



Influence of Attention Deficit Hyperactivity Disorder on Students' Performance in Geometrical Construction in Okrika, Rivers State

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Abstract

Educationally, many factors are identified as predictors of students' academic performance especially in mathematics. One such factor is attributed to the level of attention the students pay to learning a particular concept. Based on this premise, the study investigated the influence of attention deficit hyperactivity disorder (ADHD) on the performance of students in geometrical construction in Okrika, Rivers State. The analytical survey design was adopted for the study. The four objectives, four research questions and two hypotheses guided the study. The population of the study consisted of all the 1365 senior secondary students from the six public coeducational senior secondary schools in Okrika Local Government Area of Rivers State. A sample of 310 senior secondary one students obtained from the population by the Taro Yamane formula was selected for the study using a simple random sampling technique. The instruments for data collection were: Attention Deficit Hyperactivity Disorder Questionnaire (ADHDQ) and Construction Performance Test (CPT). Both ADHDQ and CPT were validated by three authorities in Mathematics Education to ensure that the instruments preserve their face and content validity. The test-retest method was adopted to establish the reliabilities of the instruments with reliability coefficients of 0.78 and 0.81. Simple percentage, mean and standard deviation were used to answer the research questions while Analysis of Variance (ANOVA) was used to test the two hypotheses at a 0.05 level of significance. The findings indicated that 29.70% of the students have ADHD out of which 52.2% are male while 47.8% are female. It was also discovered that students without ADHD performed better than students with ADHD in construction. Female students with ADHD have higher scores on construction performance tests than male students with ADHD. In view of the findings the study recommended that Mathematics teachers should utilize active learning strategies or methods for Mathematics teaching and learning to curb ADHD among students.

Keywords: Influence, Attention Deficit, Hyperactivity, Disorder, Mathematics, Performance.

Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is a learning difficulty or disorder due to inattentiveness, hyperactivity and impulsivity (Zalmon & Wonu, 2017). ADHD is a severe problem of inattention, hyperactivity and impulsivity. Attention Deficit (AD) implies having a short attention span. Learners with AD are not able to listen or pay attention to a particular task or pay attention to the teacher for a long time. They may not focus on the content of instruction for a long time when the lesson is being delivered. Every lesson may appear cumbersome, uninteresting and impossible to learn. Consequently, they are easily distracted. A little noise inside or outside the classroom is capable of shifting their attention from what the teacher is teaching. This is a learning problem. The next characteristic of children with ADHD is hyperactivity. Hyperactivity Disorder (HD) refers to a display of excessive physical movements and shifting of attention from one thing to the other at very short time intervals. Hyperactive children seem restless and find it difficult to remain at a particular spot engaged in a particular activity for a long time. Hyperactivity moments prevent such learners from learning and they can also distract other children in the classroom from learning (Agomoh & Kanu, 2015). There is a general involvement in unconscious active movements (impulsivity) in hyperactive children. Impulsivity is the condition of reacting to stimuli without having any thought over it. Impulsive movements or reactions may appear too sudden to people around, children acting on impulse can behave without even considering the teacher or anybody else. Impulsivity is also a learning problem. Some children have only attention deficit disorder (ADD) while others may have both ADD and Hyperactivity Disorder (HD). In either case, the learner suffers from a learning disability. Research shows that attention deficit hyperactivity disorder (ADHD) has a significant impact on students' academic

performance. Students with ADHD often experience difficulty maintaining focus, completing assignments, and regulating their behaviour in classroom settings. Jangmo et al. (2019) highlight that individuals with ADHD are at higher risk for poor school performance, primarily due to their inattention and hyperactive-impulsive behaviours. Additionally, the onset of ADHD symptoms at an early age has been linked to long-term academic struggles, including higher rates of grade retention and lower overall achievement scores. Studies indicate that pharmacological treatment can improve symptoms and help students better manage their academic responsibilities, although it is not a complete solution to the academic difficulties ADHD presents.

Agomoh and Kanu (2015) stated that ADHD is a severe problem of inattention, hyperactivity and impulsivity. According to them, ADHD is a condition found among many school children, particularly those with learning disabilities. ADHD is a condition with symptoms such as inattentiveness, impulsivity, and hyperactivity. ADHD affects children and teens and can continue into adulthood, it is the most commonly diagnosed mental disorder for children. Children with ADHD may be hyperactive and unable to control their impulses. They may have trouble paying attention. These behaviours interfere with school and home life. It's usually discovered during the early school years when a child begins to have problems paying attention. The global prevalence of ADHD, particularly among school-aged children, contributes to challenges in academic environments. Salari et al. (2023) report that ADHD affects 7.6% of children aged 3 to 12, which underscores the widespread nature of the disorder during critical learning years. These children often exhibit deficits in executive functioning, leading to disorganization. ADHD is complex and chronic, ADHD affects a student's ability to complete tasks that require a high degree of executive functioning, attention, and reflection. Children with ADHD may exhibit behavioural issues that can impair learning in the classroom. Documented behaviours include inattention, disruptive behaviour and poor social relationships Gureasko-Moore et al. (2006). Executive function is inhibited in children with ADHD, leading to issues in the classroom that include problems with memory, reasoning, and general cognitive ability (Daley & Birchwood, 2010). Without supportive interventions, students with ADHD fall behind acceptable levels in subject areas, most notably mathematics and reading as they require a higher level of executive functioning (Zentall, & Lee, 2013). Children with ADHD have a short duration of attention compared to typically developing children. Barry et al. (2002), examining the occurrence of academic underachievement in a group of children diagnosed with ADHD, found that the greater the severity of behavioural symptoms in children with ADHD, the greater the negative impact on their school performance. Therefore, the researcher having considered different strategies used in teaching Mathematics decided to investigate the influence of ADHD on students' Geometric construction performance.

Statement of the Problem

Abysmal performance of senior secondary students in Mathematics in annual external examinations has become a recurring decimal. Every year, reports of students' performance in Mathematics in the West African Senior Secondary Certificate Examination (WASSCE) always indicate higher percentage of failure than passes. Zalmon and Wonu (2017) reported students' abysmal performance in Mathematics over the years, precisely twenty-six (26) years ago with 27.31% of students obtaining credits and above while 72.69% having passed and below in the May/June WASSCE. A similar report was given by Charles-Ogan (2014), that from 1991 to 2012 West African Senior Secondary Certificate Examination (WASSCE) in Mathematics, an average of 72% of the students failed Mathematics with only 28% of them passing at credit level and above. These ugly recurring reports of students' Mathematics performance could be as a result of students' inattentiveness, hyperactivity and impulsivity. Therefore, the study is poised to answer the question: what is the influence of attention deficit hyperactivity disorder on the performance of students in geometrical construction?

Aim and Objectives of the Study

The aim of the study was to determine the influence of attention deficit hyperactivity disorder (ADHD) on senior secondary students' performance in Mathematics. Specifically, the study shall be guided by the following objectives:

1. Ascertain the prevalence of ADHD among senior secondary students.
2. Determine the prevalence of ADHD among the female and the male senior secondary students.
3. Compare the performance of students with and without ADHD in construction.
4. Determine if a difference exists between the performance of the female and the male students with ADHD in construction.

Research Questions

The following four research questions shall guide the study:

1. What is the prevalence of ADHD among senior secondary students?

2. What is the prevalence of ADHD between female and male senior secondary students?
3. What is the difference in the performance mean scores of students with and without ADHD in construction?
4. What is the difference between the performance mean scores of the female and the male students with ADHD in construction?

Research Hypotheses

The study shall be guided by the following null hypotheses, testable at 0.05 level of significance:

1. There is no significant difference in the performance mean scores of students with and without ADHD in construction.
2. There is no significant difference between the performance mean scores of the female and the male students with ADHD in construction.

Methodology

This study adopted the analytical survey research design involving two schools from the six coeducational public schools in the Okrika local government area. The two schools were randomly selected, the population of male students from the two schools were 178 while female students were 132. The population of the study consisted of all 1365 senior secondary students from the six public coeducational senior secondary schools in the Okrika local government area of Rivers State (Rivers State Senior Secondary Schools Board, Planning, Research and Statistics Department, 2018). A sample of 310 senior secondary students obtained from the population by the Taro Yamane formula was used for the study. This sample size was selected by a simple random sampling technique from two schools in the area. The two schools were randomly selected. Attention Deficit Hyperactivity Disorder Questionnaire (ADHDQ) and Construction Performance Test (CPT) were the two instruments used for data collection. ADHDQ is a structured 25 ADHD-item questionnaire patterned after Likert's like scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). The respondents indicated the extent to which they exhibited the behavioural characteristics or symptoms of ADHD students. With the data collected from ADHDQ, using mean criterion cut-off point of 2.50, the students were categorized into ADHD and non-ADHD students. The second instrument consisted of 10 objectives and two theory test items from construction contents of the senior secondary class one Mathematics curriculum. CPT was used to test the performance of the students in construction. ADHDQ and CPT were validated by three experts in Mathematics Education and Educational Psychology to ensure that the instruments preserved their face and content validity. Their suggestions and corrections were implemented by the researcher before administering the instruments to the respondents to elicit data. The test-retest method was adopted to establish the reliability of the instruments. The instruments: ADHDQ and CPT were administered to 15 students at two different periods, the data generated were correlated using Pearson Product Moment Correlation (PPMC) and the correlation coefficients of the instruments were determined as 0.78 and 0.81 respectively. ADHDQ and CPT were administered personally to the students in the two schools with the assistance of their Mathematics teachers. The instruments and answer booklets including the drawing book were retrieved immediately after the test. Simple Percentage, Mean and Standard Deviation were used to answer the research questions while Analysis of Variance (ANOVA) was used to test the two hypotheses at a 0.05 level of significance.

Results

Research question 1: What is the prevalence of ADHD among senior secondary students?

Table 1: Descriptive statistics of frequency of prevalence of ADHD among senior secondary students

ADHD	Frequency	Percentage
Without ADHD	218	70.30
With ADHD	92	29.70

Table 1 above showed that out of 310 students sampled for the study, 218 (70.30%) were diagnosed without ADHD while 92 (29.70%) were diagnosed with ADHD.

Research question 2: What is the prevalence of ADHD among female and male senior secondary students?

Table 2: Descriptive statistics of frequency of prevalence of ADHD among male and female students of senior secondary school

	ADHD		Total
	Without ADHD (%)	with ADHD (%)	
Male	130(59.63)	48(52.20)	178
Female	88(40.37)	44(47.80)	132

About 48 (52.20%) of males were diagnosed with ADHD while about 44 (47.80%) of females were diagnosed with ADHD. This implies that ADHD is prevalent among the male folks of senior secondary school students.

Research question 3: What is the difference in the performance mean scores of students with and without ADHD in construction?

Table 3: Descriptive statistics of mean and standard deviation on the difference in the performance of students with and without ADHD in construction

ADHD Category	N	\bar{X}	Std	Mean Difference	
				\bar{X}	Std
Without ADHD	218	30.09	15.30	2.54	2.06
With ADHD	92	27.55	13.24		

Table 3 above shows that students without ADHD performed better ($\bar{X}=30.09$, Std=15.30) than students with ADHD ($\bar{X}=27.55$, Std=13.24) in the construction performance test. The mean difference between the students is 2.54 with 2.06 as a standard deviation.

Research question 4: What is the difference between the performance mean scores of the female and the male students with ADHD in construction?

Table 4: Descriptive statistics of mean and standard deviation on the difference in the performance of male and female students with ADHD in construction

ADHD Category	N	\bar{X}	Std	Mean Difference	
				\bar{X}	Std
Male	48	25.31	12.09	4.69	2.05
Female	44	30.00	14.14		

Table 4 above shows that female students with ADHD performed better ($\bar{X}=30.00$, Std=14.14) than male students with ADHD ($\bar{X}=25.31$, Std=12.09) in the construction performance test. The mean difference between the students is 4.69 with 2.05 as the standard deviation.

H01: There is no significant difference in the performance mean scores of students with and without ADHD in construction.

Table 5: Summary of Analysis of Variance (ANOVA) on the difference in the performance mean scores of students with and without ADHD in construction

	Sum of Squares	Df	Mean Square	F	Sig.	F _{tab}
Between Groups	416.542	1	416.542	1.921	.167	3.84
Within Groups	66772.893	308	216.795			
Total	67189.435	309				

Table 5 above showed that $F_{1,308} = 1.921$, $p=.167$, since F_{tab} at 1 and 308 degrees of freedom is 3.84 is greater than F_{cal} . Value 1.921, hence it is concluded that there is no significant difference in the performance mean scores

of students with and without ADHD in construction. Therefore the null hypothesis one tested at 0.05 level of significance is retained and the alternate hypothesis is rejected.

H₀₂: There is no significant difference between the performance mean scores of the female and the male students with ADHD in construction.

Table 6: Summary of Analysis of Variance (ANOVA) on the difference in the performance mean scores of the female and the male students with and without ADHD in construction

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	504.416	1	504.416	2.934	.090
Within Groups	15470.313	90	171.892		
Total	15974.728	91			

The table above showed that $F_{1,90} = 2.934$, $p = .090$, since F_{tab} at 1 and 90 degrees of freedom is 4.00 is greater than F_{cal} . Value 2.934, hence it is concluded that there is no significant difference between the performance mean scores of the female and the male students with ADHD in construction. Therefore, the null hypothesis two tested at 0.05 level of significance is retained and the alternate rejected.

Discussion

The study found that about 92 students have attention deficit hyperactivity disorder out of 310 students diagnosed. This implies that in every 310 senior secondary students, 92 (29.7%) of them have ADHD, with a greater percentage of 52.2% (48) being male students while 47.8% (44) of the students with ADHD are female. Students without ADHD performed better than students with ADHD in construction performance tests. This is so because, since they pay uttermost attention or give maximum attention to the teacher, they are able to learn more especially vital difficult concepts from the teacher in the class. Although there was no significant difference in their mean performance, their levels of performance were not the same. Lastly, the female students with ADHD performed better than the male students with ADHD in the construction performance test even though this difference in performance is not significant, implying that the female students had more control over ADHD than their male counterparts.

The finding that ADHD is most prevalent in children aged 3 to 12 years, with a global incidence of 7.6% Salari et al. (2023), aligns with existing literature that consistently highlights early childhood as a critical period for the onset of ADHD symptoms. Research by Al-Wardat et al. has contributed to research that emphasizes the prevalence of attention deficit hyperactivity disorder (ADHD) in school-age children. In one of their notable works published in 2024, they systematically estimate that ADHD affects approximately 7.6% of children and adolescents globally. Their study highlights the importance of recognizing the broad prevalence of ADHD across different populations, with variations in prevalence rates depending on geographic and demographic factors. The study explores the challenges ADHD poses for educational and social functioning, with a focus on how these prevalence rates impact diagnosis and treatment strategies. Al-Wardat et al. (2024) research aligns with other global ADHD prevalence studies, which often find varying rates in different regions, including rates as high as 22.2% in some countries and as low as 1.3% in others. This disparity underscores the need for standardized diagnostic criteria and better healthcare interventions, especially in regions with lower reported ADHD rates. In the U.S., ADHD is observed predominantly in children aged 4 to 17 years, with national prevalence estimates ranging from 10.08% to 10.47% between 2017 and 2022, Li et al. (2024). This is consistent with earlier reports, such as those by Danielson et al., which found a similar ADHD prevalence in U.S. children, further supporting the age bracket for diagnosis Danielson et al. (2024). The persistence of ADHD symptoms into adolescence and adulthood is well-documented. Studies show that many individuals diagnosed in early childhood continue to experience symptoms, highlighting the chronic nature of ADHD (Reuben et al., 2024).

Conclusion

Based on the findings, the study concludes that attention deficit hyperactivity disorder (ADHD) relatively influences students' academic performance in Mathematics. The prevalence of ADHD among senior secondary students is 29.70% with the male students diagnosed with higher ADHD than the female students.

Recommendations

Based on the findings of the study the following are therefore recommended:

1. Teachers should ensure that appropriate active learning strategies/methods are used for instruction in Mathematics to help improve the performance of students with ADHD.

2. Teachers should give serious attention to the students diagnosed with ADHD, especially the male students, in order to mitigate its negative impact on their Mathematics performance.

References

- Al-Wardat, M., Etoom, M., Almhdawi, K. A., Hawamdeh, Z., & Khader, Y. (2024). Prevalence of attention-deficit hyperactivity disorder in children, adolescents and adults in the Middle East and North Africa region: a systematic review and meta-analysis. *BMJ open*, *14*(1), e078849. <https://doi.org/10.1136/bmjopen-2023-078849>
- Agomoh, O. E., & Kanu, S. A. (2015). Introduction to psychology of special needs children: Understanding special needs education. *Port Harcourt: Kanissi Publishers*.
- Barry, T., Lyman, R., & Klinger, L. (2002). Academic Underachievement and AttentionDeficit/Hyperactivity Disorder: The Negative Impact of Symptom Severity on School Performance. *Journal of School Psychology 40*(3):259–283
- Charles-Ogan, G. I. (2014). Metacognitive strategy and senior secondary school Mathematics students' misconceptions in Rivers State, Nigeria. *Abacus: The Journal of Mathematical Association of Nigeria*, *39* (1), 234-246.
- Daley W. & Birchwood, R. (2010). ADHD and academic performance: why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom. *Journal of Child Care Health and Development 36*(4):455-64 · <https://doi.org/10.1111/j.1365-2214.2009.01046.x>
- Danielson, M. L., Claussen, A. H., Bitsko, R. H., Katz, S. M., Newsome, K., Blumberg, S. J., Gureasko-Moore, J. DuPaul, F. & White, Z. (2006). The Effects of Self-Management in General Education Classrooms on the Organizational Skills of Adolescents With ADHD. *Behavior Modification 30*(2):159-83.
- Jangmo, A., Stålhandske, A., Chang, Z., Chen, Q., Almqvist, C., Feldman, I., Bulik, C. M., Lichtenstein, P., D'Onofrio, B., Kuja-Halkola, R., & Larsson, H. (2019). AttentionDeficit/Hyperactivity Disorder, School Performance, and Effect of Medication. *Journal of the American Academy of Child and Adolescent Psychiatry*, *58*(4), 423–432. <https://doi.org/10.1016/j.jaac.2018.11.014>
- Li, Y., Yan, X., Li, Q., Li, Q., Xu, G., Lu, J., & Yang, W. (2023). Prevalence and Trends in Diagnosed ADHD Among US Children and Adolescents, 2017-2022. *JAMA network open*, *6*(10), e2336872. <https://doi.org/10.1001/jamanetworkopen.2023.36872>
- Reuben, C, & Elgaddal, N. (2024) Attention-deficit/hyperactivity disorder in children ages 5–17 years: United States, 2020–2022. NCHS Data Brief, no 499. Hyattsville, MD: National Center for Health Statistics. 2024. DOI: <https://doi.org/10.15620/cdc/148043>
- Salari, N., Ghasemi, H., Abdoli, N. (2023). The global prevalence of ADHD in children and adolescents: a systematic review and meta-analysis. *Ital J Pediatr* *49*, 48 (2023). <https://doi.org/10.1186/s13052-023-01456-1>
- Zalmon, I. G., & Wonu, N. (2017). Comparative analysis of student mathematics achievement in West African senior secondary certificate examination in Nigeria. *European journal of research and reflection in educational sciences*, *5*(1).
- Zentall, S. V., Tom-Wright, B., & Lee, J. (2013). Psychostimulant and Sensory Stimulation Interventions That Target the Reading and Math Deficits of Students With ADHD. *Journal of Attention Disorders 17* (4): 308-329.