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Research Article

Effects of Environmental, Instructional and Behavioural Intervention Strategies on Academic Performance of Pupils with Attention Deficit Hyperactivity Disorder in Akwa Ibom State Nigeria

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Abstract: At the international level, the majority of intervention strategies have concentrated on medical and behavioural approaches with very little attention being given to the impact of educational and/or academic interventions. Because children with ADHD are at two to three time's greater risk of school failure than their peers without ADHD, it is essential that research focuses on educational approaches within school and classroom environments to address this problem. The purpose of the present research was to investigate the effects of educational intervention strategies which are environmental, instructional and behavioural modifications on the academic performance of pupils with Attention Deficit Hyperactivity Disorder (ADHD) in Uyo Local Government Area of Akwa Ibom State. The study was a quasi experimental design, the sample size of 44 ADHD pupils were purposively selected from three public primary schools. The instruments used for this study were adapted diagnostic checklist, pupils' performance tests (pretest and posttest), environmental modification intervention strategies (EMIS), and Instructional modification intervention strategies (IMIS), Behvioural modification intervention strategies (BMIS). Descriptive statistics such as analysis of co-variance (ANCOVA) was used to test the hypotheses at .05 level of significance. The findings of this study, have indicated that environmental, instructional and behavioural modification intervention strategies significantly improved the Mathematics performance scores of pupils with ADHD than the conventional method of instruction (CMI) in Uyo Local Government Area of Akwa Ibom State. It is therefore suggested that, teachers should be encouraged in developing more confidence in managing ADHD pupils' challenging behaviours, implementing positive strategies in the classroom that lead to more time learning and less time managing behaviours, and improving their relationships with pupils in the classroom.
Keywords: Environmental, Instructional, Behavioural Intervention Strategies, ADHD.

INTRODUCTION

In the perspective of the Nigeria's philosophy of education, "every Nigerian child has a right to equal educational opportunities irrespective of any real or imagined disabilities, each according to his or her ability." Every child as far as classroom teaching and learning is concerned; is important [1]. One of the roles of education is to help every child, notwithstanding his or her disability, gender, background, culture, religion and ability, develop his/her potential to its fullest. Hence, education in Nigeria should endeavour to engage pupils fully in the learning process and provide varieties of experiences and opportunities for them to thrive. Therefore, every Nigerian child needs all round education in order to develop holistically especially the development of the innate gift (s) each possesses and the acquisition of novel talents.

Within the four walls of schools, according to Davis, Rimm and Siegle [2], there exist varieties of exceptionalities such as giftedness, mentally challenged, emotional and behavioural disorder, attention deficit disorder (ADD) and attention deficit/hyperactivity disorder (ADHD). However, pupils whether mentally challenged or with exceptional gifts and talents and learning potential require specific knowledge and attention from their parents, teachers, school authority and government, both at state and federal levels; they need to be given appropriate attention, careful nurturing of their gifts, suitable education, and support which are of paramount

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importance to them because gifted, talented and ADHD pupils have the potential to make a unique and terrific contribution to their various communities. But if they are ignored, they will use their gifts, disorders and talents in a wrong way. Therefore, one should be in accord with the Davis, Rimm and Siegle [2] opinion that the consequences for neglecting the pupils with extraordinary gifts, talents or attention deficit hyperactivity disorders include loss of creative potential, and sometimes loss of enthusiasm for educational success, and professional performance, thereby loosing significant contributions each would have made to the society. Nevertheless, pupils with other exceptionalities such as ADD or ADHD can reach a great height if appropriate intervention strategies such as environmental intervention, instructional intervention and behavioural intervention strategies are employed. Nonetheless, the main focus of this paper is the effect of the aforementioned intervention strategies on academic performance of pupils with Attention Deficit Hyperactivity Disorder (ADHD).

American Academy of Pediatrics [3], defined Attention Deficit Hyperactivity Disorder (ADHD) as a chronic condition marked by persistent inattention, hyperactivity, and sometimes impulsivity. ADHD begins in childhood and often lasts into adulthood. As many as two out of every three children with ADHD continue to have symptoms as adults. Symptoms of ADHD can differ from person to person, but there are three basic types of ADHD. Each one is identified by the symptoms of hyperactivity, impulsivity, and inattention. Smitha (2015) stated that the main symptoms of ADHD are inattention, distraction, and disorganization, the type is usually called primarily inattentive. The symptoms of hyperactivity and possibly impulsiveness appear to diminish with age but are seen in the primarily hyperactive/impulsive type. The third type has some symptoms from each of the other two and is called the combined type. Children with ADHD often have trouble functioning at home and in school and can have difficulty making and keeping friends and getting along in the classroom. If left untreated, ADHD may interfere with school and work, as well as with social and emotional development. ADHD is more common in boys, whose impulsivity and hyperactivity may appear as disruptive behaviour. Inattentiveness is a hallmark of ADHD in girls, but because they aren't often disruptive in the classroom, they may be harder to diagnose. ADHD tends to run in families. When one person is diagnosed with ADHD, there is a 25 percent to 35 percent chance that another family member will also have the condition, compared to one percent to six percent of the general public estimates of the prevalence of the disorder [4]. ADHD is one of the most commonly diagnosed conditions of children [5].

Atkins and Pelham [6], opined that despite the fact that children with ADHD form only a small minority of all pupils, they frequently come to the attention of their teachers because they display a high degree of externalizing behaviours (i.e., off-task behaviours that are easily observed, may distract other pupils, and can be disruptive to the functioning of the classroom). They further explained that, because the symptoms associated with attention disorders appear to be most apparent and problematic in educational settings, ADHD has even been defined as "a school-based disorder". Consequently, children with ADHD are quite often brought to the attention of the school personnel by concerned teachers, who in addition to concerns about these children's disruptive behaviours may note academic underperformance and negative social relations.

A child's academic success is often dependent on his or her ability to attend to tasks and teacher and classroom expectations with minimal distraction. Such skill enables a pupil to acquire necessary information, complete assignments, and participate in classroom activities and discussions [7]. When a child exhibits behaviours associated with ADHD, consequences may include difficulties with academics and with forming relationships with his or her peers if appropriate instructional methodologies and interventions are not implemented. In this study, three different intervention strategies were used to improve the academic performance of ADHD pupils.

According to Barkley [8] children with ADHD are at serious risk of underperformance as they have difficulty in sitting and following through an instruction in the classroom and with the fact that the classroom is a structured environment, they find it difficult to easily adjust to the system. Pupils with ADHD often experience difficulties with academic performance and development of core reading and math skills [9]. In this research work, academic performance as a variable is the driving force of all stakeholders in the education sector; thus, interventions directly addressing academic deficits are necessary. The gender of pupils with ADHD is also an important factor of consideration in this research work; whether it affects more boys than girls or otherwise.

Hinshaw and Melnick [10], observed that girls were more likely to have difficulty focusing in school work than boys because of their in attention nature but Barkley [8] dispelled the myth that though ADHD takes a different toll on boys and girls yet they do not differ in terms of performance. In this study it will be necessary to find out which of the intervention strategies work best for both boys and girls with ADHD. Because no two children with ADHD are alike, it is important to keep in mind that no single educational strategy, intervention, or setting will be best for all children. Intervention strategies used in this study include the following variables: environmental, instructional and behavioural intervention strategies.

Statement of the Problem

From the introductory aspect of this research work, it has been established that problems associated with ADHD can lead to poor academic performance of children who are victims of this disorder. In order to help ADHD children succeed scholastically and socially, it is very important that there is intervention which is tailored to the child's specific needs [11]. Olota [12], conducted a study on the influence of teacher-pupil factors on academic performance of pupils with ADHD in private schools in Uyo Local Government Area, but did not address the use of intervention strategies to help ADHD pupils do better in their academic endeavours. A lot of works had been done in an attempt to help ADHD pupils succeed academically; one of which had been done on the Nigerian educators' knowledge about attention deficit hyperactivity disorder (ADHD) and inclusive classroom management practices when serving pupils with ADHD [13]; the result of this work revealed that Nigerian educators have little or no knowledge about ADHD and its interventions.

Ayoka, Osarenren and Obi [14], conducted a study in Lagos on helping children with Attention Deficit Hyperactivity Disorder (ADHD) to enjoy peaceful schooling by using a single component of instructional strategies. Abikwi and Egbochukwu [15] studied ADHD strategies and counseling tips for primary school teachers; but not much attention was given to behavioural strategies as a component of ADHD intervention strategies. Several other works had also been done on ADHD intervention strategies for pupils with ADHD [16-18] all of which used, instructional and behavioural intervention strategies at different times.

Hitherto, the issue of poor performance of children with attention deficit hyperactivity disorder in both private and public schools still persists. As a result of this, the problem of low performance of children with ADHD forms the basis for this study. In the school system, no provision has been made regarding intervention strategies for pupils with ADHD. Since the knowledge of ADHD and how it influences academic performance is not widely known by teachers and school authorities; in the classroom, more often than not, teachers are faced with quite a number of difficulties managing pupils with ADHD; it was appropriate therefore to conduct a study as to ascertain the effect of environmental, instructional and behavioural intervention strategies on academic performance of pupils with ADHD. Therefore, this research sought to fashion out a new model by using instructional intervention and behavioural intervention strategies as a compact component to increase the Mathematics academic performance of pupils with attention deficit hyperactivity disorder.

Purpose of the Study

The main purpose of the study was to determine the effects of environmental, instructional and behavioural intervention strategies on academic performance of pupils with ADHD in Akwa Ibom State, Nigeria. Specifically, the objectives were to:

1. Determine the difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies and those exposed to conventional method of instruction?
2. Determine the difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies and those exposed to conventional method of instruction?
3. Determine the difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies and those exposed to conventional method of instruction.
4. Find out the difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies and those exposed to conventional method of instruction.
5. Determine the difference in the Mathematics performance scores of boys and girls with ADHD exposed to instructional intervention strategies.
6. Determine the difference in the Mathematics performance scores of boys and girls with ADHD exposed to behavioural intervention strategies.
7. Determine the interactive effects of two intervention strategies and gender on ADHD pupil's performances in Mathematics

Hypotheses

The following hypotheses stated in the null form guided the study and were tested at .05 level of significance:

Ho_1: There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies and those exposed to conventional method of instruction.

Ho_2: There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies and those exposed to conventional method of instruction

Ho_3: There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies and those exposed to conventional method of instruction.

Ho_4: There is no significant difference in the Mathematics performance scores of boys and girls with ADHD exposed to environmental intervention strategies.

Ho_5: There is no significant difference in the Mathematics performance scores of boys and girls with ADHD exposed to instructional intervention strategies.

Ho_6: There is no significant difference in the Mathematics performance scores of boys and

girls with ADHD exposed to behavioural intervention strategies.

Ho_7: There is no significant interaction effect of the three intervention strategies and gender on the Mathematics performance scores of pupils with ADHD.

Area of the Study

The study was conducted in Uyo Local Government Area of Akwa Ibom State. Uyo is a town and the state capital of Akwa Ibom State located in the South-Eastern Nigeria that is endowed with great economic potentials. It covers an area of about 914.3km2. The area is bounded in the North by Itu and Uruan Local Government Areas and in the south by Nsit Atai and Nsit Ibom Local Government Areas. Uyo lies on the road from Oron to Ikot Ekpene, it consists of 105 villages and has four (4) clans which are, Offot Ukwa, Etoi, Oku and Ikono. Uyo people are of Ibibio stock and speak Ibibio language. The main occupations of the people are farming and trading. The area has a big market with commodities ranging from local foodstuffs to a variety of imported and manufactured goods. Uyo Local Government has a Federal University, health institutions, industries, banks, hotels, federal, state and local government establishments.

Uyo has a unique but various traditions and cultures, in dressing, the dominant attire of an Ibibio man is a loin cloth (unwawang-ofong-isin), shirt, hat and staff to go with it. While the women folk have loin clothes as well, as generally called "Ndot Iba" with a piece if it on the head as head-tie with blouse to match. They are also blessed with delicacies such as white soup (afia efere), afang soup, nkong ubong, efere ibaba, efere ndukpap, edikang ikong and a host of others. Uyo local government has good roads, good power supply and markets. The choice of the area for the study was based on the fact that some of the children in the primary level have characteristics of ADHD and as such show low interest in their academic work. The researcher therefore, wanted to find out if the findings of the study will help pupils with ADHD improve in their academic work by using environmental, instructional and behavioural intervention strategies.

Research Design

This research was a quasi-experimental study patterned on pre-test and post-non-equivalent control group design. Quasi experimental design is a design in which random assignment of subjects to treatments and control groups is not possible [19]. The study involved three experimental groups (which are environmental, instructional and behavioural strategies) and each of the experimental group) had one control group (conventional method) to determine the effect of ADHD intervention strategies on academic performance of pupils with ADHD. The experimental groups were taught using three ADHD intervention treatments while the control group used the conventional method. The design is diagrammatically represented as follows:

Non-equivalent Control Group Design

E_1	O_1	X_1	O_2
E_2	O_3	X_2	O_4
E_3	O_5	X_3	O_6
C	O_7	X	O_8

Where:

E_1	=	Experimental group 1 (Environmental Intervention Strategy)
E_2	=	Experimental group 2 (Instructional Intervention Strategy)
E_3	=	Experimental group 3 (Behavioural Intervention Strategy)
C	=	Control group (Conventional Strategy)
O_1	=	Pre-test for treatment 1
O_2	=	Post-test for treatment 1
O3	=	Pre-test for treatment 2
O_4	=	Post-test for treatment 2
O_5	=	Pre-test for treatment 3
O_6	=	Post-test for treatment 3
O_7	=	Pre-test for control group
O_8	=	Post-test for control group
_____	=	Non-equivalent

Population of the Study

The population of the study comprised all the 2,972 primary one pupils in the 47 public primary schools in Uyo Local Government Area of Akwa Ibom State, as at 2016/2017 academic session (See Appendix I). Specifically, the population consisted of ADHD pupils in primary one who were in public primary schools. The use of public primary schools and not private schools was based on the fact that the former gave a better and more accurate representation of the

indigenes of the State that constituted the target population for the study, most indigenes attend public primary schools; they are using the same scheme of work and the pupils use the same Mathematics textbook prepared in accordance to the basic education curriculum for public primary school pupils according to the Nigerian Educational Research Development Council (NERDC).

Sample and Sampling Technique

A sample size of 44 ADHD pupils was purposively selected for the study by using an ADHD checklist; this sample size was taken out of a total number of 479 pupils selected from three public primary schools in Uyo Local Government Area of Akwa Ibom State. A sample for the study must:

a. be a pupil from primary one in Uyo Local Government of Akwa Ibom State public schools
b. must have eight out of 16 items on the checklist thus be an ADHD pupil in the sampled school.
c. be able to write the answers to the tests given without assistance at an appreciable level of his/her mental age (based on teacher's recommendation)
d. be willing to participate in the treatment.

The selection of primary one pupil as the subject matter for the study is based on the fact that they are within Early Childhood Education age groups. The sample size of the study was selected amongst primary one pupil in public primary schools. Purposive random sampling technique was adopted by using diagnostic checklist to select pupils with ADHD characteristics. Purposive sampling technique which is a non-probability sampling technique was adopted because it is aimed at picking a characterized audience which possesses behavioural traits different from their mates through the use of observation and teachers confirmation of ADHD traits observed by the researcher. Any pupil that possesses eight out of the sixteen character traits of ADHD according to the APA Diagnostic Standard was eligible as a pupil with ADHD in this study. Thus, from the total number of 47 found in the three schools, 44 pupils were selected as pupils having ADHD.

Instruments for Data Collection

The following instruments were used to gather data for this study:

(a) Instruments

- Adapted Attention deficit hyperactivity disorder (ADHD) diagnostic checklist. APA [6].
- Pupils performance test (pre-test and post-test) on Mathematics

(b) Intervention Programmes

Instructional (Treatment) packages on intervention strategies: The treatment programme comprised three intervention strategies and conventional method.

- Environmental intervention Strategy
- Instructional intervention Strategy
- Behavioural intervention Strategy
- Conventional Method

Description of the instruments

Attention Deficit Hyperactivity Disorder Diagnostic Checklist (ADHDDC)

The ADHDDC is an adapted version of the APA (2013) diagnostic checklist. The checklist has 16 items in all, it was expected that if a pupil marked eight out of the 16 items on the checklist, the pupil was termed an ADHD pupil; and if any pupil scored less than eight, that is, a scale of one-seven, the pupil could not be termed an ADHD pupil. For the purpose of this research the classroom teacher that was directly involved with the pupils was expected to assess the pupils based on the questions in the checklist and tick the option that best answered the questions to the pupil's behaviour either by marking yes or no where applicable; after which the researcher confirmed the checklist for each pupil by conducting a random observation at different intervals on each of the pupils termed ADHD. Some of the questions in the checklist are outlined below:

- This pupil has difficulties in organizing tasks
- Is forgetful or absent in class
- Has difficulties playing or working quietly
- Does not give attention to details etc.

Pupils Performance Test PAT (Pre-test and Post-test) on Mathematics

The performance test for the trial testing was developed by the researcher based on the scheme of work for the term with the help of the teachers in primary one. The instrument was used for pre-test and post-test on the pupils identified with ADHD characteristics. The instrument had 10 questions each for pres-test and post-test, this was done in order to test pupils' performance in basic mathematics; each question in each of the test was scored one mark. The questions in pre-test were not different from the questions in post-test, the only difference was

numbering of the questions which was rearranged by the researcher. (See Appendices III and IV)

Instruments for Intervention Strategies

Environmental Intervention Strategy (EIS)

EIS is an intervention strategy that modifies pupils' environment. Here, the environment was reorganized and routines restructured. An ADHD pupil was not meant to be isolated from the classroom but the sitting arrangement should be preferential with the child relocated from back or middle seat close to the chalkboard or to the teacher. The classroom environment was structured for ADHD pupil in order to reduce distractions from other children. EMS included the following:

1. Preferential Sitting-next to the teacher, close to the blackboard, away from high traffic areas such as doors, pencil, sharpeners, areas in which teachers give individualized instruction.
2. Sit pupil away from talkative classmates.
3. Define spatial boundaries perhaps by placing a boundary with tape around the pupil's desk.

Instructional Intervention Strategy (IIS)

IMS is an intervention strategy that simplified instructions for pupils, the simpler the expectations communicated to an ADHD pupil, the more likely he or she would comprehend and complete any task given. IIS include the following:

1. Give short one-step directions; one at a time.
2. Ask for feedback; have the pupil repeat the exercise.
3. If the exercise was in written form, have the pupil underline or highlight key words.
4. Make sure you had the pupil's attention before giving instructions by maintaining eye contact, using verbal cues such as "this is important" or "eyes up here" and maintaining a close physical proximity.

Behavioural Intervention Strategy (BIS)

BIS was designed to assist ADHD pupils display the behaviours that are most conducive to their learning. This was used as an opportunity for teaching in the most effective and efficient manner rather than as an opportunity for punishment. BMS included the following:

1. When disciplining, try not to restrict a pupil's recess time as it's a great way to release energy and give the pupil a break.
2. Don't assume they know appropriate behaviour- it may need to be taught and reinforced. Appreciate and reinforce good behaviour by giving token where necessary.
3. Avoid vague or unclear messages such as "be good". Clearly state the desired behaviour.
4. Establish routines. Keep consistent, explicit classroom rules visible.
5. Have pupils participate in the development of classroom rules.
6. Provide consequences in a calm, matter of fact manner.

Instrument for Conventional Method (Control Group)

Conventional Method (CM)

Conventional Method **(**CM) is an instrument developed by the researcher based on the conventional method that is mostly used by teachers to punish ADHD pupils. Conventional Method Strategy **(**CMS) contains the following:

1. Compulsory sleep
2. Teachers send them to naughty corners
3. Closing of eyes
4. Corporal punishment
5. che che che shame
6. Face the wall
7. Leave the class (Appendix VIII).

Validity of the Instruments

Face and content validity was established by experts. To ascertain the validity of the instruments, the instruments were presented to two experts in Test and Measurement and three experts in Child Psychology and Special Education, University of Uyo, for their inputs, suggestions and corrections. The inputs and corrections of these experts were incorporated into the final draft of the instruments for data collection.

Reliability of the Instruments

To determine the reliability of the instruments used, a trial testing was conducted on pupils and schools that were not part of the main study. The data collected was used to determine the estimate of internal consistency of each of the instruments. Specifically, Kuder Richardson formular 21 ($K\text{-}R_{21}$) was used to estimate the reliability coefficient of pupils' performance test on Mathematics. Cronbach alpha was used to estimate the reliability coefficient of ADHD Diagnostic rating scale. Kuder Richardson formular 21 was appropriate because items of pupils' performance test were essay test and were subjectively scored. Cronbach's alpha was appropriate for ADHD Diagnostic checklist because its items were continuously scored.

The ADHD diagnostic checklist (observational checklist), Mathematics Performance Test I and II (MAT Pre-test and Post-test) were estimated by subjecting them to trial testing to check for reliability. The data collected were used to estimate the reliability coefficient of each of the instruments. Primary schools pupils in Uyo Local Government Area who were not used for the main research participated in the trial testing. Hence, a total number of twenty-four (24) ADHD pupils were involved. The reliability coefficient of ADHD diagnostic checklist (observational checklist) was determined using Cronbach's alpha; the reliability

index was .92. Kuder Richardson 21 was used to ascertain the reliability of the Mathematics Performance Tests I and II and the reliability indices were .51 and .85 respectively. (See appendix). The results showed that all the instruments used were reliable and were used for the main study.

Administration of the Instruments

Armed with a letter from the university, the researcher sought the permission from the appropriate authorities of the schools before the commencement of the study. Before the commencement of the selection of ADHD pupils from the intact class; primary one teacher(s) who were the research assistants in each of the selected schools were given an overview of what the research entailed particularly on the concept of ADHD and the characteristics of ADHD pupils so as to enable them identify ADHD pupils without any bias. The researcher did this by explaining the purpose of the study and the possible benefits that could be derived if properly conducted; a mini training/ orientation was carried out on the skills involved in the use of ADHA intervention strategies for the pupils and the usefulness of both the pre-test and the post-test that were used for the pupils; this orientation involved both the teachers in the treatment groups and the control groups. With the help of the research assistants, the researcher administered the pre-test, the intervention programme and the post test on the selected sample for the study successfully.

Method of Data Analysis

Descriptive statistics such as mean and standard deviation were used to analyze and answer the research questions while analysis of co-variance (ANCOVA) was used to test the hypotheses at .05 level of significance.

RESULTS

H_{01}**:** There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies (EIS) and those exposed to conventional method of instruction (CMI).

Table-1: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mathematics Performance Scores of Pupils with ADHD Exposed to Environmental Intervention Strategies (EIS) and those Exposed to the Conventional Method of Instruction (CMI)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	80.064	4	20.016	11.770	.000	.797
Intercept	121.615	1	121.615	71.514	.000	.856
Pre-test	15.060	1	15.060	8.856	.012	.425
Strategies	23.803	1	23.803	13.997	.003	.538
Gender	.029	1	.029	.017	.898	.001
Strategies * Gender	1.894	1	1.894	1.114	.312	.085
Error	20.407	12	1.701			
Total	892.000	17				
Corrected Total	100.471	16				
a. R Squared = .797 (Adjusted R Squared = .729)						

The result in Table 1 shows that an F-ratio of 13.997 with associated probability value of .003 was obtained with regards to the difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies (EIS) and those exposed to the conventional method of instruction (CMI). Since the associated probability (.003) was less than .05 set as the benchmark for taking a decision, the null hypothesis (H_{01}) which stated that; there is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies (EIS) and those exposed to conventional method of instruction (CMI) was rejected. Therefore, inference drawn was that there was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies (EIS) and those exposed to the conventional method of instruction (CMI).

H_{02}: There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies and those exposed to conventional method of instruction.

Table-2: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Mathematics Performance Scores of Pupils with ADHD Exposed to Instructional Intervention Strategies (IIS) and those Exposed to Conventional Method of Instruction (CMI)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	47.784[a]	4	11.946	9.156	.007	.840

Intercept	137.643	1	137.643	105.497	.000	.938
Pre-test	.034	1	.034	.026	.877	.004
Strategies	33.927	1	33.927	26.003	.001	.788
Gender	3.161	1	3.161	2.422	.164	.257
Strategies * Gender	2.795	1	2.795	2.142	.187	.234
Error	9.133	7	1.305			
Total	717.000	12				
Corrected Total	56.917	11				
a. R Squared = .840 (Adjusted R Squared = .748)						

The result in Table 2 shows that an F-ratio of 26.003 with associated probability value of .001 was obtained with respect to the difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies (IIS) and those exposed to the conventional method of instruction (CMI). Since the associated probability (.003) was less than .05 set as the criterion for taking a decision, the null hypothesis (H_{02}) which stated that; there is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies and those exposed to conventional method of instruction was rejected. Hence, the conclusion drawn was that there was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies (IIS) and those exposed to the conventional method of instruction (CMI).

H_{03}**:** There is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies and those exposed to conventional method of instruction.

Table-3: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Mathematics Performance Scores of Pupils with ADHD Exposed to Behavioural Intervention Strategies (BIS) and those Exposed to Conventional Method of Instruction (CMI)

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	93.893[a]	4	23.473	11.831	.001	.826
Intercept	99.367	1	99.367	50.083	.000	.834
Pre-test	9.207	1	9.207	4.641	.057	.317
Strategies	34.431	1	34.431	17.354	.002	.634
Gender	6.188E-5	1	6.188E-5	.000	.996	.000
Strategies * Gender	7.624	1	7.624	3.843	.078	.278
Error	19.840	10	1.984			
Total	965.000	15				
Corrected Total	113.733	14				
a. R Squared = .826 (Adjusted R Squared = .756)						

The result in Table 3 shows that an F-ratio of 17.354 with associated probability value of .002 was obtained with regards to the difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies (BIS) and those exposed to the conventional method of instruction (CMI). Since the associated probability (.002) was less than .05 set as the criterion for taking a decision, the null hypothesis (H_{03}) which stated that; there is no significant difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies and those exposed to conventional method of instruction was rejected. Thus, the inference drawn was that there was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies (BIS) and those exposed to the conventional method of instruction (CMI).

H_{04}**:** There is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies.

Table-4: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mathematics Performance Scores of Male and Female Pupils with ADHD Exposed to Environmental Intervention Strategies (EIS).

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	80.064	4	20.016	11.770	.000	.797
Intercept	121.615	1	121.615	71.514	.000	.856
Pre-test	15.060	1	15.060	8.856	.012	.425

Strategies	23.803	1	23.803	13.997	.003	.538
Gender	.029	1	.029	.017	.898	.001
Strategies * Gender	1.894	1	1.894	1.114	.312	.085
Error	20.407	12	1.701			
Total	892.000	17				
Corrected Total	100.471	16				
a. R Squared = .797 (Adjusted R Squared = .729)						

The result as presented in Table 4 also shows that an F-ratio of .017 with associated probability value of .898 was obtained with regards to the difference in the Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies (EIS). Since the associated probability (.898) was greater than .05 set as the benchmark for taking a decision, the null hypothesis (H_{04}) which stated that; there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies was not rejected. So, the conclusion drawn was that there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies (EIS). This implies that the Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies (EIS) do not differ significantly.

H_{05}: There is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies.

Table-5: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Mathematics Performance Scores of Male and Female Pupils with ADHD Exposed to Instructional Intervention Strategies (IIS).

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	47.784[a]	4	11.946	9.156	.007	.840
Intercept	137.643	1	137.643	105.497	.000	.938
Pre-test	.034	1	.034	.026	.877	.004
Strategies	33.927	1	33.927	26.003	.001	.788
Gender	3.161	1	3.161	2.422	.164	.257
Strategies * Gender	2.795	1	2.795	2.142	.187	.234
Error	9.133	7	1.305			
Total	717.000	12				
Corrected Total	56.917	11				
a. R Squared = .840 (Adjusted R Squared = .748)						

The result as presented in Table 5 also shows that an F-ratio of 2.422 with associated probability value of .164 was obtained with respect to the difference in the Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies (IIS). Since the associated probability (.164) was greater than .05 set as the benchmark for taking a decision, the null hypothesis (H_{04}) which stated that; there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies was not rejected. Therefore, the conclusion drawn was that there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies (IIS). This means that the Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies (IIS) do not differ significantly.

H_{06}**:** There is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies.

Table-6: Analysis of Covariance (ANCOVA) of the Significant Difference in the Mean Mathematics Performance Scores of Male and Female Pupils with ADHD Exposed to Behavioural Intervention Strategies (BMIS)

Source	**Type III Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	93.893[a]	4	23.473	11.831	.001	.826

Intercept	99.367	1	99.367	50.083	.000	.834
Pre-test	9.207	1	9.207	4.641	.057	.317
Strategies	34.431	1	34.431	17.354	.002	.634
Gender	6.188E-5	1	6.188E-5	.000	.996	.000
Strategies * Gender	7.624	1	7.624	3.843	.078	.278
Error	19.840	10	1.984			
Total	965.000	15				
Corrected Total	113.733	14				
a. R Squared = .826 (Adjusted R Squared = .756)						

The result as presented in Table 6 also shows that an F-ratio of .000 with associated probability value of .996 was obtained with regard to the difference in the Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies (BIS). Since the associated probability (.996) was greater than .05 set as the benchmark for taking a decision, the null hypothesis (H_{06}) which stated that; there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies was not rejected. Hence, it was concluded that there is no significant difference in the Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies (BIS). This means that the Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies (IIS) do not differ significantly.

H_{07}**:** There is no significant interaction effect of the three intervention strategies and gender on mathematics performance scores of pupils with ADHD.

Table-7: Analysis of Covariance (ANCOVA) of the significance of interaction effect of the three intervention strategies and gender on mathematics performance scores of pupils with ADHD

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	219.120[a]	8	27.390	16.935	.000	.795
Intercept	433.171	1	433.171	267.829	.000	.884
Pretest	20.331	1	20.331	12.571	.001	.264
Strategies	105.285	3	35.095	21.699	.000	.650
Gender	.835	1	.835	.516	.477	.015
Strategies * Gender	17.964	3	5.988	3.702	.021	.241
Error	56.607	35	1.617			
Total	2574.000	44				
Corrected Total	275.727	43				
a. R Squared = .795 (Adjusted R Squared = .748)						

The result in Table 7 shows that an F-ratio of 3.702 with an associated probability value of .021 was obtained with respect to the interaction effect of the strategies and gender on mathematics performance scores of pupils with ADHD. Since the associated probability (.021) was less than .05 set as the level of significance, the null hypothesis (H_{07}) was rejected. Thus, the conclusion drawn was that; there is a significant interaction effect of the strategies and gender on mathematics performance scores of pupils with ADHD.

Summary of the Study and findings

This research was a quasi-experimental study; with a sample population of 44 ADHD pupils. The instruments used for the study were adapted diagnostic checklist, pupils' performance tests (pre-test and post-test) and intervention programmes (treatments). The intention of this study is to determine if environmental, instructional and behavioural intervention strategies have any significant effects on the Mathematics performance of pupils with attention deficit hyperactivity disorder.

Findings of this research showed that

- The environmental intervention strategies (EIS) seemed to improve the Mathematics performance scores of pupils with ADHD than the conventional method of instruction (CMI).
- There was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to environmental intervention strategies (EIS) and those exposed to the conventional method of instruction (CMI).
- The instructional intervention strategies (IIS) appeared to improve the mean Mathematics performance scores of pupils with ADHD than the conventional method of instruction (CMI).
- There was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to instructional intervention strategies (IIS) and those exposed to the conventional method of instruction (CMI).

- The behavioural intervention strategies (IIS) seemed to improve the mean Mathematics performance scores of pupils with ADHD than the conventional method of instruction (CMI).
- There was a significant difference in the Mathematics performance scores of pupils with ADHD exposed to behavioural intervention strategies (BIS) and those exposed to the conventional method of instruction (CMI).
- The environmental intervention strategies (EIS) seemed to slightly improve the Mathematics performance scores of male pupils with ADHD than their female counterparts.
- The Mathematics performance scores of male and female pupils with ADHD exposed to environmental intervention strategies (EIS) do not differ significantly.
- The instructional intervention strategies (IIS) appeared to slightly improve the Mathematics performance scores of female pupils with ADHD than their male counterparts.
- The Mathematics performance scores of male and female pupils with ADHD exposed to instructional intervention strategies (IIS) do not differ significantly.
- The behavioural intervention strategies (BIS) seemed to slightly improve the Mathematics performance scores of male pupils with ADHD than their female counterparts.
- The Mathematics performance scores of male and female pupils with ADHD exposed to behavioural intervention strategies (IIS) do not differ significantly.
- For both male and female groups exposed to the three intervention strategies, the posttest means were greater than the pretest means with males having a slightly higher mean gain than their female counterparts when exposed to BIS, IIS and EIS, while the female group had a slightly higher mean gain than their male counterparts when exposed to the CMI.
- There is a significant interaction effect of the three intervention strategies and gender on mathematics performance scores of pupils with ADHD.

CONCLUSIONS

Having reviewed different literatures on ADHD and several intervention strategies, the researcher would like to conclude that ADHD is present in our schools, especially in Nigerian public primary schools. The prevalence of ADHD in our setting is similar to those in other parts of the world. From the researchers experience, teachers need to be aware of the different treatments they could use in helping ADHD pupils perform better academically, though the problem is present amongst primary schools, yet most teachers are not even aware of what the problem is called; this is because ADHD is one of the emerging mental health problems and a neglected health issue in Nigeria and Africa at large.

It is believed that this study has established that the mathematics performance of pupils with ADHD could be enhanced with the use of environmental, instructional and behavioural intervention strategies. It has demonstrated the effects of these three intervention strategies on mathematics performance of pupils with ADHD. It has demonstrated the relevance of intervention programmes in the management of learning difficulty in mathematics of pupils with ADHD in public primary schools. With this, the possibility of turning the academic difficulty of pupils with ADHD expressing deficiencies in mathematics performance to positive opportunity that could guarantee them success in their academic pursuit is a possibility and reality.

The findings of this study may help school psychologists and other school personnel to understand the difficulties teachers go through in their classes with ADHD pupils, hitherto providing teachers with ample information on how they could help ADHD pupils do better by using modification interventions strategies which would help to facilitate educational and academic success. In conclusion, the result of this study implies that to manage pupils with ADHD learning difficulty in Mathematics; and for them to succeed scholastically and socially, it is very important that modification interventions are projected to meet these pupils' specific needs.

RECOMMENDATIONS

Based on the findings of this study, which have indicated that environmental, instructional and behavioural intervention strategies significantly improved the Mathematics performance scores of pupils with ADHD than the conventional method of instruction (CMI) in Uyo Local Government Area of Akwa Ibom State, the following recommendations are made as a means of bridging the missing gaps in the research area:

1. Educators should ensure that classroom teachers are aware of these intervention strategies so as to be able to help guide ADHD pupils.
2, The family, society and significant others should take time to appreciate and understand the academic and developmental challenges faced and experienced by pupils with ADHD expressing deficiencies in mathematics performance as to devise appropriate measures to help them overcome their challenges and adjust well to their challenges.
3. Counselling /psychological intervention programmes should be put in place by the government through head teachers and administrators to help guide pupils with ADHD expressing deficiencies in mathematics performance to self-rediscover their potentials, abilities and capabilities and improve their academic attainment.
4. The government should ensure that functional counselling and psychological services are made

available in schools to attend to the needs of pupils with ADHD expressing deficiencies in mathematics performance.

5. Teachers should be encouraged in developing more confidence in managing ADHD pupils' challenging behaviours, implementing positive strategies in the classroom that lead to more time learning and less time managing behaviours, and improving their relationships with pupils in the classroom behaviour.

6. Pupils with ADHD expressing deficiencies in mathematics performance should not be labelled or stigmatized as failures but should be encouraged and re-enforced positively to overcome their frustrating academic experiences and function optimally in school to attain good academic performance

7. Curriculum planners and developers should ensure that the curriculum content should not be ambiguous, it should be stepwise and precise to ensure easy delivery by teachers and assimilation by pupils, especially ADHD pupils.

8. School proprietors and administrators should provide a learning rich environment in the classroom for easy comprehension by ADHD children.

9. Teachers should endeavour to use environmental, instructional and behavioural modifications intervention strategies appropriately as effective measures to encourage pupils expressing deficiencies in mathematics performance.

10. Teachers should use appropriate teaching methods and aids that will not only stimulate the desire to learn among pupils with ADHD expressing deficiencies in mathematics performance but also motivate them to conquer their academic deficiencies and challenges.

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