teachers to work on the grounds and other facilities in the school to favour all learners especially those with CP. These things require a constant source of income to be able to build them in schools and homes, however, with the little funding; we try our best to ensure all learners are comfortable." ***Parent 1***

"We still have a little problem with our physical environment because it's not fully adapted, there are a lot of potholes and stones around the compound which makes it not so easy for learners to use AT around freely. Learners are compelled to move with a lot of care to avoid any possible accidents." ***Parent 4***

Parent feedback highlighted efforts to enhance the physical environment, including levelling grounds for improved mobility of learners with cerebral palsy (CP). One parent cited financial constraints, deeming

the current setting unsuitable. Rehabilitation officers acknowledged the cost of installing specialized amenities for CP students and expressed the need for more financial support, particularly from the federal government. Parents 1 and 4 concurred, noting inadequacies in the residence and school grounds for students with CP and aligning with quantitative findings indicating mobility challenges due to an ill-fitted environment.

These findings align with Ackah and Danso's (2019) evaluation of inclusive schools in Ghana, indicating poor facilities hindering accessibility for children with disabilities. Ackah and Danso recommended redesigning school layouts for improved accessibility, paralleling the present study's focus on assessing physical environments' impact on students' mobility. While Ackah and Danso conducted a case study in a single primary school, the current research encompassed a larger population across households and schools. Consistent with Shami and Hussein's (2005) findings, an unfriendly physical environment, especially within school grounds, influenced learners' use of assistive technology (AT) in various activities. However, the current study utilized a descriptive approach, differing from Shami and Hussein's case study with a correlation design. Walton (2011) suggests comprehensive access audits involving students for effective learning in inclusive schools. In contrast, Sahin, Erden, and Akar (2011) found accessible but not very spacious physical facilities for learners in Turkey, contradicting the present study's discovery of partially adapted and inaccessible environments in schools and homes. These inconsistencies highlight the contextual variations in physical environments affecting the independent use of AT by children with cerebral palsy.

5.0 DISCUSSION AND CONCLUSION

5.1 Attitudes of learners with CP towards the use of Adaptive Technology

The literature review highlighted the importance of attitudes in the learning context and the impact of attitudes on academic performance. However, there was a noticeable gap in the literature regarding students' attitudes toward Adaptive Technology (AT), especially among learners with cerebral palsy (CP) in Busia Municipality, Uganda. The study aimed to address this gap by investigating how students with CP perceive the use of AT. The quantitative results revealed a generally positive attitude toward the use of AT among children with CP in Busia. A significant percentage of participants expressed a liking for using AT, and there was an overall positive interest in using AT. However, challenges such as forgetfulness, a lack of care for AT devices, and a significant number of children not showing interest in using AT were identified. These findings indicate that while there is a positive inclination, targeted interventions may be needed to address specific challenges and enhance the effectiveness of AT for children with CP. The qualitative findings provided additional insights into the negative attitudes displayed by some children with CP. Factors such as the size of the devices and the absence of peer support were identified as barriers to sustained use. This emphasizes the need for a holistic approach that considers not only the individual preferences but also the social and environmental factors influencing the attitudes of children with CP toward AT. To foster a positive attitude in children with CP toward AT, the researcher recommends building stronger connections between parents and rehabilitation officers. This recommendation aligns with the literature emphasizing the importance of collaboration between different stakeholders, including parents, educators, and rehabilitation professionals, to create a supportive environment for learners with special needs (Peters, 2019). Additionally, interventions that address the

specific challenges identified, such as device size and peer support, may contribute to improving attitudes and increasing the effectiveness of AT use among children with CP.

5.2 Training Levels on the Use of AT

The literature review highlighted the importance of training in enhancing the independence of learners with disabilities using Assistive Technology (AT). Legal frameworks, such as the Individuals with Disabilities Education Act (IDEA) and Section 160-4-7-.02 Free Appropriate Public Education (FAPE), mandate the provision of AT devices and services. The study aimed to assess the training levels of caregivers and educators in Busia regarding the use of AT for learners with CP. The quantitative results revealed a significant gap in training levels. Only a small percentage of caregivers reported that children with CP receive training on the use of AT. Moreover, a considerable number of caregivers, including parents and teachers, have not received training on AT. This lack of training extends to important aspects such as knowledge of caring for AT devices and understanding regulations for AT use. The qualitative findings provided additional context to the quantitative results. Parents expressed concerns about the adequacy of the training they received, emphasizing the need for more time and specific focus on the devices provided to their children. The limitations in training duration and content were identified as barriers to caregivers' proficiency in supporting children with CP in using AT. The study's findings underscore the insufficient training received by parents of children with CP in using AT. This aligns with previous research emphasizing the importance of continuous and comprehensive training programs for caregivers and educators working with learners with disabilities (Salovita, 2018). The study recommends a mindset shift and stronger collaboration between parents and rehabilitation officers to improve attitudes and facilitate effective training (Peters, 2019).

5.3 Abilities for using AT

The literature review highlighted the significance of specific techniques, social skills, and mobility training for learners with cerebral palsy. The study aimed to explore the motor competencies of learners with CP in utilizing AT for enhanced independence in Busia, Uganda. The quantitative results indicated varying levels of physical abilities among children with CP. While a significant percentage of children demonstrated positive mobility aspects, challenges such as difficulties in balance and speaking without difficulty were identified. The average mean suggested an overall moderate level of physical functioning, emphasizing the diverse challenges faced by children with CP in their daily activities. The qualitative findings provided additional insights into the challenges faced by children with CP. Parents highlighted the impact of the physical environment, including the presence of potholes and stones, on the mobility of learners with CP using AT. Financial constraints were identified as a barrier to creating a fully adapted environment. The study's findings contribute to the existing body of knowledge by providing a comprehensive assessment of the motor competencies of learners with CP using AT. The study recommends interventions that address specific challenges, including environmental adaptations, to enhance the overall independence of children with CP in using AT.

5.4 Environmental Adaptations

The literature review emphasized the essential role of regulations and physical adaptations in enhancing the independence of individuals with disabilities using AT. The study aimed to assess the environmental adaptations for AT users with CP in Busia, Uganda. The quantitative results revealed a moderately adapted

environment, with positive responses regarding covered potholes, good lighting, and guide rails in latrines. However, significant challenges were identified, including the lack of ramps in school and home compounds, narrow doorways, and insufficient wide paths for AT users. The average mean suggested the need for enhancements to ensure better accessibility and mobility for AT users with CP. The qualitative findings provided additional context to the quantitative results. Parents highlighted efforts to improve the physical environment but noted challenges such as financial constraints. Rehabilitation officers emphasized the need for more financial support, particularly from the federal government, to create a fully adapted environment. The study's findings align with previous research highlighting the impact of the physical environment on learners with disabilities (Ackah and Danso, 2019). The study recommends comprehensive access audits involving students for effective learning in inclusive schools and emphasizes the importance of financial support to create an adapted environment that facilitates the independent use of AT by children with CP.

Recommendations can be made on the following basis:

1. Caregiver training emerges as a critical factor, with only 15% reporting that children with CP receive training on AT. A concerning 55% of caregivers assert that children lack knowledge about caring for AT devices. The overall average mean of 3.04 suggests a need for more comprehensive training programs to enhance caregivers' proficiency in supporting children with CP in using AT.
2. The skills of children with CP in using AT display varying levels, with positive aspects in mobility, such as taking steps to walk (50%), but challenges in areas like balance (60%). The overall average mean of 2.92 indicates a moderate level of physical functioning, emphasizing the diverse challenges faced by these children in their daily activities.
3. Environmental adaptations for AT users present a mixed scenario, with positive aspects like covered potholes (30% strongly agree) but significant challenges, including the lack of ramps (40% strongly disagree) and narrow doorways (50% strongly disagree). The overall average mean of 2.99 suggests a moderately adapted environment, indicating the need for enhancements to ensure better accessibility and mobility for AT users with CP.
4. Qualitative insights from parents further emphasize the financial constraints and ongoing efforts to improve physical environments, aligning with existing literature on the impact of physical surroundings on learners with disabilities. The study recommends targeted interventions to address specific challenges, emphasizing the importance of collaboration between parents, rehabilitation officers, and educators to create a supportive and accessible environment for children with CP using AT.

In conclusion, the study delves into the attitudes, training levels of caregivers, skills of children, and environmental adaptations related to the use of adaptive technology (AT) among learners with cerebral palsy (CP). The findings reveal a generally positive attitude toward AT usage among children with CP, with a significant liking for AT (30%) and a positive mean score of 3.0. Though, challenges arise, including a lack of peer support, forgetfulness, and a substantial percentage (50%) of children expressing dissatisfaction, indicating potential barriers that require targeted interventions as indicated in the recommendations.

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