EFFECT OF APPLIED BEHAVIOUR ANALYSIS ON SOCIAL SKILLS AND ACADEMIC ACHIEVEMENT OF PUPILS WITH AUTISM SPECTRUM DISORDER

Dorothy Ebere Adimora[1],Friday Mamudu Adene[2],
Monica Obiageli Omeje[3] , Juliana Ngozi Ejiofor[4*],
Edmund Eberechukwu Offordile[5]

[1,2,4,5]Department of Educational Foundations, Faculty of Education, University of Nigeria,Nsukka, Nigeria,*Email: ebere.adimora@unn.edu.ngNsukka. Post code- 410001- Nigeria*

[3]Department of Arts Education,Faculty of Education, University of Nigeria, Nsukka, Nigeria
Email: monica.omeje@unn.edu.ng,Nsukka. Post code-410001- Nigeria
Corresponding author: Juliana Ngozi Ejiofor: juliana.ejiofor@unn.edu.ng

Abstract
Objectives: *Autism is a chronic neurodevelopmental disorder. The study investigated the prevalence of autism spectrum disorder (ASD) amongst primary school pupils in Enugu State, Nigeria.*
Design: *Pretest-Posttest non-equivalent control group design, with the experimental group adopting applied behaviour analysis (ABA) intervention and the control group using conventional method.*
Materials and Methods: *Two research questions and two null hypotheses guided the study. The population comprised all the pupils identified with ASD in Enugu State, Nigeria. The sample comprises 36 pupils identified with ASD in schools used. The instruments were observation schedule, semi-structured interview schedule and 4- point Likert-type questionnaire administered to elicit information on pupils' social skills while their academic achievement test scores were used to ascertain their academic achievement. Research questions were analysed using mean and standard deviation while the hypotheses were tested using analysis of covariance (ANCOVA) statistic at 0.05 probability level.*
Results: *The results showed that exposing pupils with ASD to ABA intervention boosted their social skills and academic achievement scores. Parents of children exposed to intensive ABA, report greater reductions in daily stress than parents of children with other treatments.*
Conclusions: *exposing pupils with ASD to ABA is efficacious in enhancing their social skills and academic achievement.*
Keywords: *Autism, Behaviour Analysis, Social Skills and Academic Achievement.*

1.1 Introduction

Every parent looks forward to having a baby, a healthy one for that matter, a baby who is normal, attractive, graceful, smart, energetic, and loving, but some parents though not by their choice are gifted with children with one form of disorder or another. Unfortunately, such parents may feel disappointed and resentful. Some can cope with such a situation while others cannot. The presence of children with autism spectrum disorder and every other disorder in the family is a challenge for parents and family members, likewise to the teacher in the classroom. Autism spectrum disorder (ASD) is a reality in every society, and the problems associated with it are quite enormous.

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impaired social interactions, communication deficits, and patterns of restricted or repetitive behaviours [1]. Autism is a complex developmental disability also called Pervasive Developmental Disorders (PDD). A category of neurological disorders that is characterized by severe and pervasive impairment in many areas of development [2]. Autism, as a spectrum disorder, means that the symptoms and characteristics can manifest in a wide variety of combinations, from mild to severe [2]. Their presence in the classroom has been a challenging task for teachers, as the teachers juggle many tasks when trying to modify activities and lessons, to meet the diverse needs of pupils. This disorder typically appears during the first three years of life and is the result of "a neurological disorder that affects the normal functioning of the brain", impacting development [3].

ASD has been described by some experts as a condition that affects social interaction, communication, interests and behaviour. People with autism often find social interaction difficult. They also have problems with verbal and non-verbal communication and demonstrate restrictive and repetitive behaviour and have a limited set of interests and activities [4]. An atypical eating behaviour occurs in about three-quarters of children with the disorder. Sleep problems occur in about two-thirds of them such as difficulty in falling asleep, frequent nocturnal awakenings, and early morning awakenings [5]. Autism interferes with reasoning, social interaction, and communication skills which are the basic development of the brain. Although autism is explained by a particular set of behaviours, children can exhibit any combination of these behaviours with varying degrees of severity. The key features of ASD typically start to develop in childhood [6]. As reported in [4] notes that the level of intellectual functioning extremely varies in persons with ASD, which ranges from profound impairment to superior non-verbal cognitive skills. Thus, the identification of an autism spectrum disorder according to WHO is difficult before the age of 12 months but possible at two years old [4]. Furthermore, [4] explained that 50 percent of persons who have ASD also suffer from an intellectual disability.

In fact, there is no known medical cure for ASD rather a broad range of treatments including education and behaviour support could help people with the condition. On what parents can do to help their child with autism, a WHO document noted that parents can contribute to ensuring access to health services and education, offer affection and care [5]. Nevertheless, the rate of autism disorder in Nigeria is not clear, but Promoting education on management of autism. [7] estimates that over 1 million people in Nigeria live with autism. Indeed, autism affects "girls and boys of all races and in all geographic regions and has an enormous impact on children, their families", teachers, communities and societies [5].

However, in Nigeria, ASD affects all races, ethnic groups and socioeconomic levels, many children are suffering from Autism, and much need to be done to improve the basic needs of children with ASD in Nigeria. Many of them are isolated, maltreated and discriminated. Though the significant percentage of people involved in these acts do not have the knowledge of autism, and besides, they nurse the illusion that every human being must conform to conventional behaviour [5]. Characteristic features of the onset include the delay in the development or temporary regression in language, social skills and repetitive stereotyped patterns of behaviour [5]. Individuals with ASD experience social impairments such as a lack of shared enjoyment, trouble with perspective taking, difficulty maintaining or initiating social interactions, or lack of or inappropriate use of nonverbal body language. [7] stipulated that many individuals with ASDs lack social interest and fail to comprehend social nuances. Also, they often exhibit little social initiation, as well as reduced social responsiveness. Other impairments such as social play, restricted or rigid interests and impaired communication skills could limit opportunities to establish positive and long-lasting

social relationships with others. These deficits in social skills make interacting with peers more difficult for individuals with ASD [8].

According to [9], social skill is "a set of competencies that (a) allow an individual to initiate and maintain positive social relationships, (b) contribute to peer acceptance and satisfactory school adjustment, (c) allow an individual to cope effectively with the larger social environment". Social skills can also be explained in the context of social and emotional learning - recognizing and managing emotions, developing care and concern for others, establishing positive relationships, making responsible decisions, and handling challenging situations constructively and ethically [10].

Good social skills are critical to successful functioning in life. These skills enable one to know what to say, how to make good choices, and how to behave in diverse situations. The extent to which children and adolescents possess good social skills can influence their academic performance, behaviour, social and family relationships, and involvement in extracurricular activities. Social skills are also linked to the quality of the school environment and school safety [11]. Students with good social skills seem to have the ability to make social choices that strengthen their interpersonal relationships and facilitate success in school, experience positive and safe school environment, child resilience in the face of future crises or other stressful life events, they seek appropriate and safe avenues for aggression and frustration.

Students with poor social skills have been shown to experience difficulties in interpersonal relationships with parents, teachers, and peers; evoke highly negative responses from others which lead to high levels of peer rejection [11]. According to [7] social skill impairments include impairments in making social initiations, responding to social overtures, and demonstrating social comprehension (i.e., behaving appropriately in circumstances that require complex or multicomponent initiations and responses). Impairments in these fundamental skills limit the success of social integration and can negatively affect how an individual interacts with others in their environment.

In a classroom environment, autistic children strive for successful learning which requires them to interact closely with teachers and peers. In addition to their general importance for daily interaction, as these autistic children seem to lack social skills, it can have a big impact on their ability to succeed in an academic setting. The classroom becomes both a training ground for the development of social skills and an arena in which those skills are put to use to help autistic children improve socially and academically. Autism has been found to adversely affect students' educational performance, achievement and social activity at home, school, and community settings. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences. Students with autism vary widely in abilities, intelligence, and behaviours [12]. It was further revealed that students with autism experience family issues; poor academic preparedness, for example, lack of time management, poor organization and lack of study skills: reading, writing, math and research activities; unfavourable classroom or campus climate; inadequate commitment to educational goals and the institution especially as regards the role of the university vision and mission in meeting the student academic and social goals; issue of social and academic integration of students with developmental and learning disabilities [12].

Academic achievement, however, is the outcome of education- the extent to which a student, teacher or institution has achieved their educational goals. Academic achievement is commonly measured by examinations or continuous assessment [13]. Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished

specific goals that were the focus of activities in instructional environments, specifically in school, college, and university [14]. In a typical school in Nigeria, autistic children face a scaring challenge early in life. They are labelled with derogatory names by parents, teachers and their peers. Autism is easily taken for something else as these children are perceived as academically backward, 'possessed' by evil spirits or suffering from some parental neglect and other negative experiences. They could even be flogged if the teacher gets nervous by their slowness. Parents also experience challenges of rejection from school to school of their 'slow' child and sometimes lack of empathy from authorities and other caregivers and teachers. As a result of these problems, teachers seem to have difficulty in teaching them together with other pupils in class.

Amidst these challenges, there is evidence that early identification and intervention such as Applied Behaviour Analysis (ABA) has the propensity of helping individuals with autism overcome many of the symptoms and lead a productive and fruitful life. ABA is the scientific study of behaviour and the application of the principles of learning and motivation from ABA, and procedures and technology derived from those principles, to the solution of problems of social significance. ABA is the process of systematically applying interventions based on the principles of learning theory to improve socially significant behaviours such as in reading, academics, social skills, communication, and adaptive living skills to a meaningful degree, and to demonstrate that the interventions employed are responsible for the improvement in behaviour [15]; [16]. Adaptive living skills include gross and fine motor skills, eating and food preparation, toileting, dressing, personal self-care, domestic skills, time and punctuality, money and value, home and community orientation, and work skills.

ABA was explained by [17] as the design, implementation, and evaluation of environmental modifications to produce socially significant improvement in human behaviour. ABA includes the use of direct observation, measurement, and functional analysis of the relations between environment and behaviour. ABA uses antecedent stimuli and consequences, based on the findings of descriptive and functional analysis, to produce practical change." This definition places emphasis on socially significant changes, but ABA can be used to alter virtually any behaviour irrespective of its social relevance. ABA is just as much about maintaining and using skills as about learning. It may seem odd to use the word "behaviour" when talking about learning to talk, play, and live as a complex social animal, but to a behaviourist, all these can be taught, so long as there are intact brain functions to learn and practice the skills. That is the essence of the recovery hypothesis--for many children, the excesses and deficits of autism result mainly from a learning 'blockage,' which can be overcome by intensive teaching.

ABA methods are used to support persons with autism in at least six ways: -to increase behaviours (e.g., reinforcement procedures increase on -task behaviour, or social interactions); -to teach new skills (e.g., systematic instruction and reinforcement procedures teach functional life skills, communication skills, or social skills) -to maintain behaviours (e.g., teaching self-control and self-monitoring procedures to maintain and generalize job-related social skills). -to generalize or to transfer behaviour from one situation or response to another (e.g., from completing assignments in the resource room to performing as well in the mainstream classroom). -to restrict or narrow conditions under which interfering behaviours occur (e.g., modifying the learning environment); and to reduce interfering behaviours such as self-injury or stereotype [17].

According to [17], the first step in ABA is to analyze the behaviour. This is done using the ABC model: A - Antecedent - a directive or request for the child to perform an action. B– Behaviour- behaviour, or response from the child - successful performance, noncompliance, or no response. C - Consequence - a reaction from the therapist, which can

range from strong positive reinforcement (i.e,. a special treat, verbal praise) to a strong negative response, "No!"

Furthermore, Morris enumerated eight techniques to be used in Applied Behaviour Analysis as -Task Analysis: Task analysis is a process in which a task is analyzed into its parts so that those parts can be taught through the use of chaining: forward chaining, backward chaining and overall task presentation. –Chaining: The skill to be learned is broken down into smallest units for easy learning. For example, a child learning to brush teeth independently may start with learning to unscrew the toothpaste cap. Once the child has learned this, the next step may be squeezing the tube, and so on.

- **Prompting:** The parent or therapist provides assistance to encourage the desired response from the child. The aim is to use the least intrusive prompt possible that will still lead to the desired response. -Fading: The overall goal is for a child to eventually not need prompts. This is why the least intrusive prompts are used, so the child does not become overly dependent on them when learning a new behaviour or skill. Prompts are gradually faded out as new behaviour is learned.

- **Shaping:** Shaping involves gradually modifying the existing behaviour of a child into the desired behaviour. For instance, a young boy who only engages with the pet dog by hitting it.

- **Differential reinforcement**: Reinforcement provides a response to a child's behaviour that will most likely increase that behaviour. It is "differential" because the level of reinforcement varies depending on the child's response. Difficult tasks may be reinforced heavily whereas easy tasks may be reinforced less heavily.

–**Generalization:** Once a skill is learned in a controlled environment (usually table-time), the skill is taught in more general settings. *Video modelling*: One teaching technique found to be effective with some students, particularly children, is the use of video modelling (the use of taped sequences as exemplars of behaviour). It can be used by therapists to assist in the acquisition of both verbal and motor responses, in some cases for long chains of behaviour.

However, there is a growing awareness and increasing the prevalence of autism in the western world and some parts of Africa, but to the best of the researcher's knowledge, there seem to be fewer efforts in Nigeria to embark on the campaign for autism awareness. In the present time, there has been virtually no awareness or sensitization to recognize neuropsychological disorders in pupils/students at any level of the country's educational system." Research reveals that the level of preparedness of Nigerian teachers to cater for the educational and social needs of these children is poor [18]. It therefore, becomes imperative to strategize so as to proffer solution to this burning issue.

1.2 Statement of the Problems/Justification

Regrettably, it is difficult to give specialized attention to those who have impaired communication, social interaction and imaginative functions with no obvious physical disability as is the case in autism, which is the subject of this research. Furthermore, in Enugu State, Nigeria, there is a dearth of data with which to canvass for assistance for autism, due to lack of awareness amongst teachers, researchers and even health personnel. There is no active surveillance as in other parts of the world where significant efforts and funds are being invested in funding research on autism.

To the best of our knowledge, intervention measure such as ABA on autistic children has not been empirically ascertained in Nigeria, specifically Enugu State of Nigeria. On that note, the effect of ABA on social skills and academic achievement of children with ASD is still in

doubt and calls for urgent research attention. Against this background, therefore, the researchers set to ascertain the effect of ABA on social skills and academic achievement of pupils with ASD in Nsukka, Enugu State, Nigeria.

In this area, there seem to exist a good number of pupils with autism and the teachers, parents and peers appear to lack the knowledge of the pupils' problem and how to intervene to ameliorate the problem. The problem which arose from this study, therefore, is; what is the effect of ABA on social skills and academic achievement of primary school pupils with ASD in Enugu State, Nigeria?

The following research questions guided the study:

1. What is the effect of ABA on the pretest-posttest mean social skills scores of pupils with ASD?

2. What are the pretest-posttest mean achievement scores of pupils with ASD exposed to ABA?

2.1 Method

Autism is a chronic neuro-developmental disorder. The researchers adopted a quasi-experimental design in investigating the prevalence of ASD amongst primary school pupils in Enugu State, Nigeria. The specific design for this study is pretest-posttest non-equivalent control group design, with the experimental group adopting ABA intervention and the control group using the conventional method. Intact classes were used in order not to disrupt the regular classroom arrangement since the study lasted for six weeks. The researchers obtained approval from State Primary School Education Authority for the study protocol for a preliminary survey to identify pupils with ASD and for the pretest-posttest treatment intervention.

The study was carried out in Nsukka East, Nsukka West and Nsukka Central Education Authority in Enugu state, Nigeria. The population comprised all primary school pupils identified with autism in Nsukka, Enugu State, Nigeria. The instrument for data collection was an observation schedule, a semi-structured interview schedule self-report questionnaire and treatment package. The instruments were subjected to field trial to ensure suitability in achieving the expected objectives. They were modified accordingly based on data generated through field trial. A self-administered pre-tested questionnaire was used to get information on socio- demographic data and knowledge of autism while a modified checklist was employed by the researchers and the trained research assistants to screen pupils in the class for trait(s) of ASD. The academic performance of these pupils with autistic traits was assessed using their previous results in the past one year from the school head teachers' records. With regards to pretest-posttest, observation, interview schedule and a questionnaire on a four-point Likert-type format were administered to elicit information on pupils' social skills. Also, a well-developed treatment package on ABA intervention was used to train the identified autistic pupils and afterward, their post-test result was compared with their pre-test mean score to determine their academic achievement test was administered to ascertain their academic achievement for pretest-posttest results.

2.2 Treatment Procedure

Before the commencement of the training, the researchers sought the co-operation of the headmasters/headmistresses of the schools involved to enable them to build their research programme into the school schedule without disrupting the school programme. The researchers explained the purpose of the study and the benefits that could be derived if

properly conducted. This, however, helped the researchers to obtain the co-operation of the principals of the schools throughout the period of the study. The headmasters/headmistresses later introduced the researchers to the teachers who were trained to assist in the experimental study. The researchers familiarized themselves with all the teachers used for the study and trained them on the techniques involved in ABA and how to use it to boost autistic children's social skills and academic achievement. The objectives were to ensure that those teachers who served as research assistants acquired the necessary competencies for implementing the programme. The researchers administered the treatment by themselves because the treatment needed an expert touch. However, the researchers collaborated with the class teachers in the execution of the treatment programmes in the intact classes of the schools assigned experimental and control schools. The parents/caregivers of the pupils involved in the study were informed and co-opted in the treatment since they also help in administering the treatment at home. Two weeks before the commencement of the training, the researchers and the teachers for the experimental group used the prepared ABA therapy to administer to the autistic pupils in the experimental group. These techniques include task analysis, chaining, prompting, fading, shaping, differential reinforcement, generalization and video modelling. During the actual treatment, both those in the experimental and control groups were taught the selected passages in their regular class setting. By this time, those in the experimental group received instruction in the skills involved in ABA while those in the control group were engaged in their conventional classroom. The researchers and teachers administered the ABA intervention to these pupils with ASD in a period of 25hours in a week. In administering the Applied Behaviour therapy, researchers and the teachers in the experimental group used the laid down rules logically on the autistic pupils. All these were done by taking these pupils through the following methods such as:

-**Task Analysis**: Task analysis is a process in which a task is analyzed into its parts so that those parts can be taught through the use of chaining: forward chaining, backward chaining and total task presentation.

-**Chaining:** The skill to be learned is broken down into the smallest units for easy learning. For example, a child learning to brush teeth independently may start with learning to unscrew the toothpaste cap. Once the child has learned this, the next step may be squeezing the tube, among others.

-**Prompting:** The parents or therapists provide assistance to encourage the desired response from the child. The aim is to use the least intrusive prompt possible that still leads to the desired response. Prompts can include: •Verbal cues-"Take the toothpaste cap off, Bobby". •Visual cues - pointing at the toothpaste. •Physical guidance - moving the child's hands to unscrew the lid. •Demonstration such as taking the cap off to show the child how it is done. -Fading: The overall goal is for a child to eventually not need prompts. This is why the least intrusive prompts are used, so the child does not become overly dependent on them when learning a new behaviour or skill. Prompts are gradually faded out as then the new behaviour is learned. Learning to unscrew the toothpaste lid may start with physically guiding the child's hands, to pointing at the toothpaste, then just a verbal request.

-**Shaping**: Shaping involves gradually modifying the existing behaviour of a child into the desired behaviour. An example here is a young boy who only engages with the pet dog by hitting it. Although time-consuming, the parents intervene every time he interacts with the dog, grab his hand and turn the hit into a stroking motion. This is paired with positive reinforcement "It's great when you are gentle with Pooch!" and doing a favourite activity immediately afterwards as a reward. -Differential reinforcement: Reinforcement provides a response to a child's behaviour that will most likely increase that behaviour. It is "differential" because the level of reinforcement varies depending on the child's response.

Difficult tasks may be reinforced heavily whereas easy tasks may be reinforced less heavily. We must systematically change our reinforcement so that the child responds appropriately under usual schedules of reinforcement (occasional) with natural types of reinforcers (social). Reinforcement can be positive (verbal praise or a favourite activity) or negative (an emphatic 'no'). Positive reinforcement is an incentive given to a child who complies with some request for behaviour change. The aim is to increase the chances the child responds with the changed behaviour. Positive reinforcement is given immediately after the desired behaviour has occurred so that it will shape the child's future behaviour. Some examples of positive reinforcement include • Preferred activities (e.g., specific job; coffee with a friend; concert; sporting event) •Free time. •Verbal praise •Food-related activities (special treats - not food they have the right to access anyway). •Desired objects (if affordable). •Privileges (e.g., team leader for a day or week; certificate; badge; choice of outing). •Tokens (e.g.: a special trip when the child earns five gold stars on the fridge).

-Generalization: Once a skill is learned in a controlled environment (usually table-time), the skill is taught in more general settings. Certainly, the skill will be taught in the natural environment. If the child has successfully mastered learning colors at the table, the teacher may take the student around the house or his school and then re-teach the skill in these more natural environments. Behaviour analysts have spent a considerable amount of time studying factors that lead to generalization.

-Video modelling: One teaching technique found to be effective with some students, particularly children, is the use of video modelling (the use of taped sequences as exemplars of behaviour). It can be used by therapists to assist in the acquisition of both verbal and motor responses, in some cases for long chains of behaviour. The researchers and the class teachers were involved in the treatment process. Data was finally analyzed using mean and standard deviation to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 probability level.

2.3 Results
Table 1 (here):

Mean and Standard Deviation of social skill scores of pupils with ASD exposed to ABA therapy and those in the control group. The result presented in Table 1 shows that the experimental group exposed to ABA had a pre-test mean of 1.82 with a standard deviation of 0.16 and a post-test mean score of 3.23 with a standard deviation of 0.36. The mean gain score for pupils with ASD exposed to ABA is 1.41. The control group had a pre-test mean score of 1.75 with a standard deviation of 0.08 and a post-test mean score of 1.71 with a standard deviation of 0.19. The mean gain score for those in the control group is -0.04 which shows a mean loss. However, for experimental group, the post-test mean is greater than the pre-test mean score, while the pre-test mean is higher than the post-test in mean for the control group. This reveals that ABA therapy increases pupils' mean score in social skills than the conventional method of teaching. The null hypothesis which predicted no significant effect of ABA on the pretest-posttest mean social skills scores of pupils with ASD was tested at 0.05 level of significance.

Table 2 (here):
The result shows that pupils with autism exposed to ABA therapy and those in the control group. An F-ratio of 52.84 was obtained with associated probability value of 0.00. Apparently, the probability value of 0.00 obtained was less than 0.05 level of significance. Therefore, the null hypothesis which predicted no significant effect of ABA on the pretest-posttest mean social skill scores of pupils with ASD was rejected. Thus, it was inferred that

there was a statistically significant effect of ABA on the post-test mean social skills scores of pupils with ASD.

Table 3 (here):

The result presented on Table 3 shows that pupils with autism exposed to ABA had a pre-test mean of 17.14 with a standard deviation of 0.19 and a post-test mean score of 35.17 with a standard deviation of 0.28. The mean gain score for pupils with ASD exposed to ABA is 18.03. The control group had a pre-test mean score of 11.72 with a standard deviation of 0.15 and a post-test mean score of 21.81 with a standard deviation of 0.19. The mean gain score for those in the control group is 10.09 which shows a mean loss. However, for the experimental group, the post-test mean is greater than the pre-test mean score, while the pre-test mean is higher than the post-test in the control group. This reveals that ABA therapy increases pupils' mean scores in social skills than the conventional method of teaching.

The null hypothesis which predicted no significant effect of ABA on the pretest-posttest mean social skills scores of pupils with ASD was tested at 0.05 level of significance. The result is presented in Table 2 thus:

The ABA therapy had a significant effect on the academic achievement of pupils with ASD. This was revealed by the F-ratio of 54.02 which is significant at 0.05 probability level. The probability value of 0.00 obtained was less than 0.05 level of significance. Therefore, the null hypothesis which predicted no significant effect of ABA on the pretest-posttest mean academic achievement scores of pupils with ASD is rejected. The adjusted R Square of .074 further suggested that 74% of total variance on the academic achievement was contributed by treatment using ABA therapy. Thus, this evidence inferred that there was a statistically significant effect of ABA on the post-test mean academic achievement scores of pupils with ASD.

3.1 Discussion

Results of the study show that the effect of ABA on the post-test mean social skills scores of pupils with autism spectrum disorder was significant. Apparently, exposing students with autism had a significant improvement in their post-test mean social skill scores as compared to their pre-test mean scores and that of the control group. This finding is in affirmation with [16] who asserted that ABA is the process of systematically applying interventions based on the principles of learning theory to improve socially significant behaviours such as in reading, academics, social skills, communication, and adaptive living skills to a meaningful degree, and to demonstrate that the interventions employed are responsible for the improvement in behaviour. It was also demonstrated that many children with autism experience significant improvements in learning, reasoning, communication and adaptability when they participate in high-quality ABA programs. Some preschoolers who participate in early intensive ABA for two or more years acquire sufficient skills to participate in regular classrooms with little or no additional support.

This study found that ABA intervention had a statistically significant effect on the post-test mean academic achievement scores of pupils with autism spectrum disorder. The finding of the study clearly indicates that exposing students with autism to ABA intervention resulted in a significant improvement in their post-test mean social skill scores as compared to their pretest mean scores and that of the control group. The findings of the present study collaborate prior findings by [12] which revealed that students with autism spectrum disorder experience family issues; poor academic preparedness, for example, lack of time management, poor organization and lack of study skills: reading, writing, math and research activities; unfavourable classroom or campus climate; inadequate commitment to educational goals and the institution especially as regards the role of the university vision and mission in

meeting the student academic and social goals; issue of social and academic integration of students with developmental and learning disabilities

Conclusively, exposing pupils with ASD to ABA intervention had a statistically significant effect on their social skills and academic achievement. ABA is efficacious in enhancing social skills and academic achievement of pupils with ASD.

Ethical Approval: Ethical clearance and permission for this study was obtained from University of Nigeria Nsukka institutional review board and ethical committee.

Informed Consent: Verbal and written consent were obtained from the school administration and from the parents of the pupils prior to data collection. Confidentiality was maintained by omitting their personal identification. Privacy was maintained throughout the study. They were informed that participation was voluntary and were assured of anonymity and confidentiality of information before informed consent was obtained. The researchers assisted those who needed help to complete the questionnaire.

Conflict of Interest: All the authors declare that they have no conflict of interests with the publication of this paper.

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Tables

Table 1: Mean and Standard Deviation of social skill scores of pupils with ASD exposed to ABA therapy and those in the control group.

Group	N	Pre-test		Post-test		MeanGain
		ξ	SD	ξ	SD	Score
Applied Behaviour Analysis	19	1.82	0.16	3.23	0.36	1.41
Control	17	1.75	0.08	1.71	0.19	-0.04
Total	**36**	**1.80**	**0.15**	**2.38**	**0.81**	**0.58**

Table 2: Analysis of Covariance (ANCOVA) of the significant effect of ABA on the pretest-posttest mean social skills scores of pupils with ASD.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected model	8.338[a]	3	2.779	21.795	.000
Intercept	.674	1	.674	5.284	.032
Pretest	.051	1	.051	.399	.535
Treatment	6.738	1	6.738	52.841	.000
Treatment	6.825	1	6.825	54.021	.000
Error	2.550	20	.128		
Total	221.960	24			
Corrected Total	10.888	23			

R Square = .074 (Adjusted R Square = .074)

Table 3: Mean and Standard Deviation of the pretest-posttest mean achievement scores of pupils with ASD exposed to ABA.

Group	N	Pre-test		Post-test		Mean Gain Score
		ξ	SD	ξ	SD	
Applied Behaviour Analysis	19	17.14	0.19	35.17	0.28	18.03
Control	17	11.72	0.15	21.81	0.16	0.09