2025 Volume: 01 Issue: 06 www.ijrpa.com Review Article

International Journal Research Publication Analysis

Page: 01-30

THE EFFECTS OF ADAPTIVE COMPUTER ON THE ACQUISITION OF SOCIAL INTERACTION SKILLS OF PUPILS WITH AUTISTIC SPECTRUM DISORDER IN SOME SELECTED INCLUSIVE SPECIAL PRIMARY SCHOOLS IN CENTER AND LITTORAL REGIONS OF CAMEROON

[1]Ngong Emeline Diana Shee, [2]Bongwong Bruno, [3]Dr. Luma Ambei

[1]PhD Student of Special Education, Faculty of Education, Department of Department of Educational Psychology.

[2]Associate Professor Lecturer of the Lecturer of Psychology, Faculty of Education, Department of Educational Psychology, University of Buea.

[3]Lecturer of the Lecturer of Special Education, Faculty of Education, Department of Educational Psychology, University of Buea.

Article Received: 23 September 2025
Article Revised: 13 October 2025
Published on: 03 November 2025

***Corresponding Author: Ngong Emeline Diana Shee**
PhD Student of Special Education, Faculty of Education, Department of Department of Educational Psychology.

ABSTRACT

This study was aimed at examining the effect of adaptive computer on the social interaction skills of pupils with autistic spectrum disorder in selected inclusive primary schools in some selected special inclusive primary schools in Center and Littoral Regions of Cameroon. The study was guided by this research question; how does the use of adaptive computers affect the acquisition of social interaction skills of pupils with autistic spectrum disorder in inclusive special primary schools? The study employed quantitative research approach, and a non-equivalent quasi-experimental design was adopted for the study. The instruments used for this study were a questionnaire, an observation checklist and an interview guide for teachers. The instruments were validated by experts. The reliability coefficient for the question and observation checklist was 0.89 and 0.87 respectively calculated using Alpha Cronbach formula. The sample size of the study was 14; 12 pupils of class five with autistic spectrum disorder and their 2 class teachers. The purposive sampling technique was adopted for the study. Data was analysed using descriptive and inferential statistics. The independent Samples T-test was used to test the research hypothesis of the study. The findings revealed

that the use of adaptive computers have a significant influence on the mean score (T-test value of 8.594, p-value 0.000 < 0.05) with, pupils in the experimental group at posttest level having a high mean score 2.17 ± 0.376 than pupils in the control group 1.77 ± 0.287. Conclusively, the use of adaptive computers influences the acquisition of social interaction skills of pupils with autistic spectrum disorder in some selected inclusive primary schools in Center and Littoral Regions of Cameroon. Therefore, it was recommended that teachers in primary schools in general should adopt the use of adaptive computers during the teaching learning process to enhance the acquisition of social interaction skills of pupils with autistic spectrum disorder. Secondly, workshops, and refresher course should be given to primary schools' teachers on how to use adaptive computers in teaching pupils with autistic spectrum disorder.

KEYWORDS: Adapted Computers, Assistive Technology, Social Interaction Skills, Autistic Spectrum Disorder, and Inclusive Special Primary Schools.

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by challenges in social communication and interaction, as well as restricted and repetitive behaviors. Children with ASD often face difficulties in navigating social situations and forming meaningful relationships with their peers. In special school settings, where children with ASD are integrated with typically developing peers, these challenges can be particularly pronounced. Assistive technology has emerged as a promising tool to support individuals with ASD in various aspects of their lives, including enhancing their social interaction skills (Irvine & Lynch 2009). Assistive technology refers to devices, tools, and strategies that are designed to support individuals with disabilities in performing tasks that may be challenging for them. In the context of ASD, assistive technology can range from simple tools such as adaptive computers, battery-operated sensory toys, adaptive recording tape, video modeling visual schedules and communication boards to more sophisticated devices like social skills training apps and virtual reality programs (Jo, 2023).

Autism is a wide range of conditions that can impact an individual's behavior, learning abilities, social skills and more. ASD turns to present differently in different people. For example, some people with autism require minimal intervention and others a significant amount of support in other to thrive in their daily lives. Prevalence rates of ASD from the Centers for Disease Control and Prevention (2012a) indicate "an average of 1 in 88 children

in the United States as having ASD" (para. 1). Statistics disclosed on the occasion of the celebration of the Cameroon National Autism Day on the 2nd of April 2022, from the Ministry of Health indicated that, at least one, of every 150 new born babies in the country manifest autistic traits. By extrapolation, Cameroon counts at least 130000 people living with autism. Autism Spectrum Disorder occurs in all ethnicities, racial groups, and socioeconomic levels.

Children with ASD may be impaired in the use of several nonverbal behaviors in an inclusive setting such as the ability to make eye contact, facial expression, body postures, and gestures thereby affecting their language and social interaction skills. They may also be lacking the development of language, lacking the ability to initiate or sustain a conversation, unable to understand humor, irony, and implied meaning. They may also have restricted, repetitive, and stereotyped patterns of behavior, interests, and activities as they exhibit stereotyped body movements such as clapping, finger flicking, rocking, or swaying, hyperactivity, impulsivity, aggressiveness, and self-injurious behaviors. Although there are a great deal of struggles and limitations for those children with Autism in inclusive settings, they require adequate support in inclusive classroom because they face many obstacles in the school environment, such as academic challenges, social isolation, anxiety, and inadequately trained teachers, inadequate language and social skills that can help them in adaptation, socialization and most importantly in the teaching learning process. It is believed that, with the use of the 21st century assistive technological devices, the challenges learners with ASD are facing might be reduced.

Martin (2006) opines that preparing today's learners for tomorrow requires using technology. In other words, it is necessary that technology be included in their learning activities from the preschool age. Introducing learners to assistive technologies early can make it easier for them to adapt to their changing learning environment. In classrooms, learners count on their teachers to provide them with the appropriate tools and strategies that help them learn. This means teachers play a major role in integrating technology and making it useful and effective in the educational process. The effectiveness and the importance of technology in classrooms and the advanced use of technology in education has facilitated the way children with special needs learn in regular classrooms (Furio, Juan, Seguí, & Vivo, 2015).

Nowadays, with the presence of adaptive computers, learners with autistic spectrum disorder find the learning environment to be more active, interactive and even more effective

(Taskiran & Kandemir, 2010). Assistive technologies and adaptive computer in particular help to facilitate the skills that persons with special educational needs struggle to utilize in daily life (Gierrach & Stindt, 2009). In the education process, assistive technologies offer various solutions in providing autistic learners with support that meets their needs (McKnight and Davies, 2013). These technologies help support active participation in the learning environment rapidly change with a lot of special needs learners relying on assistive technology (Lahm & Sizemore, 2001). However, ASD children sometimes also tend to possess positive traits such as excellence in computer skills, photographic memory and high mathematic skills. These positive traits diverse characteristics lead to difficulties in implementing a suitable curriculum for autistic children. Many individuals with ASD have difficulties in handling basic daily tasks and interacting with people leading to social barriers from the society. This therefore led to the purpose of this study.

Background to the Study

Special education in Cameroon started in the family circles where some parents and family members of persons with disabilities tried to teach their children skills related to the community. With the adaptation of Law No 83/013 of the 21st July1983 on the protection of persons with disabilities and its enabling decree No 90/1516 of 26th November 1990 laying down the conditions for implementation, children with disability are expected to be educated in normal schools and centers. The Cameroon Law No 2010/002 of 13th April 2010 relating to education of persons with disabilities states that "the education of persons with disabilities shall be subsidized with the acquisition of teaching aids to be used in their training by the state". This guarantee persons with disabilities access to education and vocational training. These measures shall include: provision for their financial need, material and pedagogic support, persons with sensory impairment like visually impaired, hearing impaired and speech problems are those who require assistive technological devices to enhance their learning.

Autism can affect a child from any race or background. Globally, the prevalence of autism is on the rise. The Centers for Disease Control and Prevention (CDC) released new data on the prevalence of autism in the United States. This surveillance study identified 1 in 68 children (1 in 42 boys and 1 in 189 girls) as having (ASD Centres for Disease Control and Prevention (CDC) 2014). In Cameroon, there has been a steady rise in the number of children with autism; overall, it was estimated that 100,000 children were affected by autism in 2011 and at

least 130,000 in 2013 (Ntaryike, 2013). One child out of 50 in Cameroon has autism (Nzie, 2014). However, many children with autism are not being identified early enough. Diagnosing autism appears to be one of the most important steps in supporting children with autism. It is worth mentioning that earlier diagnosis is mandatory in order to allow for earlier intervention (Yeargin-Allsopp, Rice, Karapurkar, Doernberg, Boyle, & Murphy, 2003).

Research indicates that many children with autism can be identified as young as 18 months, but a large number of these children are not identified until they are of school age. It is usually prior to the third year of the child's life that autism is evident (Atkins, 2011). Autism is often diagnosed in pre-school at about the age of four years; however, it can be reliably diagnosed much earlier, often by the age of two years if symptoms are clear and professionals are knowledgeable. More than 75% of children with autism were identified through the school system (Atkins, 2011). It is therefore, necessary to identify this special group of children early so that appropriate education programs and services may be provided at an early age to support learning and development.

Cameroon has, nonetheless, been severally lauded for taking measures to address problems faced by autistic children. In 2009, the Douala-based Center Orchidee Home, one of the country's earliest NGOs to begin providing educational resources for autistic children, was bestowed the Autism Community of Africa's Acheivement Award. "Autistic children don't need medicine to grow better. They need Education." The Cameroon Law No 2010/002 0f 13th April 2010 relating to education of persons with disabilities states that "the education of persons with disabilities shall be subsidized with the acquisition of teaching aids to be used in their training by the state". This guarantee persons with disabilities access to education and vocational training. This measure shall include: provision for their financial need, material and pedagogic support, persons with sensory impairments like blind, deaf, partially sighted and partially hearing loss are categories of persons with special needs who require Assistive technological devices to enhance their learning process.

The advent in modernization and greater awareness led to the establishment or creation of the Ministry of Social Affairs following Decree No 75,467 of June 28th 1975. A department of national solidarity was also established to oversee the wellbeing of persons with disabilities. This department of national solidarity works in collaboration with the Ministry of Education which has put some efforts to promote the use of Assistive technology devices in the

education of persons with impairment whether in the inclusive schools set up or special schools.

The then Cameroon Basic Education Minister, Yousouf Hadjidja Alim, was not only hushing up many distressed families, but extending the barrier to available interventions that can engender behavioural improvements amongst children with autism. Statistics disclosed by officials from the Ministry of Public Health in 2013 indicated that, at least one, of every 150 new born babies in the country, manifest autistic traits. By extrapolation, Cameroon counts at least 130000 people living with autism.

Assistive technology is an umbrella term for products and related services used by persons with disabilities to enable and enhance their inclusion in all domains of participation. AT can be used by people of all ages and with all types of impairments and all sorts of limitations in activities and for short or long periods of time. The combination of products and strategies to meet an individual's needs is called an "AT Solution" and is developed through processes as assessment trial and adaptation. Some solutions are simple and require low tech devices, while others are very expensive and complex. This variety of user groups and a wide range of assistive products and related services make the provision of AT a complex issue in education.

One of the main goals of AT is to provide added support for learners beyond what they typically receive within the general curriculum (Shepley et al., 2017). When leaners require such supports, they are evaluated for assistive technology services through special education so that they receive the appropriate device for their specific needs. Under the Individuals with Disabilities Education Improvement Act (IDEA), the governing law of special education, assistive technology service is "any service that directly assists a child with a disability in the selection, acquisition, or use of an assistive technology device" (p. 5). More specifically, these services may come in the form of evaluations, purchasing of AT, customizing the device, working with and training other professionals and services, training parents, or working with the students.

Tchombe (2019) stipulated that in Cameroon, several children living with disabilities, including those with autism, find it difficult to communicate among themselves and socialize in inclusive settings. This could be as a result of their disability that makes them feel uncomfortable and as a consequence of insufficient acquisition of social skills to pupils with

autism; they turn to put up strange behaviours and lack of interest to interact with other learners thereby limiting their opportunities to learn. Nsagha (2021) added that insufficient acquisition of the social interaction skills amongst learners with autism in a nutshell affects their academic performance and other skills acquisition. Hence, the study is aimed at investigating the effects of the use of adaptive computer on the social interaction skills of pupils with autistic spectrum disorder in special schools in Center and Littoral Regions of Cameroon.

Assistive Technology is widely used in schools in Cameroon especially by learners with special needs as it gives the opportunities to improve their communication and relationship thereby expending their social/emotional challenges. Bonwell and Eison (1991) opine that AT provides children with disabilities with equal opportunities to participate in active environments with predictive activities that are aligned with their abilities. Many assistive technology devices are available to assist the teacher in improving the functional capabilities of their learners thereby increasing students' participation in learning opportunities and involvement in other social activities (Sherer, 2004). The potential value of assistive technology for enhancing social interaction skills and learning opportunities have been recognized by many countries with Cameroon not being an exception. Lenker (1998) explained that assistive technology emerged as a viable area of specialization for occupational therapist in settings ranging from school to adult rehabilitation of developmental centers.

As an invitee in an "Open Door Day" (journée portes ouvertes) in Promhandicam one of the inclusive schools in Yaoundé Mfoundi Division, Center Region of Cameroon, one of the researchers noticed that learners with special needs had something to offer to the population. The researcher's attention was drawn to pupils with autistic spectrum disorder whom the researcher noticed that they were doing the same activity over and over again. Their countenance and actions show that, they were facing difficulties to change to another activity. In addition to that, they were not being able to initiate communication with each other as they were doing these activities. At the same time, the researcher could notice that some of these pupils were behaving as if they were shy as they could not even look at the faces of other classmates. Above all, these pupils did not want to interact with others. This demonstrated their inability to act in accordance with the rules of effective teaching learning for sustainability and empowering pupils with skills that could help them in the society. This

equally hinders the pupils to understand personal learning space. This to a greater extent might be affecting these pupils' acquisition of interactive skills, collaborative skills, critical thinking skills, creative skills and problem-solving skills. These skills are very important for 21st century learners irrespective of their status or background learning. Based on these observations the researcher concluded as a special education student that these pupils were suffering from autistic spectrum disorder thus, the curriculum, teaching methods, teaching learning materials and environment in schools need to be adapted to meet the needs of all the learners. This will go a long way to enhance the effective implementation of inclusive policy in primary schools in Cameroon.

After this "Open Door Day" (journée portes ouvertes) the researcher went for a visit to PROMHANDICAM based on what was observed during the open-door day. During this visit to this institution the researcher requested for the pupils the researcher observed during the first day to that institution from the administrator. The researcher was taken to the classes of these pupils. Eta, Nsagha & Ihenacho (2019) pustulated that these pupils mostly lack interpersonal skills such as persuasion and active listening and this makes them to be friendless. Their withdrawn nature and lack of capacity to share feelings and sense of togetherness results in dislike from other classmates and in the case where they avoid playing with others it courses other learners to look at them from a distance. This might greatly affect their academic performance adversely, acquisition of other skills that comes through interaction. In addition to that, the isolation of other pupils from them might lead to aggressiveness, school dropout, stigmatization and to some extent suicide. Tchombe (2019) contents that engaging time is actually very useful in the education of children with impairment to learn well, whether in an inclusive setup school or special school they must be able to understand the platform of better communication between them and the teacher, be it verbal, visual or auditing dialogue. Due the researcher's observation, this aroused the interest of this researcher to find out if adaptive computers as one of the assistive technological tools could remedy this situation with respect to ameliorating social interaction skills of pupils with autistic spectrum disorder to effectively socialize with other peers. This in a nutshell might be a panacea to these pupils' acquisition of social interactive skills to better their academic performance and other skills acquisition of other 21st century.

Statement of the Problem

Despite everything put in place by the effort of the government of Cameroon and stakeholders of education to promote inclusive education at level of education to meet the context of Cameroon and international standard, this is yet to have a significant effect on pupils with autistic spectrum disorder.

The reality on the ground both in special and inclusive schools is that pupils with ASD still experience increased social isolation, reduced self-esteem, and limited opportunities for social learning and skill development. They may also face challenges in understanding social cues, initiating and maintaining conversations, and participating in group activities, leading to feelings of exclusion and frustration. These difficulties can have long-term implications for their academic progress, overall well-being, and future social integration.

It is against this backdrop that this research sought to investigate if the use of adaptive computers as one of the assistive technology tools can enhance social interaction skills of pupils with autistic spectrum disorder in some selected special schools in the Littoral and Center Region of Cameroon.

The general research question of this study was how does the use of adaptive computers affect the acquisition of social interaction skills of pupils with autistic spectrum disorder in inclusive special primary schools? This was transformed into a null hypothesis which states:

The use of adaptive computers does not have a significant effect on the acquisition of social interaction skills of pupils with autistic spectrum disorder in special schools.

Review of Related Literature

Autistic Spectrum Disorder

Autism spectrum disorder (ASD) is a neurological development disorder that affects social communication, social interaction, restricted and repetitive patterns in behaviors and activities (American Psychiatric Association, 2013). Autism is simply mental retardation, where people lack in interest with other people in a group of society. The exact cause of autism is still not known, but researches indicate that it may be caused due to the combination of genetic and environmental factors. The symptoms of autism in children appear during infancy stage. Autism spectrum disorder (ASD) is a neurodevelopmental disorder that presents in the form of severe difficulties in social communication and interaction, along with

repetitive behaviors and stereotypical interests. The main cause of ASD is considered to be a neurobiological malfunction that has not been traced to a specific area of the brain, impeding its normal function (Cho & Ahn, 2016).

Autism spectrum disorder may be a condition associated with brain development that affects how an individual perceives and socializes with others, causing problems in social interaction and communication. The Autism spectrum disorder also includes limited and repetitive patterns of behavior (Okoye, 2023). The term "spectrum" in autism spectrum disorder refers to the wide selection of symptoms and severity. Autism spectrum disorder includes conditions that are considered separate-autism, asperge's syndrome, childhood disintegrative disorder and an unspecified sort of pervasive developmental disorder (Faras, 2010). Some people still use the term "Asperger's syndrome" is usually thought to be at the mild end of autism spectrum disorder.

These difficulties have an impact on the deficiencies in interaction, communication, and social imagination, essential skills for child independence (Schmidt, Laffey, Schmidt, Wang, & Stichter, 2012). In addition to this, they can cause anxiety in children (Jahr, Eldevik, & Eikeseth, 2000). Other indirect impacts such as bullying, social rejection, and school dropout also arise. Therefore, for these children, it is important to acquire collaborative skills that improve their behavior in the social environment in which they live. Due to this challenge, the importance of cooperative play in children with ASD is emphasized. Learning to work together in reciprocity and maintaining joint attention with shared activities and goals achieved increases trust in the partner and improves conflict management, monitoring of norms, understanding of common interests and objectives, awareness and social interaction, decision-making, making requests, acceptance of the results and adaptation of behavior to the environment, among others (Menzies, 2011).

Autism Spectrum Disorder (ASD) is a spectrum of psychological characteristics describing a wide range of abnormal behavior and difficulties in social interaction and communication, as well as severely limited interests and frequently repeated behavioral acts. The onset of the disease occurs in the first three years of life. In some cases, developmental disorders are observed from birth (Kanner's syndrome). In another variant, against the background of normal development at the age of 1 to 3 years, a total regression may develop with loss of contact with others, impaired emotional response, loss of speech and self-service skills in general, this disease is characterized by a very uneven profile of the development of mental

functions, which includes the strengthening of some abilities against the background of a gross decrease in others (Haebig, Jiménez, Cox, & Hills, 2020).

In order for ASD to be diagnosed, the main symptoms must appear in the early developmental period and impair the child's everyday activities (APA, 2013). Some of the most common symptoms are related to difficulties in attention and impairment in cognitive, sensory, motor and emotional functions. Children with ASD display difficulties in understanding the feelings, motives, and body language, etc., of other people and in managing their social relationships. As ASD is characterised by a spectrum of symptoms and a wide range of intelligence, it is possible for children with ASD to be low functioning or high functioning.

Both the verbal and non-verbal communication skills of children with ASD are generally quite low, and some never develop completely functional speech corresponding to their chronological age. Lack of awareness of the way of thinking, and even the presence, of other people, is a major feature of ASD, resulting in difficulties in social interaction (Quill, 1995). The diagnosis of ASD is becoming more common. Epidemiological studies have indicated an occurrence rate of ASD of 1:100 children in 2006, 1:88 in 2008 and 1:68 in 2010 (Cho & Ahn, 2016). ASD can be diagnosed in early childhood (Ouss et al., 2014) and early intervention is considered necessary to minimize the occurrence of symptoms.

Learners with disabilities have different special needs; therefore, unsuitable environment within the school may hinder their learning. In order to curb such a problem, the school environment should be adjusted to accommodate the learner's diverse needs. This involves re-organizing the classroom and the school compound (UNESCO, 2004a; 2017). The physical adaptations in a school may include landscaping, building ramps instead of staircases, building child-friendly toilets, enlarging classroom windows and painting walls with attractive pictures and improving lighting (Cheshire, 2004).

Children with autism tend to show pronounced pathological specificity in the development of sensory perception. At an early age, at first glance, their sensory development occurs ahead of time often such children develop independent actions early, and the accuracy of their implementation is quite high. Such a child can jump between chairs without missing or falling to the floor, which gives the impression of a high level of sensory development (Mamokhina, 2017). The anticipatory selection of individual sensory impressions is

combined with a delay in the development of ideas about the everyday environment, their fragmentation, insufficient development of a detailed, objectively and functionally organized picture of the world, attitudes towards things in accordance with their function (Nason, 2016). The child's attention is often attracted not by a thing, but by a part of it, sensory attractive or giving the opportunity to make a spectacular impression (a wheel that can be turned). And, if normally children begin to evaluate the value, recognize sensory properties, determine the shape, the number of objects in the process of their use in everyday life, in the context of their purpose, the benefits of surrounding things, then with autism, individual "pure" sensory impressions become valuable for the child, they stand out early and become attractive (Lapshina, 2019).

Moreover, autism has broad variation in the type and severity of disorder children experience, therefore, it is also known as “spectrum disorder”. As there are three types of autism spectrum disorders identified: Autistic Disorder (which is also called "classic" autism), Asperger Syndrome and Pervasive Developmental Disorder. Autistic children are treated as social stigma in the society and this make it difficult for the children to survive where everyone is staring them and jugging them for being the part of this judgmental society. These days, the children diagnosed with autism disorder have grown at alarming rate. Consequently, narrow focus, language issues, lack of attention etc. hinders children growth, following this, families also suffer because they have to observe their child for 24 hours seeing as he/she totally depends on their caretaker.

Children with ASD tend to adjust to schedules that include repetitive patterns and activities, and they respond negatively to change, in contrast to their peers of typical development (TD) who adjust relatively easily to new conditions. As every child with ASD has different abilities and needs, a personalized program must be designed for each child separately. In recent decades, various methods of therapeutic intervention have been developed for children with ASD, among the most common of which are Applied Behavioral Analysis, the Teacch Autism Program, the Picture Exchange Communication System (PECS), the Makaton language program, the Spell framework, and Sensory Integration Therapy (Francis, 2005). McKnight and Davies (2013) opined that learners with ASD can use assistive technologies to assist them in the language and communication, interaction and socialization areas such as voice recognition applications, mobile devices, symbol-based interaction and virtual reality

which may be used to support their different educational needs during their education process.

Social Interaction

Social interaction is the exchange between two or more people and this enhances the growth of the society. Through interacting people come up with rules, institutions and systems which enable them to live in harmony (Geschwin & State, 2015). However, this can be challenging to children with autism because autism is a neuro-developmental condition. The child has delays in speech development, limited social relatedness and restricted interests and activities (America Academy of Child and Adolescent Psychiatry, 2010). The child may avoid direct eye contact and exhibit odd behaviors such as focusing on parts of objects (for example, the spinning wheel of a toy car). There may be unusual motor movements such as hand flapping, self-stimulation or walking on toes. According to the article 15 (freedom of association) United Nations Convection on the Rights of Children (1989) every child has the right to interact with other children and young people and to join groups and organizations, as long as this does not interfere with other people's rights.

Based on Social skills of children with ASD, the researcher notes that one of the two major characteristics of ASD is a difference in social communication and interaction (Parritz & Troy, 2018). Oftentimes, educators simply refer to this area as "social skills" since both communication and interaction are skills required to function successfully in social environments. While the families of typically-developing students may take their child's level of social functioning for granted, families of students with ASD know that even the smallest gains toward positive social interaction should be celebrated.

The fact of the matter, ASD children are not capable of learning skills naturally by watching others (Neik, Lee, Low, Chia, & Chua, 2014). They always have difficulty with emotions, behaviour, fact and fiction, belief, feeling and desires. In order to teach social skills for ASD children, there are three main aspects that need to be considered; environment or situation, expectation and implementation (Brown, Hewitt, & Thompson, 2012). Additionally, Gillis and Butler (2007) suggest that the focus must be on skills that are appropriate to the children's ages.

Social interaction skills are essential for children's ability to mingle with people in society and interpret things from their opinion (Astington, & Edward, 2010). Hence, social

interaction was possibly the most lacking in their daily lives, among many challenge faces by autistic child individually and they consistently require social, psychological, pedagogical support and additional tools in their educational services (Øhrstrøm, 2011). Usually, individual with ASD suffer from understanding of social interactions due to characteristic associated with ASD, which contribute to social skills deficits. ASD children have difficulty in interaction with peers, family and educator because of inability to recognize social cues in their surrounding (Ogilvie, 2011). Interestingly, they can memories and learn each social cues present around them (Dautenhahn, and Billard, 2002). It is important for them to participate in social interactions as greater social interactions in ASD children could reduce the severity level of their ASD (Hughes, 2013). In conclusion, social communication, social emotion and social behaviour are identified as the dominant domains for social skills competence.

The Use of Adaptive Computers and the Acquisition of Social Interaction Skills of Learner's with Autism

Adaptive computer technology is reported to be a highly effective teaching tool for people with ASD, who tend to do well with visual stimulus-based communication systems, while demonstrating significant learning benefits (Moore et al., 2000). Mobile technology offers opportunities for them to learn and acquire skills in authentic situations. Improvement in the portability and computing capabilities of electronic devices has increased research into the possibilities of using AT applications, running on palm computers, tablets and smartphones for people with disabilities. Earlier literature reviews (Kagohara et al., 2013; Ramdoss et al., 2011) document encouraging results and confirm the potential of digital technologies for improving the communication, social and vocational skills of people with ASD, and reducing their problematic behaviors. The use of adaptive computers and computer-based devices has shown promise in promoting the acquisition of social interaction skills in autistic learners. These devices, such as computers, tablets, or smartphones, offer a range of interactive programs and applications specifically designed to target social communication and interaction abilities. Research studies have demonstrated the effectiveness of computer-based interventions in improving social skills among individuals with autism spectrum disorder (ASD). For instance, a study by Parsons and Cobb (2011) found that computer-based interventions led to significant improvements in social interaction skills, including joint attention and social communication, in children with ASD.

Computer devices provide a structured and predictable platform for social interaction. Autistic individuals often struggle with the unpredictability and sensory overload associated with face-to-face interactions. Computer programs and applications offer a controlled environment with clear rules, visual cues, and structured activities, reducing anxiety and facilitating engagement. This predictability allows learners to focus on social cues, turn-taking, and reciprocal interactions. A study by Bekele et al. (2014) demonstrated that computer-based social skills training improved social responsiveness and engagement in children with ASD. The visual and auditory feedback provided by computer devices can enhance social learning in autistic learners. These devices can present social scenarios, videos, or virtual characters, allowing individuals with autism to observe and learn social cues, expressions, and appropriate behaviors. The interactive nature of computer programs enables learners to practice social skills in a safe and controlled environment, promoting active participation and skill generalization. A study by Tanaka et al. (2010) showed that computer-based interventions improved facial emotion recognition and social interaction skills in children with ASD.

Computer devices offer individualization and customization options, allowing interventions to be tailored to the specific needs of each learner. Programs can be adjusted in terms of difficulty level, pacing, and feedback to match the learner's abilities. This personalized approach facilitates engagement and maximizes the effectiveness of social skills training. Research by Ramdoss et al. (2011) reported that individualized computer-based interventions improved social communication and play skills in children with ASD. The visual and auditory supports provided by computer devices can compensate for challenges in verbal and nonverbal communication among individuals with autism. Visual cues, graphics, and written prompts can enhance comprehension and understanding of social information, reducing reliance on verbal communication. Additionally, the use of multimedia elements, such as videos and animations, can facilitate social learning and engagement. A study by Moore et al. (2009) demonstrated that computer-based interventions improved social communication and understanding of emotions in children with ASD. Computer devices can facilitate social interaction and engagement with peers. Online platforms and social networking sites provide opportunities for individuals with autism to connect with others, share interests, and engage in social communication. These platforms can reduce barriers to social interaction by allowing individuals to communicate at their own pace, with reduced sensory demands. Additionally, computer-mediated communication can enhance social reciprocity and provide

a supportive environment for social skill development. A study by Kuo et al. (2013) found that computer-mediated communication improved social interaction and peer relationships in adolescents with ASD.

Methodology

The study employs quantitative research approach. This study design was a non-equivalent quasi-experimental research design. The target population was made up of all the pupils with autistic spectrum disorder in special primary schools in Ray of Hope Academy Douala, Dewey International School of Applied Sciences, Petit Rousseau College Bonaberi, Prohandicam Nursery and Primary School Yaounde, Timely Performance Care Center Yaounde and Centre des Handicapés d' Etoug- Ebe Yaounde made up the target population of the study. The accessible population was made up of pupils with autistic spectrum disorder in Dewey International School of Applied Sciences in the littoral region and Timely Performance Care Center Yaounde in the centre region of Cameroon.

The sample size of the study was 12 pupils of class five with autistic spectrum disorder from these schools and 2 teachers of these clases. Thus, a total sample of 14. The researchers used non-probability sampling techniques, specifically, the purposive sampling technique to select the sample.

The Experimental Procedures

The researcher administered the questionnaire and passively observed the class five pupils' social interaction abilities using a checklist. All these results gave the pretest of the experimental group of the study. The next week the class teacher exposed the pupils to assistive technological tools. This process took place for four weeks. The researcher observed passively from outside the class room as the teacher was administering the treatment. The researcher corrected the teacher in areas that the researcher observed that there were some lapses on the part of the teacher using the tools.

The control group teacher was not trained by the researcher. The researcher also administered the questionnaire and observed the pupils' social interaction abilities using a checklist. This took place the next day after the experimental group pupils were observed. The information was recorded and that served as pretest for the control group. It should be noted that the experimental procedures were taking place vis-à-vis in the two towns. Each school from

different geographical was taking as control and experimental group to avoid diffusion of information.

After the four weeks of treatment, the researcher visited the experimental group and observed the social interaction abilities of the pupils with autistic spectrum and recorded their interactions. Secondly, the questionnaires were also administered and they answered that same day and returned them to the researcher. The results were recorded and this constituted the post test of the experimental group. The next day, the researcher visited the control group that was exposed to the conventional teaching methods. This is the methods inclusive primary schools in Cameroon have frequently been using in teaching these pupils with autistic spectrum disorder with in their schools. The researcher followed the same procedure of administering the instruments to the pupils the same way it was done with the experimental group and their results recorded. This constituted the post test of the control group.

The intervening/extraneous variables of the study was held constant or controlled so that the results were not to be as a result of other factors rather than the treatment that was given to group. These variables were participant maturation threat; only the pupils of class five of the same age took part in the study. Instrumentation threat; the researcher made sure that the teachers were using the same program to expose the pupils with assistive technology tools. Test diffusion threat. Separate schools were used as control and experimental groups. Selection mortality threat; only pupils who were observed at the pretest were the same who were observed during the post test for both groups. Figure 3 presents the schema of the procedure of the study.

Figure 1

Schema of the Procedure of the Study

N O1 X O2

N O2 C O2

Where: **N** = Non-equivalent quasi-experimental group**, O1** = Experimental group**, X** = Treatment,

O2 = Control group, **C** = no treatment

Data was analysed inferentially, descriptively and thematically. Dependent Samples T- test was used to test the hypothesis. The Dependent Samples T- test was also used because the study was comparing means between two groups as we have in this study (control and experimental group).

Presentation of Findings and Discussion

How does the use of adaptive computers affect the acquisition of social interaction skills of pupils with autistic spectrum disorder in inclusive special primary schools?

Table 1: Pupils Mean Score on the Acquisition of Social Interaction Skills at Pretest Level without the Use of Adaptive Computers.

Item	Test level	Group	N	Mean	Std. Deviation	Std. Error of Mean
The use of computers has helped me improve my ability to initiate conversations with my friends	Pre test	Control	6	1.33	.817	.333
		Experimental	6	1.17	.408	.167
Computer-based activities have enabled my understanding of non-verbal cues during social interactions	Pre test	Control	6	1.83	.753	.307
		Experimental	6	1.67	.516	.211
The use of computers has improved my ability to maintain eye contact when talking with my friends	Pre test	Control	6	1.67	1.033	.422
		Experimental	6	1.83	.983	.401
Computer-based activities have eased my development of turn-taking skills in social situations	Pre test	Control	6	2.00	.894	.365
		Experimental	6	2.33	.817	.333
The use of computers has increased my engagement in group activities and cooperative play.	Pre test	Control	6	1.83	.983	.401
		Experimental	6	2.00	.894	.365
Total	**Pre test**	**Control**	**6**	**1.73**	**.896**	**.366**
		Experimental	**6**	**1.80**	**.723**	**.295**

n=12

Comparing the pupils mean score on the acquisition of social interaction skills at the pretest level without the introduction of the use of adaptive computers in both the control and experimental groups, pupils in all school for both groups score almost the same mean value. In aggregate, the mean score for pupils in the control group is 1.73 ± 0.366 while that for pupils in the experimental group is 1.80 ± 0.295. The low difference in the standard deviation value between the control group 0.896 and experimental group 0.723 implies that the pupils

did not significantly differ in their mean score in the acquisition of social interaction skills of pupils with autistic spectrum disorder. Thus, they were at the same knowledge or social interactive level.

Table 2: Pupils Mean Score on the Acquisition of Social Interaction Skills at Post Test Level after Introduction of the Use of Adaptive Computers.

Item	Test level	Group	N	Mean	Std. Deviation	Std. Error of Mean
The use of computers has helped me improve my ability to initiate conversations with my friends	Post test	Control	6	1.35	.818	.343
		Experimental	6	2.33	.516	.211
Computer-based activities have enabled my understanding of non-verbal cues during social interactions	Post test	Control	6	1.90	.761	.327
		Experimental	6	1.67	.516	.211
The use of computers has improved my ability to maintain eye contact when talking with my friends	Post test	Control	6	1.67	1.035	.432
		Experimental	6	2.00	.894	.365
Computer-based activities have eased my development of turn-taking skills in social situations	Post test	Control	6	2.01	.897	.375
		Experimental	6	2.50	.5478	.224
The use of computers has increased my engagement in group activities and cooperative play.	Post test	Control	6	1.90	.983	.405
		Experimental	6	2.33	1.033	.422
Total	Post test	**Control**	**6**	**1.77**	**.701**	**.287**
		Experimental	**6**	**2.17**	**.899**	**.376**

In aggregate, comparing the pupils mean score on the acquisition of social interaction skills at the posttest level after the introduction of the use of adaptive computers, the results showed

that there was an increase in the mean score for all the pupils when compare to that at the pretest level even for pupils in the control group but, the mean score for pupils in the experimental group (2.17 ± 0.376) is higher than those in the control group (1.77 ± 0. 287). Thus, this increment is as a result of the treatment that was offered to the experimental group as all the other extraneous variables were held constant.

Testing of Hypothesis which state that the use of adaptive computers does not have a significant effect on the acquisition of social interaction skills of pupils with autistic spectrum disorder in special schools.

Table 3: ***The Effect of Adaptive Computers on the Acquisition of Social Interaction Skills of Pupils with Autistic Spectrum Disorder in Special Schools.***

Group	Test level	N	Mean	Std. Deviation	Std. Error of Mean	T-test value	P-value
Control group	Pre test	**6**	**1.73**	**.896**	**.366**	8.694	0.000
	Post test	**6**	**1.77**	**.701**	**.287**		
Experimental group	Pre test	**6**	**1.80**	**.723**	**.295**		
	Post test	**6**	**2.17**	**.899**	**.376**		

Finally, comparing the pupils mean score in on the acquisition of social interaction skills of autistic learners at pretest level when use of adaptive computers was not introduced and at posttest level after use of computers had been introduce, statistics showed that there was a significant increase in the mean score (T-test value 8.594, p-value 0.000 < 0.05) with, pupils in the experimental group at posttest level having a high mean score 2.17 ± 0.376 than pupils in the control group 1.77 ± 0.287. Therefore, the null hypothesis was rejected while the alternative hypothesis that state the use of computers significant influence the acquisition of social interaction skills of pupils with autistic spectrum disorder was accepted. This result on table 3 is also presented on figure 3 for clarity;

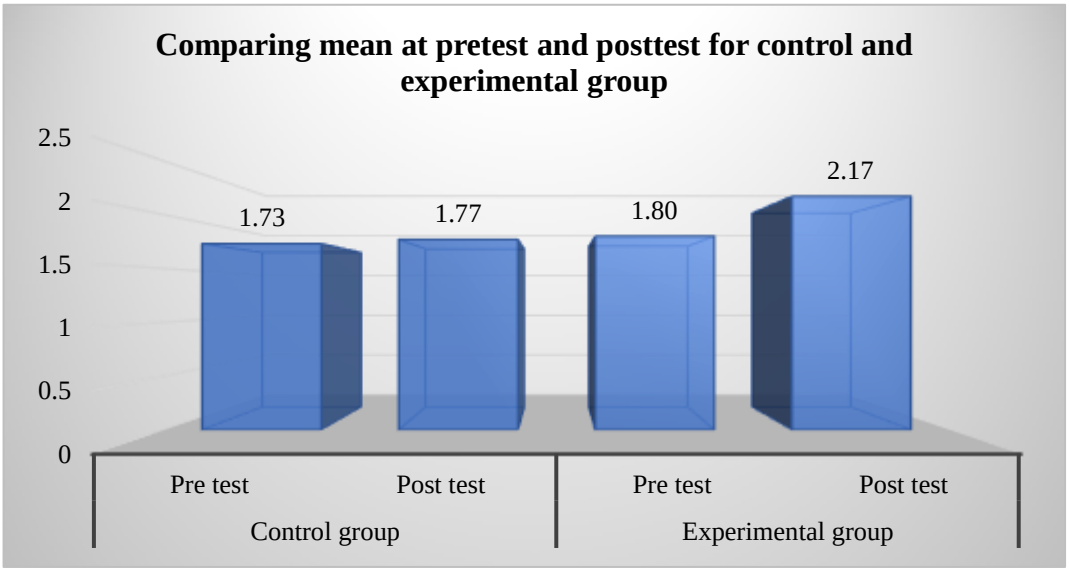

Figure 2: ***The Effect of Adaptive Computers on the Acquisition of Social Interaction Skills of pupils with Autistic Spectrum Disorder in Special Schools***

The pupils where equally observed before the introduction of the intervention, however, the researcher discovered that the pupils where very timid and were not very interactive after first two weeks of observing the pupils in their classes by the researcher as their various teachers were executing their teaching duties using the conventional teaching methods. The observation finding is presented on table 4;

Table 4: ***Observation of Pupils Acquisition of Social Interaction Skills after Introduction of the Use of Adaptive Computers.***

Items	**Almost always**	**Often**	**Some times**	**Almost never**
Helps to initiate conversations with peers	1 (8.3%)	3 (25.0%)	5 (41.7%)	3 (25.0%)
Enhance social interaction	0 (00.0%)	4 (33.3%)	8 (66.7%)	0 (00.0%)
Helps in maintaining eye contact when talking with friends	0 (00.0%)	2 (16.7%)	10 (83.3%)	0 (00.0%)
Withdraw when doing computer activities with others	1 (8.3%)	7 (58.3%)	4 (33.3%)	0 (00.0%)
Seems to be aware of facial expressions during computer activities	1 (8.3%)	1 (8.3%)	10 (83.3%)	0 (00.0%)
Withdraw when doing computer activities with other pupils in class	1 (8.3%)	1 (8.3%)	8 (66.7%)	2 (16.7%)
Multiple Response Set (MRS)	**4 (5.6%)**	**11 (15.3%)**	**48 (66.7%)**	**9 (12.5%)**

From the observation carried out after the introduction of the use of adaptive computers, cumulatively, majority of the pupils with autistic spectrum disorder 66.7% occasionally display evident of the acquisition of social interaction skills while 20.9% of them consistently display evident of the acquisition of social interaction skills. For instance, 83.3% of the pupils with autistic spectrum disorder sometimes helps in maintaining eye contact when talking with friends. Also, 83.3% of the pupils sometimes seems to be aware of facial expressions during computer activities, 66.7% sometimes enhance social interaction, but withdraw when doing computer activities with other pupils in class. While 66.6% of the pupils with autistic spectrum disorder constantly helps to initiate conversations with peers and but withdraw when doing computer activities with others.

The data collected from the interview of the teachers that were teaching these pupils with ASD by the researcher is presented on table 5;

Table 5: ***Teachers' Opinion on How Adaptive Computers Influence the Social Interaction Skills of pupils with Autistic Spectrum Disorder in Special Schools.***

Theme	Sample Quatetion
Personalized and Adaptive Learning	*"Adaptive learning platforms can cater to individual learning styles and paces making learning more accessible and motivating for pupils with autism."* *"Though it is a very important tool, it doesn't help all the children to the same extent. While others improve in becoming independent, others communication difficulties increase, becoming more independent but improve in learning generally. "*
Enhance Communication	*"Alternative communication devices help children that are nonverbal to communicate effectively."* *"The use of technology has helped pupils with Autistic Spectrum Disorder feel more confident in their ability to communicate and interact with others."* *"It has helped in providing structured communication for example, these learners now respect instructions while using the computers."*
Social Interaction and Collaboration	*"It has impacted the social interaction skills of guide with disabilities to socials through peer engagement."* *"Through the use of adaptive computers, there is peer interaction as it enables collaboration with peers and fosters opportunities for interactions through teamwork."* *"The key is brought online to in-person interactions."*
Interactive Learning	*"Through gamification, by incorporating games like element, adaptive computers can make learning social and more interactive."* *"Computers stimulate social scenarios as these systems include role-playing games."* *"Visual tools enhance understanding through visual learning."* *"Adaptive computers make use of visual support materials (aids) such as social stories or visual schedules."*

Based on table 5, teachers experience on how the use of adaptive computers influence the social interaction skills of pupils with ASD, majority of the teachers said the use of adaptive computers enhanced ASD learners personalized and adaptive learning, enhance their communication, their social interaction and collaboration, and interactive learning skills.

Finally, the results of the study revealed that the use of adaptive computers significantly influence the acquisition of social interaction skills of pupils with ASD in special schools in the Littoral and Center Regions in Cameroon. The results from teachers also highlight that adaptive computers significantly influence the social interaction skills of pupils with autism spectrum disorder (ASD) in various dimensions. One major theme is personalized and adaptive learning, where teachers noted that *"adaptive learning platforms can cater to individual learning styles and paces making learning more accessible and motivating for pupils with autism."* Again, the theme of social interaction and collaboration emerged strongly, with teachers observing that *"it has impacted the social interaction skills of guide with disabilities to socials through peer engagement."* This finding is echoed in the work of Maria & Vana (2025) who highlight that technology can facilitate peer interactions, thereby fostering teamwork and collaboration among students. The teachers noted, *"through the use of adaptive computers, there is peer interaction as it enables collaboration with peers and fosters opportunities for interactions through teamwork."* This suggests that adaptive technologies not only enhance individual learning but also create a platform for social engagement. This assertion aligns with research by Rose, Meyer, & Hitchcock (2019) which emphasizes the importance of personalized learning in enhancing engagement and motivation among students with special needs.

Schwartz et al. (2018); Hetzroni and Shrieber (2004) on their studies revealed that children with ASD often struggle with social skills, typically exhibiting similar challenges regardless of their educational interventions. This shows that use of adaptive computers can ameliorate the acquisition of social interaction skills. Research by Kasari et al. (2014) emphasizes that structured technology-based interventions can provide repeated opportunities for practice, which is essential for children with ASD who may struggle with social nuances and cues. Alper and Raharinirina (2006) found that that the use of adaptive computers enhances the interaction and engaging learning environments for learners with autism to acquire different types of learning skills. García et al. (2020) on their parts suggests that educators should consider integrating adaptive computers into their teaching strategies to maximize the

developmental potential of these pupils. This result corroborates with the findings of Moira & Diane (2011) in their found that there is a significant increase in mean scores from pretest to post-test in the experimental group with adaptive computers usage in the teaching of pupils with ASD. Kagohara et al. (2013) opine that technology can bridge communication gaps for students with autistic spectrum disorder thereby fostering social engagement. Previous studies corroborate these findings, suggesting that computer-based interventions can effectively support social skill acquisition in children with ASD by providing interactive and engaging learning experiences. This result aligns with findings from Babalola et al. (2024), who equally noted that without tailored interventions, children with ASD often remain at a disadvantage in social contexts. Van den Heuvel, Lexis, & de Witte (2015) note that socially assistive robotics and other technologies have shown positive effects on social skills development in children with ASD. Similarly, Chaurasia & Singh (2022) highlight that assistive technology (AT) interventions aim to improve social relationships and functioning within the ASD population. Diomampo and Marquez (2025) in their study found that while technology promotes cognitive and social development, there's a weak correlation between screen time and social outcomes, suggesting that the context of technology use is crucial.

The result anchors on the Technology Acceptance Model (TAM) proposed by Fred Davis (1986), which emphasizes two primary factors influencing technology adoption: perceived usefulness and perceived ease of use. The study demonstrates that adaptive computer not only enhance the acquisition of social skills but also promote greater confidence and engagement among pupils with autism spectrum disorder (ASD), reflecting a strong perceived usefulness of computers in educational settings.

CONCLUSION

The study was to investigate the effects of adaptive computers on the acquisition of social interaction skills of pupils with autistic spectrum disorder in some selected inclusive special schools in the Center and Littoral Regions of Cameroon. The results revealed that adaptive computers enhance the acquisition of social interaction skills of pupils with autistic spectrum disorder in these selected special schools.

RECOMMENDATIONS

Schools should adopt and integrate the use of adaptive computers, into their curricula. This is because adaptive computers have demonstrated significant effectiveness in enhancing the social interaction skills of pupils with autistic spectrum disorder in special inclusive schools.

Teachers should be equipped with strategies and techniques to maximize the benefits of the adaptive computer in fostering social skills development among pupils with autism.

REFERENCES

1. American Academy of Child and Adolescent Psychiatry. (2010). Practice parameter for the assessment and treatment of children and adolescents with anxiety disorders. *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(3), 272-297.
2. American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
3. Astington, J. W., & Edward, M. J. (2010). The development of theory of mind in early childhood. *Handbook of Social Development: A Lifespan Perspective*, 2, 165-183.
4. Atkins, M. S. (2011). Technology-based interventions for mental health in schools: What we know and what we need. *Psychology in the Schools,* 48(10), 1018-1032.
5. Alper, S., & Raharinirina, S. (2006). Assistive technology for individuals with disabilities: A review and synthesis of the literature. *Journal of Special Education Technology*, 21(2), 47–64.
6. Babalola, T., Sanguedolce, G., Dipper, L. & Botting, N. (2024). Barriers and Facilitators of Healthcare Access for Autistic Children in the UK: *A Systematic Review. Review Journal Autism Development Disord*., 12, (4), 1-29. https://doi.org/10.1007/s40489-023-00420-3
7. Bekele, E. (2014). Assessing the utility of a virtual environment for enhancing facial affect recognition in adolescents with autism. *Journal of Autism and Developmental Disorders*, 44(7), 1641-1650.
8. Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom. ASHE-ERIC Higher Education Report No. 1.* Jossey-Bass.
9. Brown, T. A., Hewitt, P. L., & Thompson, L. W. (2012). Measurement structure of the Obsessive-Compulsive Inventory—Revised: Replication and extension in a clinical sample. *Journal of Psychopathology and Behavioral Assessment*, 34(3), 371-380.
10. Cameroon Law No 2010/002 of 13th April 2010.
11. Centers for Disease Control and Prevention. (2012a). *Autism spectrum disorder (ASD): Data & statistics*. https://www.cdc.gov/ncbddd/autism/data.html

12. Chaurasia, A., & Singh, A. P. (2022). Assistive Support Through Technologies for Persons with Disabilities in Libraries. *DESIDOC Journal of Library & Information Technology*, 42(2), 30-43.
13. Centers for Disease Control and Prevention. (2014). Prevalence of autism spectrum disorder among children aged 8 years - Autism and Developmental Disabilities Monitoring Network, 11 sites, United States, 2010. *Morbidity and Mortality Weekly Report*, 63(2), 1-21.
14. Cheshire, J. (2004). Discourse variation, grammaticalisation and stuff like that. *Journal of Sociolinguistics*, 8(4), 493-515.
15. Cho, Y., & Ahn, S. (2016). The impact of social media on college students' consumption patterns. *Journal of Marketing Development and Competitiveness*, 10(2), 33-44.
16. Dautenhahn, K., & Billard, A. (2002). Games children with autism can play with Robota, a humanoid robotic doll. *In Proceedings of the 1st International Conference on Development and Learning (pp. 113-118).* IEEE.
17. Diomampo, M. B. E., & Marquez, M. F. (2025). The Impact of Technology Use on Social and Cognitive Development of Children with Autism. *Journal of Education, Learning, and Management*, 12, 14-29.
18. Eta, V. N., Nsagha, D. S., & Ihenacho, H. N. (2019). Social determinants of health and health inequalities: Comparative study of population health status and household socioeconomic indicators in Cameroon and Nigeria. *International Journal of MCH and AIDS*, 8(1), 21-33.
19. Francis, L. J. (2005). The psychology of gender differences in religion: A review of empirical research. *Religion*, 35(2), 100-123.
20. Fred, A., Davis. (1986). The psychology of humor: Theoretical perspectives and empirical issues. In P. E. McGhee & J. H. Goldstein (Eds.), *Handbook of Humor Research (Vol. 1, pp. 61-82).* Springer.
21. Furio, J., Seguí, S., & Vivo, J. (2015). The influence of digital reading habits on reading comprehension skills. *Comunicar*, 22(44), 71-79.
22. Faras, H. (2010). Autism spectrum disorders: A review of the literature. *Journal of Autism and Developmental Disorders*, 40(5), 631–641.
23. García, F. M, Mattedi, A. P., & Seabra, R. D. (2020). *Self-Eficacy Among Users of Information and Communication Technologies.* Minas Gerais Brazil.
24. Geschwin, N., & State, M. W. (2015). Gene hunting in autism spectrum disorder: On the path to precision medicine. *The Lancet Neurology*, 14(11), 1109-1120.

25. Gierrach, S., & Stindt, S. (2009). The influence of social motivation on affective responses to social exclusion. *Journal of Experimental Social Psychology*, 45(1), 234-238.
26. Gillis, J. S., & Butler, R. N. (2007). Communication patterns of older adults with varying degrees of hearing loss. *Journal of Gerontology: Psychological Sciences*, 62(5), 373-380.
27. Haebig, E., Jiménez, L., Cox, C., & Hills, T. T. (2020). Online measures of prediction in sentence comprehension. *Behavior Research Methods*, 52(1), 389-403.
28. Hetzroni, O. E., & Shrieber, B. (2004). Word processing as an assistive technology tool for enhancing academic outcomes of students with writing disabilities in the general classroom. *Journal of Learning Disabilities*, 37(2), 143-154.
29. Hughes, C. (2013). Assistive technology for people with intellectual disabilities: A review of recent research. *Current Opinion in Psychiatry*, 26(5), 479-483.
30. Jahr, E., Eldevik, S., & Eikeseth, S. (2000). Teaching children with autism to initiate and sustain cooperative play. *Research in Autism Spectrum Disorders*, 4(4), 509-515.
31. Kagohara, D. M., van der Meer, L., Ramdoss, S., O'Reilly, M. F., Lancioni, G. E., Davis, T. N., ... & Sigafoos, J. (2013). Using iPods® and iPads® in teaching programs for individuals with developmental disabilities: A systematic review. *Research in Developmental Disabilities*, 34(1), 147-156.
32. Kasari, C., Lawton, K., Shih, W., Barker, T. V., Landa, R., Lord, C., ... & Wetherby, A. (2014). Caregiver-mediated intervention for low-resourced preschoolers with autism: An RCT. *Pediatrics*, 134(1), e72-e79.
33. Kuo, M. H., Orsmond, G. I., Coster, W. J., & Cohn, E. S. (2013). Media use among adolescents with autism spectrum disorder. *Autism*, 17(6), 724-738.
34. Lahm, E. A., & Sizemore, L. (2001). Assistive technology for individuals with disabilities: A review of the literature. *Journal of Rehabilitation*, 67(3), 13-20.
35. Lapshina, N. (2019). The role of technology in the development of social skills in children with autism spectrum disorders. *International Journal of Emerging Technologies in Learning*, 14(14), 163-173.
36. Lenker, J. A. (1998). Assistive technology for communication: An overview. *Journal of Special Education Technology*, 13(1), 5-15.
37. Maria, A., & Vana K. (2025). Learning disabilities: Technology and interventions. Magna Scientia Advanced Research and Reviews, 13(02), 113-130.

38. Mamokhina, K. (2017). The effectiveness of assistive technology for children with autism spectrum disorder: A systematic review. *Journal of Special Education and Rehabilitation*, 18(1-2), 7-26.
39. Martin, R. (2006). Assistive technology for students with autism spectrum disorders: An overview. *TEACHING Exceptional Children Plus*, 2(4), 1-14.
40. McKnight, L., & Davies, M. (2013). Using video self-modeling to teach social skills to individuals with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 43(10), 2490-2501.
41. Moira, K., & Diane, T. (2011). *The use of technology to support students with autism spectrum disorders*. Retrieved from https://www.autismspeaks.org/sites/default/files/2018-08/technology_report.pdf
42. Moore, M., Calvert, S., & Breit-Smith, A. (2009). The influence of virtual peers on young children's empathy and aggressive behavior. *Journal of Applied Developmental Psychology*, 30(3), 346-357.
43. Moore, M., Calvert, S., Johnson, D., & Smith, L. (2000). The effects of interactive computer play on problem-solving skills and attributions. *Journal of Educational Psychology*, 92(1), 100-106.
44. Menzies, H. M. (2010). *Learning to work together: Reciprocity and joint attention in children with autism.* University Press.
45. Neik, T. T., Lee, K. M., Low, W. Y., Chia, Y. C., & Chua, Y. P. (2014). Assistive technology for children with autism spectrum disorder: A review of the literature. *Autism Research and Treatment*, 12, 1-14.
46. Nason, E. (2016). Autism in Nigeria: A review of the literature. *Journal of Autism and Developmental Disorders*, 46(3), 910-919.
47. Nsagha, D. S. (2021). Autism spectrum disorder: A review of the literature. *Journal of Neurology and Neuroscience*, 12(2), 1-9.
48. Ntaryike, F. T. (2013). Autism in Africa: A perspective from Cameroon. *Journal of Autism and Developmental Disorders*, 43(12), 2902-2903.
49. Nzie, E. M. (2014). Autism in Cameroon: A review of the literature. *Journal of Autism and Developmental Disorders*, 44(1), 28-35.
50. Ogilvie, C. (2011). The impact of the Individuals with Disabilities Education Act on autism research and treatment. *Journal of Autism and Developmental Disorders*, 41(5), 545-554.

51. Øhrstrøm, P. (2011). The ethics of assistive technology for autism. *Disability & Society,* 26(6), 745-758.
52. Ouss, L., Steffgen, G., & Gilles, I. (2014). The impact of a computer-based attention training intervention on attentional deficits in adults with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 44(11), 3075-3084.
53. Parritz, R. H., & Troy, M. F. (2018). *Disorders of childhood: Development and psychopathology*. Cengage Learning.
54. Parsons, S., & Cobb, S. (2011). State-of-the-art of virtual reality technologies for children on the autism spectrum. *European Journal of Special Needs Education,* 26(3), 355-366.
55. Quill, K. A. (1995). *Teaching children with autism: Strategies to enhance communication and socialization.* Delmar Publishers.
56. Rose, D. H., Meyer, A., & Hitchcock, C. (2019). *The importance of personalized learning in enhancing engagement and motivation among students with special needs.* Harvard Education Press
57. Ramdoss, S., Lang, R., Mulloy, A., Franco, J. H., O'Reilly, M., Didden, R., ... & Lancioni, G. (2011). Use of computer-based interventions to teach communication skills to children with autism spectrum disorders: A systematic review. Journal of Behavioral Education, 20(1), 55-76.
58. Schmidt, L. A., Laffey, J. G., Schmidt, J. A., Wang, Y., & Stichter, J. P. (2012). Using video modeling to teach social skills to elementary school children with autism. *Journal of Positive Behavior Interventions,* 14(3), 133-143.
59. Schwartz, G.G., Steg, P.G., Szarek, M., Bhatt, D.L., Bittner, V.A, Diaz, R., Edelberg, J.M., Goodman, S.G., Hanotin C., Harrington R.A., Jukema J.W., Lecorps G., Mahaffey K.W., Moryusef, A., Pordy R., Quintero K, Roe, M.T., Sasiela, W.J., Tamby J.F., Tricoci, P., White, H.D., & Zeiher A.M. (2018). Reserve-building activities and depression in disabled individuals: A longitudinal study. *Frontiers in Psychology,* 9, 12-34
60. Shepley, C., Levin, L., & Hersh, M. A. (2017). The effect of a parent-implemented communication intervention on the social communication skills of young children with autism spectrum disorder. *Journal of Autism and Developmental Disorders,* 47(6), 1735-1745.
61. Sherer, M. R. (2004). Teaching conversation skills to children with autism: Effect on the development of a theory of mind. *Journal of Autism and Developmental Disorders,* 34(4), 379-393.

62. Tanaka, J. W., Wolf, J. M., Klaiman, C., Koenig, K., Cockburn, J., Herlihy, L., ... & Schultz, R. T. (2010). Using computerized games to teach face recognition skills to children with autism spectrum disorder: The Let's Face It! program. *Journal of Child Psychology and Psychiatry*, 51(8), 944-952.
63. Taskiran, S., & Kandemir, M. (2010). The effectiveness of social skills training on maladaptive behaviors of children with autism. *Education and Training in Autism and Developmental Disabilities*, 45(3), 382-393.
64. Tchombe, T. M. S. (2019). Inclusive education in Cameroon: A critical analysis of the implementation process from a socio-ecological perspective. *International Journal of Inclusive Education*, 23(4), 347-363.
65. UNESCO. (2004a). *The right to education: Towards education for all throughout life.* UNESCO.
66. UNESCO. (2017). A guide for ensuring inclusion and equity in education. United Nations Educational, Scientific and Cultural Organization.
67. United Nations Convention on the Rights of the Child. (1989). *United Nations.*
68. Van den Heuvel, R., Lexis, M., & de Witte, L. (2015). ICT based technology to support play for children with severe physical disabilities. Assistive Technology, 573-577.
69. Yeargin-Allsopp, M., Rice, C., Karapurkar, T., Doernberg, N., Boyle, C., & Murphy, C. (2003). Prevalence of autism in a US metropolitan area. *JAMA*, 289(1), 49-55.