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Artificial Intelligence in Applied Behaviour Analysis (ABA) for Autism Spectrum Disorder in Nigeria: Opportunities, Challenges, and Future Directions

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ABSTRACT

This paper examines the integration of Artificial Intelligence into Applied Behaviour Analysis (ABA) for Autism Spectrum Disorder in Nigeria, with particular emphasis on emerging opportunities, existing challenges, and future directions. The paper adopts a conceptual and narrative review approach synthesizing the current literature on AI-assisted ABA interventions, autism care technologies, and digital mental health innovations in both global and Nigerian contexts. The study discusses several opportunities associated with AI integration, including early detection of ASD, automated behavioural tracking, personalized intervention systems, telehealth service delivery, caregiver support, and improved data-driven decision-making in behavioural therapy. Despite these prospects, the paper identifies critical barriers including poor digital infrastructure, limited technological expertise, inadequate funding, ethical concerns regarding data privacy, cultural misconceptions about ASD, and weak policy implementation frameworks in Nigeria. The paper concludes that although AI has substantial potential to revolutionize ABA practice and autism intervention in Nigeria, successful implementation requires coordinated efforts involving government agencies, healthcare professionals, educational institutions, technology developers, and policymakers. The study recommends increased investment in digital health infrastructure, professional training in AI-assisted behavioural therapy, development of culturally relevant AI tools, and formulation of ethical and regulatory guidelines to support responsible adoption of AI technologies in autism care. The paper further highlights the need for indigenous empirical research to strengthen the evidence base for the implementation of AI-driven behavioural interventions in Nigeria.

KEYWORDS Autism Spectrum Disorder • Artificial Intelligence • Applied Behaviour Analysis (ABA) • Behavioural Intervention • Nigeria

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1. INTRODUCTION

Autism Spectrum Disorder (ASD) has increasingly become a major global public health and developmental concern due to its growing prevalence and its profound effects on communication, social interaction, learning, and behavioural functioning among children and adolescents. ASD is a complex neurodevelopmental disorder characterized by persistent deficits in social communication and interaction, restricted interests, repetitive behaviours, and difficulties in adaptive functioning (American Psychiatric Association [APA], 2022). According to the World Health Organization, approximately 1 in every 100 children globally is diagnosed with ASD, although prevalence rates vary across countries due to differences in awareness, diagnostic systems, and screening practices (World Health Organization [WHO], 2023). The growing recognition of ASD worldwide has intensified the demand for early diagnosis, effective intervention, specialized educational support, and evidence-based behavioural therapies capable of improving developmental outcomes and quality of life among affected children with ASD, although prevalence rates vary across countries due to differences in awareness, diagnostic systems, and screening practices (World Health Organization [WHO], 2023). The growing recognition of ASD worldwide has intensified the demand for early diagnosis, effective intervention, specialized educational support, and evidence-based behavioural therapies capable of improving developmental outcomes and quality of life among affected children.

In Africa, particularly in Nigeria, ASD remains significantly underdiagnosed and poorly understood despite growing evidence of increasing cases. Studies suggest that autism prevalence in Africa may be comparable to global estimates; however, access to diagnosis and intervention services remains limited due to inadequate healthcare infrastructure, shortage of specialists, stigma, poor awareness, and socio-cultural misconceptions surrounding developmental disorders (Bakare & Munir, 2011; Franz et al., 2017). Indigenous Nigerian studies have reported varying prevalence rates across regions and clinical settings. For example, Bakare et al. (2012) documented a prevalence rate of approximately 0.8% among children attending psychiatric facilities in Southeastern Nigeria, while Lagunju et al. (2014) reported prevalence estimates of about 2.3% among children assessed in neurodevelopmental clinics in Southwestern Nigeria. Bello-Mojeed et al. (2017) also observed increasing clinical presentations of ASD cases across major urban centres in Nigeria due to improved awareness and referral systems. Recent evidence further suggests that between 0.8% and 1.2% of Nigerian children may be living with ASD, representing hundreds of thousands of affected children nationwide (Ogunmodede et al., 2023). Despite these increasing figures, Nigeria still lacks comprehensive national epidemiological data, and many children remain undiagnosed or receive intervention very late due to poor awareness and limited access to specialized services.

The integration of Artificial Intelligence (AI) into Applied Behaviour Analysis (ABA) for ASD intervention remains relatively underexplored in Nigeria despite increasing digital transformation within healthcare and educational sectors. The country continues to face major barriers, including poor digital infrastructure, unstable electricity supply, limited internet access, inadequate technological expertise, insufficient funding for digital health innovations, and weak policy frameworks guiding AI adoption in mental health services (Afolabi et al., 2024). Nevertheless, the rapid expansion of mobile technologies, telehealth systems, and digital learning platforms presents significant opportunities for improving autism intervention services in Nigeria. AI-assisted ABA interventions may help bridge the gap between increasing autism cases and the shortage of behavioural specialists through remote therapy delivery, automated behavioural monitoring, individualized intervention planning, and caregiver-assisted home-based therapies. Therefore, this paper examines the role of Artificial Intelligence in Applied Behaviour Analysis for Autism Spectrum Disorder in Nigeria with particular emphasis on the emerging opportunities, existing challenges, and future directions for research, policy, and practice.

To achieve this objective, the paper is divided into five thematic sections. The first section discusses the introduction and conceptual clarification of key concepts related to Artificial Intelligence, Applied Behaviour Analysis, and autism spectrum disorder. The second section examines the theoretical and empirical literature on AI-assisted behavioural interventions for ASD. The third section explores the opportunities and potential benefits of integrating Artificial Intelligence into ABA practices in Nigeria. The fourth section highlights the major challenges and barriers confronting the adoption of AI-driven behavioural interventions for children with ASD in Nigeria. The final section presents the future directions, policy implications, recommendations, and conclusion of the study.

2. CONCEPTUAL CLARIFICATION OF KEY CONCEPTS

Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by computer systems and digital technologies designed to perform tasks that normally require human cognitive abilities such as learning, reasoning, problem-solving, speech recognition, prediction, and decision-making (Russell & Norvig, 2021). AI involves the development of intelligent systems capable of analyzing large volumes of data, recognizing behavioural patterns, adapting to environmental changes, and making automated decisions with minimal human intervention. Major branches of AI include machine learning, natural language processing, robotics, computer vision, predictive analytics, and expert systems. In healthcare and behavioural sciences, AI technologies are increasingly utilized for diagnosis, treatment planning, behavioural monitoring, emotional recognition, and personalized intervention programmes (Topol, 2019).

Within the context of autism intervention, AI has emerged as an innovative tool for improving behavioural assessment, early diagnosis, communication training, emotional recognition, and individualized therapy for children with autism spectrum disorder (ASD). AI-powered applications such as wearable devices, speech recognition software, virtual reality systems, robotics, and intelligent behavioural tracking systems are increasingly being integrated into behavioural and educational interventions for children with developmental disorders (Alam et al., 2022). These technologies enhance real-time monitoring, data collection, and adaptive learning, thereby improving the efficiency and effectiveness of intervention programmes. Recent studies have shown that AI-assisted interventions can improve social communication, emotional engagement, learning outcomes, and behavioural adaptation among children with ASD (Abbas et al., 2024).

In Nigeria, the adoption of Artificial Intelligence in healthcare and education still be developing despite growing interest in digital innovation and smart healthcare technologies. Indigenous scholars have observed that Nigeria faces several barriers to effective AI implementation, including poor digital infrastructure, unstable electricity supply, inadequate technological expertise, insufficient funding, and weak policy frameworks regulating AI adoption in healthcare services (Afolabi et al., 2024; Olatunji & Adebayo, 2023). Nevertheless, the rapid growth of mobile technologies, telemedicine, digital learning systems, and internet penetration presents significant opportunities for AI-assisted healthcare and behavioural interventions in Nigeria. In the context of autism management, AI technologies may help address the shortage of trained specialists and improve access to behavioural therapy services through remote intervention, automated behavioural monitoring, and caregiver-assisted home-based support systems.

Applied Behaviour Analysis (ABA)

Applied Behaviour Analysis (ABA) is a scientific and evidence-based approach to understanding and modifying socially significant behaviours through the application of behavioural learning principles derived from behaviourism and operant conditioning theories (Skinner, 1953). ABA focuses on observing, measuring, and systematically changing behaviour using reinforcement, prompting, shaping, modelling, task analysis, and behaviour modification techniques. The primary objective of ABA is to improve adaptive behaviours while reducing maladaptive or problematic behaviours that interfere with learning, communication, and social functioning (Cooper et al., 2020).

ABA is widely recognized as one of the most effective interventions for children with autism spectrum disorder due to its emphasis on individualized treatment plans, structured learning environments, and measurable behavioural outcomes. ABA interventions are designed to improve communication skills, social interaction, emotional regulation, attention span, academic functioning, and independent living skills among children with ASD (Leaf et al., 2016). Common ABA techniques include positive reinforcement, discrete trial training, functional behaviour assessment, verbal behaviour therapy, and behavioural shaping. Research evidence has consistently demonstrated that intensive and early ABA interventions significantly improve developmental outcomes among children with autism (Lovaas, 1987; Reichow et al., 2018).

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder characterized by persistent difficulties in social communication, social interaction, and repetitive patterns of behaviour, interests, or activities (APA, 2022). The disorder usually begins in early childhood and affects cognitive, emotional, behavioural, and social development. Children with ASD often experience challenges in communication, emotional expression, social relationships, adaptive functioning, and behavioural flexibility. Globally, ASD has become a major public health concern, with the World Health Organization estimating that approximately 1 in every 100 children is affected by autism (WHO, 2023). Research indicates that genetic, neurological,

environmental, and developmental factors contribute to the condition, while early diagnosis and behavioural intervention remain essential for improving developmental outcomes (Lord et al., 2020).

In Nigeria, ASD remains poorly understood and significantly underdiagnosed despite increasing awareness and clinical presentations. Indigenous studies have reported varying prevalence rates across the country, including approximately 0.8% in Southeastern Nigeria and 2.3% in Southwestern Nigeria (Bakare et al., 2012; Lagunju et al., 2014). Bello-Mojeed et al. (2017) further observed increasing autism cases in urban centres due to improved awareness and referral systems. However, many Nigerian children with ASD still experience delayed diagnosis and limited access to intervention services because of stigma, cultural misconceptions, shortage of specialists, and inadequate mental health infrastructure (Bakare & Munir, 2011). In many communities, autism is often linked to supernatural beliefs and spiritual causes, contributing to discrimination and social exclusion affecting children and their families. These challenges highlight the need for improved awareness, evidence-based interventions, and technology-assisted behavioural therapies to strengthen autism care and support services in Nigeria.

3. THEORETICAL FRAMEWORK

This paper adopts a multidisciplinary theoretical framework by combining Behaviourism Theory, the Technology Acceptance Model, and Socio-Technical Systems Theory to explain the integration of Artificial Intelligence into Applied Behaviour Analysis for Autism Spectrum Disorder in Nigeria. The combination of these frameworks provides a comprehensive understanding of behavioural intervention, technology adoption, and the interaction between technological systems and social environments in autism care.

Behaviourism Theory

Behaviourism Theory, particularly the operant conditioning principles developed by B. F. Skinner, serves as one of the foundational theories underlying Applied Behaviour Analysis (ABA). The theory emphasizes that behaviour is learned and modified through interactions with the environment using reinforcement, punishment, prompting, shaping, and repetition (Skinner, 1953). According to behaviourism, desirable behaviours can be strengthened through positive reinforcement, while maladaptive behaviours can be reduced through systematic behavioural modification techniques. ABA interventions for children with autism spectrum disorder are largely based on these principles, as therapists use reinforcement strategies to improve communication, social interaction, adaptive functioning, and learning outcomes among children with autism (Cooper et al., 2020). The relevance of Behaviourism Theory to this study lies in its explanation of how Artificial Intelligence can support behavioural learning and intervention processes in children with ASD. AI-powered systems such as intelligent tutoring applications, behavioural tracking software, wearable devices, robotics, and virtual learning environments can automate reinforcement schedules, monitor behavioural responses, and personalize intervention programmes based on individual behavioural patterns. Through continuous data analysis and adaptive feedback systems, AI technologies can enhance the effectiveness, consistency, and precision of ABA interventions for children with autism.

Technology Acceptance Model (TAM)

The Technology Acceptance Model was developed by Davis (1989) to explain individuals' willingness to adopt and use technological systems. The model proposes that two major factors influence technology adoption: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which individuals believe that a particular technology will improve their performance or outcomes, while perceived ease of use refers to the degree to which individuals believe that the technology is simple, understandable, and convenient to use (Davis, 1989). The Technology Acceptance Model is relevant to this study because the successful integration of Artificial Intelligence into ABA interventions in Nigeria depends largely on the willingness of therapists, caregivers, educators, healthcare professionals, and institutions to adopt AI-assisted systems. If AI technologies are perceived as useful in improving autism diagnosis, behavioural monitoring, therapy delivery, and communication outcomes, stakeholders are more likely to embrace them. Similarly, if AI applications are designed to be user-friendly, affordable, culturally adaptable, and accessible within Nigerian contexts, their acceptance and utilization are likely to increase. However, barriers such as low technological literacy, poor infrastructure, financial constraints, and resistance to technological change may hinder adoption rates.

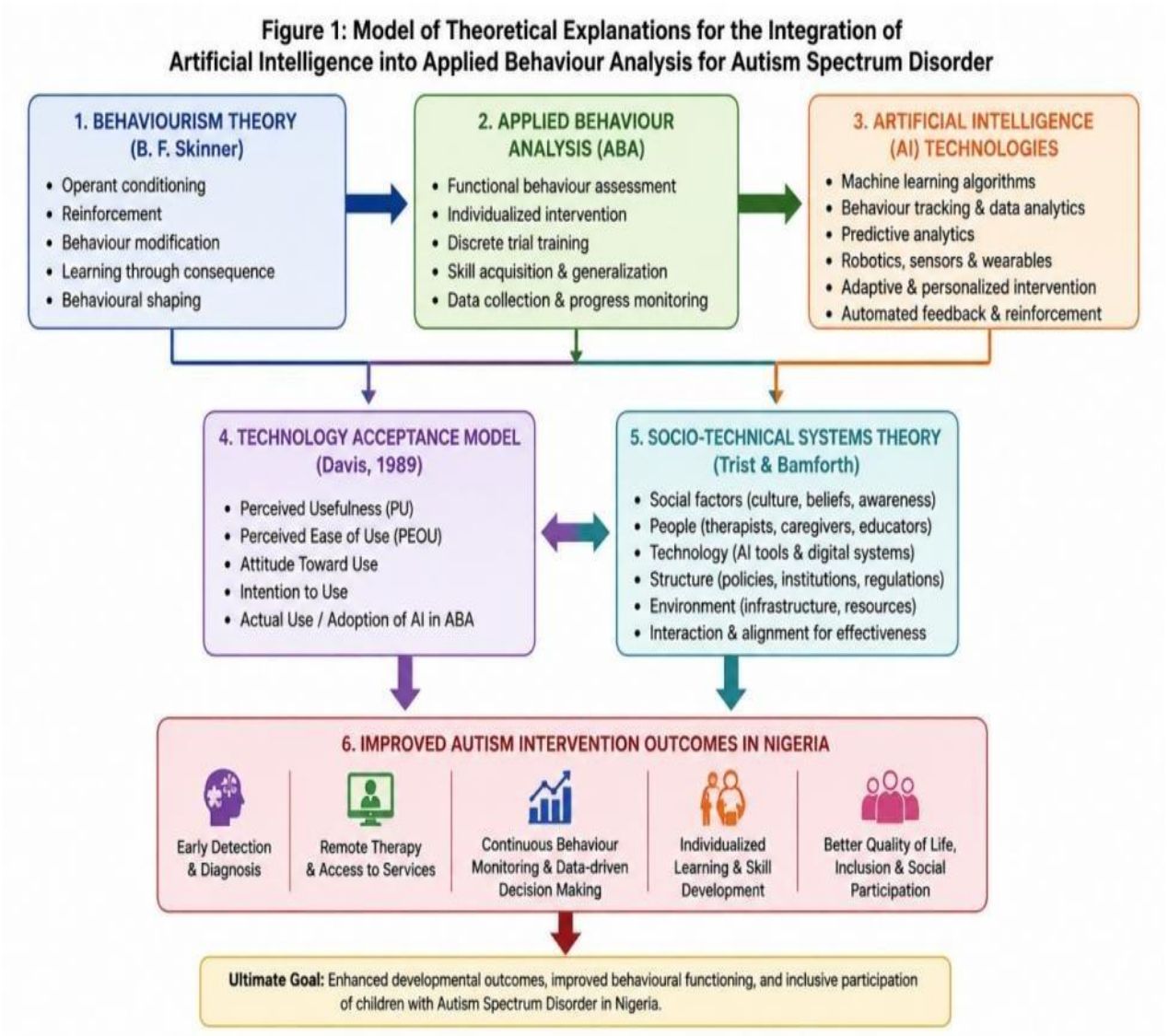


Figure 1. *Model of Theoretical Explanations for the Integration of Artificial Intelligence into Applied Behaviour Analysis for Autism Spectrum Disorder*

Source: Researchers' Conceptualization based on Behaviourism Theory, Technology Acceptance Model (TAM), and Socio-Technical Systems Theory.

Socio-Technical Systems Theory

Socio-Technical Systems Theory explains the interaction between social systems and technological systems within organizations and societies. The theory argues that effective organizational performance and technological innovation can only be achieved when technological systems are properly aligned with human, social, cultural, and institutional factors (Trist & Bamforth, 1951). Socio-Technical Systems Theory emphasizes that technology should not function independently of social realities, human behaviour, institutional structures, and environmental conditions. The relevance of this theory to the present study lies in its recognition that the successful implementation of AI-assisted ABA interventions in Nigeria depends not only on the availability of technology but also on social acceptance, cultural beliefs, institutional readiness, policy support, professional competence, and infrastructural development. In Nigeria, socio-cultural misconceptions about autism, inadequate healthcare systems, shortage of specialists, poor electricity supply, and weak digital infrastructure may affect the implementation of AI-driven behavioural interventions. Therefore, the theory highlights the importance of integrating technological innovation with social, educational, cultural, and healthcare systems to ensure effective and sustainable autism intervention services.

Collectively, these theoretical frameworks provide a comprehensive explanation of how behavioural learning principles, technology adoption processes, and socio-technical interactions influence the integration of Artificial Intelligence into Applied Behaviour Analysis for Autism Spectrum Disorder in Nigeria. The frameworks further help in understanding both the opportunities and challenges associated with AI-assisted behavioural interventions within the Nigerian context.

4. METHODOLOGY

This study adopted a systematic literature review and narrative review design to examine the role of Artificial Intelligence (AI) in Applied Behaviour Analysis (ABA) for autism spectrum disorder (ASD) in Nigeria, with particular emphasis on opportunities, challenges, and future directions. The study relied exclusively on secondary sources of data obtained from peer-reviewed journal articles, textbooks, conference papers, policy documents, institutional reports, and reputable international databases relating to Artificial Intelligence, Applied Behaviour Analysis, Autism Spectrum Disorder, digital health, telehealth, and behavioural intervention technologies. Relevant literature was sourced from electronic databases including Google Scholar, PubMed, Scopus, ScienceDirect, ResearchGate, SpringerLink, and institutional publications from organizations such as the World Health Organization, United Nations Educational, Scientific and Cultural Organization (UNESCO), Centers for Disease Control (CDC), Organisation for Economic Co-operation and Development (OECD), and the World Bank.

5. LITERATURE REVIEW: GLOBAL TRENDS IN AI-ASSISTED ABA FOR ASD

Autism Spectrum Disorder (ASD) has become one of the fastest-growing neurodevelopmental disorders globally, with increasing prevalence rates among children and adolescents. The Centers for Disease Control and Prevention reported that approximately 1 in 31 children aged 8 years in the United States were diagnosed with ASD in 2022, compared to 1 in 150 children in 2000 (CDC, 2025). Similarly, the World Health Organization estimated that about 61.8 million people globally were living with autism in 2021 (WHO, 2023). This growing prevalence has increased global interest in technology-assisted interventions, particularly the integration of Artificial Intelligence (AI) into Applied Behaviour Analysis (ABA). AI technologies such as machine learning, robotics, computer vision, predictive analytics, wearable sensors, and natural language processing are increasingly being used for early diagnosis, behavioural monitoring, communication training, emotional recognition, and personalized intervention planning for children with ASD (Zhang et al., 2025; Tsapanou et al., 2025). AI-assisted systems improve the efficiency, accuracy, and adaptability of behavioural interventions by analysing large behavioural datasets and providing real-time feedback during therapy.

A major global trend in AI-assisted ABA involves the use of machine learning algorithms and socially assistive robots to support early autism screening, behavioural prediction, communication development, and social interaction among children with ASD. AI systems can analyse facial expressions, speech patterns, eye movements, and physiological responses to detect autism-related behaviours and improve intervention planning. Studies further indicate that children with autism often respond positively to predictable and repetitive interactions provided by AI-powered robots, thereby enhancing skill acquisition and behavioural engagement within ABA programmes (Alam et al., 2022). In addition, wearable technologies and sensor-based systems are increasingly used to monitor stress levels, emotional dysregulation, repetitive behaviours, sleep patterns, and behavioural escalation among children with ASD. These innovations have expanded the use of AI-assisted ABA in schools, clinics, rehabilitation centres, and home-based intervention programmes, particularly in developed countries.

Despite these global advancements, evidence from Africa and low- and middle-income countries remains limited. In Nigeria, ASD continues to be significantly underdiagnosed and poorly managed because of inadequate healthcare infrastructure, shortage of specialists, stigma, and poor awareness (Bakare & Munir, 2011). Indigenous studies reported prevalence estimates ranging from approximately 0.8% to 2.3% across different regions and clinical settings in Nigeria (Bakare et al., 2012; Lagunju et al., 2014). Research also indicates that many Nigerian communities still associate autism with supernatural causes, thereby contributing to stigma, delayed diagnosis, and poor access to intervention services (Igwe et al., 2010). Furthermore, poor digital infrastructure, unstable electricity supply, limited internet access, inadequate funding, and shortage of behavioural specialists continue to limit the adoption of AI-assisted ABA interventions in Nigeria. Nevertheless, growing digital transformation, mobile technology penetration, telehealth expansion, and increasing awareness of developmental disorders present important opportunities for integrating AI-assisted ABA into autism intervention services in the country.

Table 1. *Summary of Global Trends in AI-Assisted ABA for ASD*

S/N	Global Trend	Description	Key Statistics	Foreign Citations	Indigenous/Nigerian Relevance
1	Rising Global ASD Prevalence	Increasing global diagnosis of ASD has intensified demand for technology-assisted interventions.	1 in 31 children diagnosed with ASD in the U.S.; global estimate approximately 1 in 100 children.	CDC (2025); WHO (2023)	Nigeria estimates range between 0.8%–1.2% among children.
2	AI-Based Early Diagnosis	AI systems use facial recognition, eye tracking, and speech analysis for autism detection.	AI diagnostic systems report over 85% accuracy in detecting ASD patterns.	Abbas et al. (2024); Lord et al. (2020)	Early diagnosis remains limited due to shortage of specialists.
3	Automated Behavioural Monitoring	AI-assisted systems monitor repetitive behaviours and emotional responses.	Wearable technologies increasingly used in Europe and North America.	Alam et al. (2022); Zhang et al. (2025)	Most Nigerian centres still rely on manual observation methods.
4	AI-Assisted ABA Intervention	AI supports behaviour tracking and individualized intervention planning.	Research shows improved behavioural consistency and therapy outcomes.	Cooper et al. (2020); Tsapanou et al. (2025)	ABA services remain underdeveloped in Nigeria.
5	Robotics and Assistive Technologies	AI-powered robots support communication and social interaction.	Studies report improved social engagement among children with ASD.	Scassellati et al. (2018); Alam et al. (2022)	Robotics-assisted therapy is largely unavailable in Nigeria.
6	AI-Powered Educational Platforms	Adaptive learning systems personalize behavioural intervention.	AI learning platforms improve communication and participation.	Song et al. (2022); Topol (2019)	Digital learning platforms are gradually expanding in Nigeria.
7	Telehealth and Remote Therapy	AI-assisted telehealth supports remote ABA intervention.	Telehealth ABA services increased globally after COVID-19.	WHO (2023); Tsapanou et al. (2025)	Teletherapy may help address specialist shortages in rural Nigeria.
8	Data-Driven Decision Making	AI analyses behavioural datasets to improve intervention planning.	Machine learning improves behavioural prediction and personalization.	Russell & Norvig (2021); Abbas et al. (2024)	Nigeria faces challenges in digital behavioural record systems.
9	Ethical and Privacy Concerns	Concerns regarding child data privacy and AI ethics.	Global frameworks emphasize responsible AI use and child protection.	UNESCO (2021); WHO (2021)	Nigeria lacks comprehensive AI governance policies.
10	Infrastructure and Accessibility Challenges	Digital infrastructure influences AI adoption in healthcare.	AI adoption remains higher in developed countries.	OECD (2023); WHO (2023)	Poor electricity and internet access remain major barriers in Nigeria.

Source: Adapted from global and indigenous literature on Artificial Intelligence, Applied Behaviour Analysis, and autism spectrum disorder, including studies by Bakare and Munir (2011), Cooper et al. (2020), Alam et al. (2022), Abbas et al. (2024), Tsapanou et al. (2025), World Health Organization (2023), and the Centers for Disease Control and Prevention (CDC, 2025).

6. EMPIRICAL ANALYSIS OF AI-ASSISTED ABA FOR ASD

Empirical evidence on AI-assisted Applied Behaviour Analysis (ABA) for autism spectrum disorder (ASD) shows growing support for the use of machine learning, robotics, wearable sensors, computer vision, and adaptive digital platforms in improving autism assessment and intervention. Autism Spectrum Disorder (ASD) has become one of the fastest-growing neurodevelopmental disorders globally, with increasing

prevalence rates among children and adolescents. The Centers for Disease Control and Prevention reported that approximately 1 in 31 children aged 8 years in the United States were diagnosed with ASD in 2022, compared to 1 in 150 children in 2000 (CDC, 2025). Similarly, the World Health Organization estimated that about 61.8 million people globally were living with autism in 2021 (WHO, 2023). This growing prevalence has increased global interest in technology-assisted interventions, particularly the integration of Artificial Intelligence (AI) into Applied Behaviour Analysis (ABA). Likewise, Nigerian ASD Prevalence Estimates, range from 0.8% to 2.3% across Nigerian clinical studies, ASD is underdiagnosed but increasingly reported in Nigeria (Bakare et al. (2012); Lagunju et al. (2014).

Further evidence indicates (Zhang et al., 2025), that AI-assisted ABA is strongest in four areas: early screening, behavioural prediction, intervention personalization, and real-time monitoring. Machine-learning models reporting 80%–90% screening accuracy suggest that AI can help reduce delays in ASD identification. Likewise, ABA Treatment Prediction, Machine-learning models predicted ABA intervention goals with about 85% accuracy, AI can support individualized treatment planning, Perry et al. (2024). Robot-Assisted Intervention, Studies report measurable improvements in imitation, joint attention, and social engagement, Robots may enhance structured ABA-based learning, Scassellati et al. (2018); Alam et al. (2022). More so, Wearable Monitoring, Wearables track heart rate, movement, stress, sleep, and repetitive behaviours in real time, Supports data-driven ABA and early behaviour-risk detection, Cano et al. (2024). Similarly, prediction of ABA treatment goals at about 85% accuracy indicates that AI can assist therapists in selecting individualized behavioural targets (Tsapanou et al., 2025).

Table 2. *Empirical Evidence on AI-Assisted ABA for ASD*

S/N	Area of AI-Assisted ABA	Quantitative Evidence/Statistics	Interpretation	Citations
1	Global ASD Prevalence	ASD increased from 1 in 150 children in 2000 to 1 in 31 children in 2022 in the United States	Rising ASD prevalence increases demand for scalable AI-supported intervention	CDC (2025)
2	Global Autism Burden	Approximately 61.8 million people globally were living with autism in 2021	Autism is a major global developmental and public health concern	WHO (2023)
3	Nigerian ASD Prevalence	Estimates range from 0.8% to 2.3% across Nigerian clinical studies	ASD is underdiagnosed but increasingly reported in Nigeria	Bakare et al. (2012); Lagunju et al. (2014)
4	AI-Based Screening Accuracy	Some machine-learning ASD screening models report accuracy levels above 80%–90%	AI can support early identification but requires clinical validation	Abbas et al. (2024); Zhang et al. (2025)
5	ABA Treatment Prediction	Machine-learning models predicted ABA intervention goals with about 85% accuracy	AI can support individualized treatment planning	Perry et al. (2024)
6	Robot-Assisted Intervention	Studies report measurable improvements in imitation, joint attention, and social engagement	Robots may enhance structured ABA-based learning	Scassellati et al. (2018); Alam et al. (2022)
7	Wearable Monitoring	Wearables track heart rate, movement, stress, sleep, and repetitive behaviours in real time	Supports data-driven ABA and early behaviour-risk detection	Cano et al. (2024)

S/N	Area of AI-Assisted ABA	Quantitative Evidence/Statistics	Interpretation	Citations
8	Telehealth ABA	Telehealth-supported ABA increased after COVID-19 and improved access to remote intervention	Useful for underserved areas and specialist shortages	Tsapanou et al. (2025)
9	Nigeria Implementation Gap	Shortage of specialists, weak infrastructure, and low awareness limit access to ABA	AI may help bridge access gaps if adapted locally	Bakare & Munir (2011); Afolabi et al. (2024)

Source: Adapted from CDC (2025), WHO (2023), Bakare et al. (2012), Lagunju et al. (2014), Abbas et al. (2024), Perry et al. (2024), Alam et al. (2022), and Tsapanou et al. (2025).

7. AI APPLICATIONS IN ABA INTERVENTIONS AND OUTCOMES

1. Artificial Intelligence (AI) is increasingly transforming Applied Behaviour Analysis (ABA) interventions for children with autism spectrum disorder (ASD) by improving behavioural assessment, therapy personalization, communication training, and real-time monitoring. One major application of AI in ABA is early screening and behavioural assessment. AI-powered systems such as machine learning algorithms, facial recognition tools, and computer vision technologies can analyse speech patterns, eye movements, facial expressions, and repetitive behaviours to identify autism-related characteristics at early developmental stages. This improves the speed and accuracy of diagnosis and enables earlier behavioural intervention, which is critical for improving developmental outcomes among children with ASD (Abbas et al., 2024).
2. Another important application is automated behavioural monitoring and data collection. Traditional ABA relies heavily on manual observation and recording of behaviours, which can be time-consuming and prone to human error. AI-assisted systems can automatically track behavioural patterns, reinforcement responses, emotional changes, attention span, and repetitive behaviours in real time through wearable sensors, mobile applications, and intelligent monitoring devices. This enhances the precision of behavioural assessment and helps therapists make data-driven intervention decisions.
3. AI also supports personalized intervention planning by analysing behavioural data and recommending individualized treatment goals, reinforcement strategies, and learning activities based on the child's behavioural profile and progress patterns.

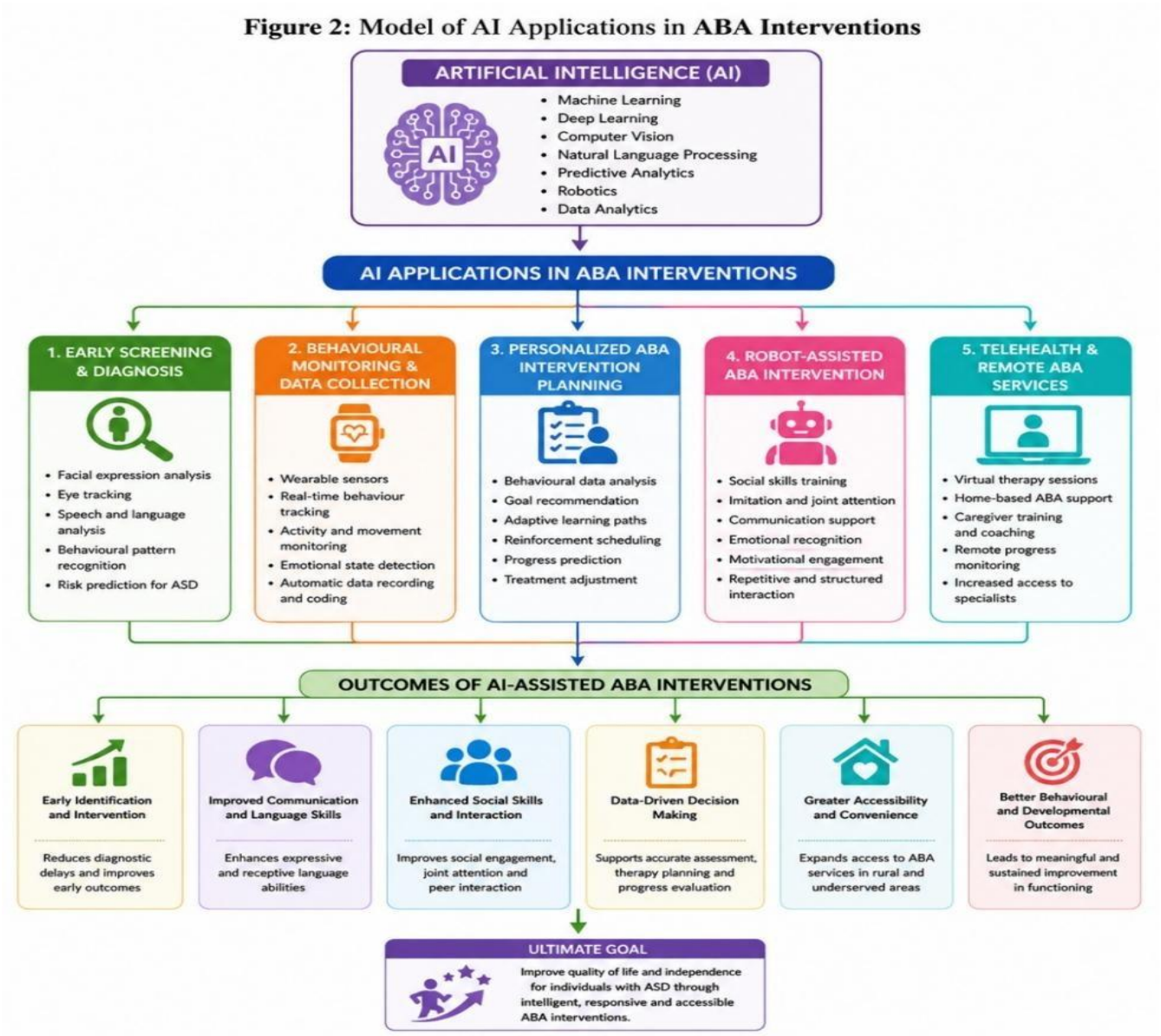


Figure 2. *Model of AI Applications in ABA Interventions*

Source: Researchers' Conceptualization based on literature from Alam et al. (2022), Abbas et al. (2024), Tsapanou et al. (2025), and Cooper et al. (2020).

4. AI applications are also evident in robot-assisted therapy and adaptive learning systems. Socially assistive robots are increasingly used to improve communication skills, joint attention, imitation, emotional recognition, and social interaction among children with ASD. Many children with autism respond positively to predictable and repetitive interactions provided by AI-powered robots, thereby enhancing behavioural engagement within ABA programmes (Alam et al., 2022). Similarly, AI-supported educational platforms and virtual learning environments provide adaptive learning experiences tailored to the cognitive and behavioural needs of each child. These systems promote skill acquisition, communication development, and independent learning through structured reinforcement and interactive activities.
5. Furthermore, AI-assisted telehealth and remote ABA intervention have expanded access to behavioural therapy, especially in underserved and rural areas. Through mobile technologies, video conferencing platforms, and AI-enabled therapy applications, caregivers and therapists can deliver home-based interventions, monitor progress remotely, and provide real-time behavioural support. This is particularly relevant in Nigeria, where shortages of behavioural specialists, poor access to autism centres, and limited mental health infrastructure restrict access to evidence-based interventions. However, despite these opportunities, challenges such as poor digital infrastructure, unstable electricity supply, limited technological expertise, ethical concerns, and high technology costs

continue to hinder the effective implementation of AI-assisted ABA interventions in many developing countries. Overall, global evidence suggests that AI has substantial potential to complement ABA interventions by improving efficiency, accessibility, personalization, and data-driven behavioural support for children with ASD.

8. OPPORTUNITIES OF AI IN ABA FOR ASD IN NIGERIA

There are various opportunities of using Artificial Intelligence (AI) in Applied Behaviour Analysis (ABA) for children with autism spectrum disorder (ASD). First and foremost, the use of AI can lead to improvement in the early diagnosis and screening of ASD. This new technology can allow early identification of autism spectrum disorder through speech analysis, facial recognition, eye-tracking technology, and behavioral assessment. Therefore, early screening and diagnosis can help in reducing the harm caused to children with ASD and ensure that they receive the necessary intervention and support. Secondly, there is an opportunity to increase access to ABA services across Nigeria. Using AI-assisted telehealth, applications, and virtual platforms can play a critical role in providing behavioral treatment services to individuals with ASD. These technological platforms can help provide intervention to more people who are unable to access traditional treatment options because of their location. As a result, children with ASD can access behavioral intervention services from rural and remote areas just like those in urban centers. In addition, the use of AI technology can help in individualizing intervention. Artificial intelligence can be used to provide recommendations and treatment options based on the needs of the child with ASD. This approach can be beneficial to children with ASD since it takes into account their social communication, emotional, and behavioral needs. As such, it allows for a treatment plan that is designed according to the needs of each individual with ASD.

9. CHALLENGES OF AI IN ABA FOR ASD IN NIGERIA

Artificial Intelligence (AI) in Applied behaviour analysis (ABA) for autism spectrum disorder (ASD) in Nigeria has several opportunities and challenges. The main opportunities include improved early diagnosis, increased access to treatment, the establishment of effective intervention plans, and improved monitoring of behaviour in ASD individuals. However, various challenges hinder the process of adopting artificial intelligence in ABA for ASD in Nigeria. Some of the challenges which may hinder the opportunities include poor digital infrastructure, a shortage of skilled professionals, high costs of implementing technology, and cultural beliefs and stigma surrounding ASD.

Poor digital infrastructure is one of the major challenges for using AI in ABA for ASD in Nigeria. Although AI has the potential to increase the early detection of ASD in children through speech pattern recognition, face, eye, and behaviour analysis tools and computer-aided diagnosis systems, such tools and systems require proper digital infrastructure to operate efficiently (Afolabi et al., 2024). However, there are inconsistencies in the provision of electricity, internet services, and digital connectivity in Nigeria, especially in the rural areas. Therefore, the opportunities for AI, including telehealth, online therapy, and monitoring and assessment through mobile applications, have been limited by the lack of proper power and digital technology. Poor digital infrastructure is closely connected to the shortage of skilled professionals. Although developing and adopting AI tools for early detection, treatment, and monitoring of ASD patients can provide more opportunities for increasing early intervention, it also creates the need to have skilled professionals who understand both behaviour analysis and information technology to operate and interpret the results of such devices and systems. For instance, AI can help develop individual intervention plans for patients with ASD based on an individual's behaviour and cognitive patterns. However, creating an intervention plan requires trained professionals such as speech pathologists, behavioural therapists, psychologists, and special education teachers (Afolabi et al., 2024). Therefore, the scarcity of professionals who understand information technology and behaviour analysis and have had training in ABA strategies presents a major challenge in adopting AI in ABA for ASD in Nigeria.

The high cost of technology development and adoption is also a significant challenge in using AI for ABA in ASD in Nigeria. Although AI has the potential to provide effective intervention and monitoring plans for individuals with ASD, such opportunities come at a high cost. Some of the most advanced technological tools used in detecting, treating, and monitoring ASD patients include socially assistive robots, sensors, mobile apps, computer systems, and other wearable technologies. Such tools and systems are usually expensive and may not be affordable to most average-income families in Nigeria. Additionally, the adoption of such systems and tools comes with maintenance costs, making them even more costly to use. Although AI can provide an opportunity for creating a more personalized treatment and monitoring system for ASD patients in Nigeria, such an advantage may be unavailable to most Nigerians due to the unavailability of funding and resources.

Another opportunity for using AI and robotics in ABA for ASD in Nigeria is increasing access to services and resources through telehealth, phone applications, and online systems. The main challenge that hinders the opportunity of using technology to increase access to ABA services includes the poor level of knowledge about ASD and low levels of technology literacy and savviness within the community in Nigeria. Lack of knowledge about ASD and low levels of technology literacy hinder the opportunity of using AI to deliver telehealth services and phone applications to create awareness and make ABA services accessible to more people in Nigeria. For instance, caregivers and family members of ASD patients need to have a proper understanding of ASD and how they can use technology to cope with their condition. However, studies indicate that the majority of community members in Nigeria have little knowledge about ASD and low levels of literacy about technology (Bakare & Munir, 2011). Therefore, the opportunities afforded by AI in increasing access to ABA and telehealth services are limited by the level of knowledge about ASD and technology among the caregivers.

In addition to the lack of knowledge about ASD and technology, negative attitudes towards ASD present another major challenge in adopting AI in ABA treatment, services, and monitoring system in Nigeria. Even with the advancement and availability of early screening and detection tools in ABA, cultural beliefs about ASD contribute to creating an impediment in the early intervention process. Although there has been an improvement in the level of awareness and understanding of ASD in Nigeria, some communities tend to attribute ASD to supernatural causes such as magic, curses, and spirit possession by evil spirits (Igwe et al., 2010). Such beliefs about ASD can lead to negative attitudes towards ASD that may increase stigma against the individuals and hinder early screening and detection of ASD. Negative attitude towards ASD can also make society reluctant to adopt new methods of managing, treating, and monitoring ASD, thus creating a barrier to adopting AI in ABA in Nigeria.

Table 3. *Challenges of AI in ABA for ASD in Nigeria*

S/N	Challenges	Brief Description	Implications for ASD Intervention	Citations
1	Poor Digital Infrastructure	Unstable electricity supply, poor internet connectivity, and inadequate digital healthcare systems limit AI implementation.	Reduces the effectiveness of telehealth, remote ABA, and AI-powered monitoring systems.	Afolabi et al. (2024)
2	Shortage of Skilled Professionals	Nigeria has a limited numbers of ABA therapists, AI specialists, speech pathologists, and developmental experts.	Limits adoption, supervision, and effective utilization of AI-assisted ABA systems.	Bakare & Munir (2011)
3	High Cost of AI Technologies	AI-powered devices, robotics, wearable sensors, and adaptive software are expensive.	Makes AI-assisted intervention inaccessible to many families and institutions.	OECD (2023)
4	Limited Awareness and Digital Literacy	Many caregivers and educators have low awareness of autism and limited technological skills.	Reduces effective use of AI-assisted intervention tools and platforms.	Bakare & Munir (2011)
5	Cultural Beliefs and Stigma	Autism is still associated with curses, witchcraft, or spiritual attacks in some communities.	Leads to delayed diagnosis, discrimination, and resistance to evidence-based intervention.	Igwe et al. (2010); Bakare & Munir (2011)
6	Ethical and Privacy Concerns	AI systems collect sensitive behavioural and personal data from children with ASD.	Raises concerns about confidentiality, consent, data protection, and misuse of information.	UNESCO (2021); WHO (2021)

S/N	Challenges	Brief Description	Implications for ASD Intervention	Citations
7	Weak Policy and Institutional Support	Nigeria lacks comprehensive autism policies and AI governance frameworks for behavioural healthcare.	Slows implementation and funding of AI-assisted ABA programmes.	Afolabi et al. (2024)
8	Limited Indigenous Research	Most AI-assisted ABA studies are conducted in Western countries with limited African evidence.	Imported AI systems may not fit Nigerian cultural and healthcare realities.	Franz et al. (2017)
9	Resistance to Technology Adoption	Some therapists, caregivers, and educators may distrust AI technologies.	Slows integration of AI into traditional ABA intervention systems.	Davis (1989)
10	Inequality in Access to Technology	Urban communities have greater access to digital infrastructure than rural areas.	Creates disparities in access to AI-assisted autism intervention services.	World Bank (2023)

Source: Adapted from Bakare and Munir (2011), Igwe et al. (2010), Franz et al. (2017), WHO (2021), UNESCO (2021), OECD (2023), World Bank (2023), and Afolabi et al. (2024).

Besides the discussed threats to the implementation of ABA, ethical and privacy concerns are integral to the use of AI in the treatment of patients. Since artificial intelligence is used to analyze data pertaining to sensitive topics, ethical issues such as data security, confidentiality, and even manipulation are likely to arise and hinder the process. The situation may also trigger mistrust in the system, reducing its general acceptance and credibility, especially in the absence of robust legal protection and control mechanisms. On the contrary, ethical considerations could help increase the trust level of the stakeholders in AI-run programs, thus promoting higher rates of adoption and compliance.

In tandem with the ethical issues surrounding the use of AI in treating ASD, the lack of policies or institutional support is another underlying weakness. Inadequate national policies, guidelines, laws, and strategies on autism spectrum disorder hinder the widespread adoption and effective use of emerging technologies such as AI in behavioral treatment. Lack of investment and interest from the relevant authorities coupled with the absence of funding to support the implementation of AI-assisted ABA programs in various setups impedes the development and proper application of the technology in mental health care.

Another issue posed by the application of AI in ABA is the lack of local evidence or research to support its adoption. Most, if not all information on the application of artificial intelligence in behavioral treatment of ASD comes from foreign sources. Therefore, applying such technology in a different setting such as Nigeria can be questioned due to differences in environmental, cultural, and institutional factors among countries. This weakness is detrimental to the integration process since it may cause skepticism among the stakeholders thus slowing down the process. However, conducting more research to add to the existing evidence would facilitate the effective and efficient incorporation of AI technology into the existing system.

In addition to the above-mentioned weaknesses, resistance to the use of technology is a major hindrance to the implementation of AI-assisted ABA programs. The idea that AI may undermine their job security or reduce patients' trust in them may trigger some caregivers, parents, or professionals to oppose the process. The lack of appropriate skills or knowledge regarding the use of AI technology or general reluctance toward the use of technology in healthcare may also impede the adoption of the technology in the treatment. The weakness is explicable considering the lack of relevant education, policies, and research as mentioned above, which makes the new concept unappealing to some stakeholders. Nevertheless, if appropriately regulated and educated, caregivers can utilize the artificial intelligence to offer better care to patients with ASD.

The last but not least weakness of AI-assisted ABA is the issue of inequality and accessibility. The ability of parents or caregivers to provide the best care to their children depends on their financial status, meaning that those in a lower bracket are less likely to use the new technology. Moreover, such technology requires reliable internet, which is a problem in some rural areas, limiting the ability of caregivers to access it. Therefore, even if AI-assisted ABA is incorporated into the system, the majority of the people will be unable to take full advantage of it due to the aforementioned factors, which will then increase inequalities in terms of access to care.

It could be asserted that the integration of artificial intelligence into ABA services for patients with ASD is not easily achievable in the Nigerian context considering the current state of affairs. Although the use of such technology has multiple advantages, including ease of access and enhanced privacy, the presence of several weaknesses is detrimental to its efficient and effective implementation. Indeed, numerous issues must be addressed for successful AI-assisted ABA in Nigeria, ranging from legal protection and proper education to improved accessibility and equality.

10. CONCLUSION AND RECOMMENDATIONS

The use of Artificial Intelligence (AI) in Applied Behaviour Analysis (ABA) is a significant innovation that has the potential to transform intervention services for children with autism spectrum disorder (ASD) in Nigeria. The capabilities of AI such as machine learning, robot-assisted interventions, wearable devices, predictive analytics, adaptive learning modules, telehealth, and telemedicine can be leveraged to enhance early diagnosis, individualized intervention plans, behaviour monitoring, communication training, social-skills development, and access to autism-specific services. However, there are several challenges associated with implementing AI-assisted interventions such as poor digital infrastructure, insufficient internet connection, lack of electricity, inadequate professionals, high cost, cultural beliefs about ASD, ethical issues, and limited indigenous research. Therefore, the best way of utilizing the power of AI to intervene in the behaviours of children with ASD is to implement it alongside existing professional procedures. Thus, this section highlights several recommendations and directions for future research on the use of AI in ABA for children with ASD in Nigeria.

Firstly, the Nigerian government should develop policies and regulations for ethical and responsible AI use in autism intervention and treatment. Policies such as data privacy and protection, and the child's right to confidentiality should be considered when developing the regulatory framework for implementing AI-assisted intervention services for children with ASD. Additionally, the government needs to invest in digital infrastructure such as reliable internet and electricity, telehealth and telemedicine networks, and other related digital infrastructural needs to support the seamless delivery of AI-assisted intervention services to children with ASD.

Secondly, universities, professional associations, and other relevant institutions need to ensure they continually offer programs and workshops on ABA, developmental disorders, digital psychology, telehealth, and telemedicine, and AI-assisted intervention methods. Also, institutions can organize training and continuous medical education for psychologists, therapists, teachers, and speech pathologists on the best ways of intervening in the behaviours of children with ASD using ABA and emerging technologies. Another important recommendation is raising public awareness about ASD and the significance of embracing evidence-based, ethical, and responsible methods such as ABA therapy and telehealth services to intervene with children with ASD. Lastly, policymakers should promote inter-professional collaborations between health professionals, telehealth and telemedicine companies, autism intervention agencies and advocacy groups, educational institutions, private and public sectors, and local government to ensure successful implementation of AI-assisted intervention services for children with ASD in Nigeria.

11. FUTURE RESEARCH DIRECTIONS

Further experimental and conceptual studies are needed to investigate the effectiveness of implementing AI-assisted interventions for children with ASD in Nigerian and African settings. Future researchers could replicate the current study to generate substantive evidence on the effectiveness of using AI in ABA for children with ASD in Nigeria and other African countries. Experimental studies should be conducted to generate empirical evidence on the effectiveness of specific AI-assisted interventions such as robot-assisted interventions, predictive analytics, and telehealth services in intervening in the behaviours of children with ASD. More research is needed to examine the impact of using these innovative intervention methods on the cognitive, behavioural, communicative, social, and educational skills of children with ASD.

Another area that future researchers could explore is developing culturally relevant and appropriate AI-assisted interventions for children with ASD. Most AI-assisted interventions have been developed and trialled in western countries; therefore, there is a need for more studies to adapt these methods to suit the linguistic, cultural, educational, communicative, and familial heritages of Nigeria. Comparative studies also need to be conducted to generate evidence on the relative cost-effectiveness of AI-assisted interventions compared to conventional methods of intervening in the behaviours of children with ASD. Lastly, future researchers could investigate the acceptability of AI-assisted interventions among caregivers of children with ASD, health professionals, and policymakers. Studies could also be designed to investigate the ethical implications of using

AI-assisted interventions and factors that predict their widespread adoption and implementation in autism intervention settings in Nigeria.

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