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RELATIONSHIP BETWEEN MENTAL HEALTH AND MATHEMATICS ACHIEVEMENT AMONG IN-SCHOOL ADOLESCENTS IN NORTH CENTRAL NIGERIA

U. V. Oyinvwi, Hadiza Kaneng Nuhu & Ogah, Benjamin Ogah
Department of Educational Foundations, Nasarawa State University, Keffi, Nigeria

Abstract

The study investigated the relationship between mental health and Mathematics achievement among in-school adolescents in North Central Nigeria. Two objectives, research questions and hypotheses guided this study. Correlation research design was adopted for this study. The population comprised 205,073 SS 2 students from 3,112 senior secondary schools in seven states in North Central, Nigeria. A sample size of 1,200 SS 2 students were drawn for this study through multi-stage sampling procedure. The instruments adopted include: Beck Anxiety Inventory (BAI), Patient Health Questionnaire (PHQ-9) and Mathematics Achievement Test (MAT). The instruments yielded a concessional logical validity indices of 0.82 for BAI, 0.74 for PHQ-9 and 0.85 for MAT which was determine from the appraisal of experts. Also a reliability coefficient of 0.92 for BAI, 0.87 for PHQ-9 and 0.75 for MAT was obtained for the instruments. Pearson Product Moment Correlation Coefficient (r) was used to answer the research questions while hypotheses were tested at 0.05 level of significance by comparing the p-value (probability value) of Pearson Product Moment Correlation. The findings revealed a significant negative relationship between depression and mathematics achievement of in-school adolescents in North Central Nigeria. The second finding also revealed a significant negative relationship between anxiety and mathematics achievement of in-school adolescents in North Central Nigeria. The study concluded that mental health is one of the factors that can hinder students' achievement. The study therefore recommended among others; that the school Psychologists and Counsellor could render psychological intervention that would help in-school adolescents with behavioural problems to improve their academic performance, specifically students who have mental health and withdrawal related problem.

Keywords: Mathematics, mental health, mathematics achievement, in-school adolescents

Introduction

Academic Students' academic outcomes serve as key indicators of educational quality and personal growth, reflecting how well learners meet established learning goals and curriculum expectations. Academic achievement refers to the level of success a student attains in their educational pursuits, typically measured through assessments, grades, and overall performance in school. It reflects students' ability to acquire, retain, and apply knowledge across various subjects (Okafor & Eze, 2018). Mathematics achievement, a subset of academic achievement, specifically assesses students' proficiency in understanding and applying mathematical concepts. Mathematics is considered a fundamental subject, as it develops critical thinking, problem-solving, and analytical skills essential for future academic and career success (Watson & Rapoport, 2019). High achievement in Mathematics is often associated with improved cognitive abilities and greater career opportunities. Academic achievement can be broadly categorized into high and low levels. High achievement indicates that a student consistently performs above average, mastering curriculum objectives and demonstrating strong analytical skills. In

contrast, low achievement suggests difficulty in meeting expected standards, which may result from cognitive, emotional, or environmental factors. Understanding this distinction helps educators provide targeted interventions.

However, in North Central Nigeria, a significant number of in-school adolescents face challenges with mathematics achievement. For example, a 2023 report by the Education Research Centre of the Nasarawa State Ministry of Education highlights a worrying decline in students' mathematics proficiency. This concern is further supported by statistics from the Chief Examiner of the West African Examinations Council (WAEC) spanning 2019 to 2023. In 2019, out of a total registered population of 476,810 students, only 11,633 candidates obtained a credit in mathematics, representing 2.44% of the total student population. In 2020, the number of candidates earning a credit dropped further to 10,809 candidates out of the registered population of 466,171 students, representing 2.32%. The decline persisted in 2021, with only 9,586 candidates achieving a credit in mathematics despite an increase in the total registered population to 486,001 students. This accounted for 1.97% of the student population. In 2022, the downward trend continued, as only 8,911 candidates obtained a credit in mathematics out of the total registered population of 513,391 students, representing 1.74%. Similarly, in 2023, just 5,967 candidates earned a credit in mathematics, which is 1.17% of the total registered population of 511,670 students. These statistics illustrate a troubling trend, consistently showing a very low percentage of students obtaining credit in mathematics each year. This alarming decline poses a serious threat to the future prospects of students and the overall educational quality in North Central, Nigeria. This decline may be attributed to mental health issues of anxiety and depression. According to Kim and Cho, (2019), mental health plays a significant role in determining students' academic success. Poor mental health, particularly anxiety and depression may be major barrier to effective learning. Students facing mental health challenges often find it difficult to concentrate, process information, and retain knowledge, which negatively impacts their academic performance, especially in Mathematics. Mental health encompasses an individual's emotional, psychological, and social well-being, shaping how they think, feel, and behave in everyday situations. It plays a crucial role in how adolescents handle stress, build relationships, and pursue academic goals. According to Brown and Smith (2020), mental health is a state in which individuals are able to manage stress effectively, engage in productive work, and make meaningful contributions to their community. For adolescents, maintaining good mental health is vital for sustaining concentration, motivation, and resilience in school settings. In North Central Nigeria, however, many in-school adolescents grapple with mental health challenges that negatively impact their mathematics achievement. Kumar and Sharma (2020) noted that academic pressure, family expectations, and peer competition are significant stressors that often undermine students' mental stability, leading to difficulties in learning and academic achievement.

Anxiety is a common mental health issue that affects students' academic performance. It is characterized by excessive worry, fear, and nervousness, particularly in academic settings. Mathematics anxiety, specifically, is a form of anxiety that causes students to feel overwhelmed, fearful, and incapable of solving mathematical problems (Watson & Rapoport, 2019). When students experience Mathematics anxiety, they tend to avoid engaging with the subject, leading to gaps in knowledge and continuous underachievement. This avoidance behavior reinforces their fear, making it difficult for them to improve their Mathematics skills and achieve academic success. Kim and Cho, (2019) asserted that anxiety can also manifest in physical symptoms such as sweating,

increased heart rate, and difficulty concentrating during Mathematics lessons and exams, further reducing students' ability to perform well. Similarly, depression is another mental health challenge that negatively affects students' academic performance. Adeyemi and Afolabi (2021) describe depression as a mental health disorder characterized by persistent sadness, lack of motivation, and difficulty concentrating. In-school adolescents suffering from depression often struggle to engage with academic tasks, complete assignments, and participate in class activities. In North Central Nigeria, the increasing prevalence of depression among students has been linked to academic pressure, personal struggles, and limited access to mental health support. Depression diminishes students' interest in Mathematics, leading to lower academic achievement and decreased participation in problem-solving activities. The emotional burden of depression further weakens students' ability to retain mathematical concepts, resulting in poor academic outcomes (Rodriguez & Perez, 2022). Mental health challenges such as anxiety and depression play a crucial role in Mathematics achievement among in-school adolescents in North Central Nigeria. The fear of failure, psychological distress, and lack of motivation create barriers that prevent students from excelling in Mathematics. It is against this background that the study seeks to investigate the relationship between mental health, anxiety, depression, and Mathematics academic achievement among in-school adolescents in North Central Nigeria.

Purpose of the Study

The general objective of this study is to examine the relationship between mental health and mathematics academic achievement among in-school adolescents in North Central, Nigeria. Specifically, the study sought to:

1. investigate the relationship between depression and Mathematics achievement of senior secondary school students in North Central, Nigeria.
2. determine the relationship between anxiety and Mathematics achievement of senior secondary school students in North Central, Nigeria.

Research Questions

The following research questions were answered in this study:

1. What is the relationship between depression and Mathematics achievement of senior secondary school students in North Central, Nigeria?
2. What is the relationship between anxiety and Mathematics achievement of senior secondary school students in North Central, Nigeria?

Hypotheses

The following null hypotheses postulated for this study were tested at 0.05 level of significance.

HO_1: There is no significant relationship between depression and Mathematics achievement of senior secondary school students in North Central, Nigeria.

HO_2: There is no significant relationship between anxiety and Mathematics achievement of senior secondary school students in North Central, Nigeria.

Methods

The studies adopt a correlation research design which according to Gravetter and Forzano (2021), is the study of the relationship between two or more variables to determine how they co-vary without manipulating them; it focuses on measuring the degree and direction of association between variables. The goal is to understand if changes in one variable is associated with changes in another variable, providing insights into patterns and potential

predictive relationships within a specific context or population. The population for this study consist of 205,073 SS II students across 3,112 senior secondary schools in the seven (7) states in North Central Nigeria namely; Benue, Kogi, Kwara, Niger, Plateau, Nasarawa and Federal Capital Territory, Abuja (Ministries of Education, 2023). The sample size of 1200 SS II students were used for this study using the Research Advisors (2006) based on the 95% confidence interval (2.5% margin of error). Three instruments were used for this study; they are: Beck Anxiety Inventory (BAI), Patient Health Questionnaire-9: Screening Instrument for Depression (PH-9) and Mathematics Achievement Test (MAT). The instruments were validated by two experts in the Department of Educational Foundations, Faculty of Education, Nasarawa State University, Keffi for face and construct validity. The instruments yielded a logical validity index of 0.82 for BAI, 0.74 for PHQ-9, and 0.84 for MAT. The instruments were pilot tested on 30 in-school adolescents within the scope of this study but not part of the sample size. Twenty (30) copies of the instruments were administered to this pilot group. Their responses were scored and analyzed using Cronbach Alpha Reliability Coefficient and Kudar Richardson as a measure of determining the internal consistency of an instrument. After the administration and analysis of their responses, a reliability coefficient of 0.88 for BAI, 0.86 for PHQ-9, and 0.84 for MAT respectively. Pearson Product Moment Correlation was used to answer and analyze the research questions based on the values of r (coefficient of correlation). To guide interpretation, a benchmark was established: correlation coefficients ranging from 0.00 to 0.49 were considered low, indicating weak relationships, while coefficients from 0.50 to 1.00 were regarded as high, reflecting strong relationships. This classification helped in assessing the strength of the associations between variables. The hypotheses were tested at the 0.05 level of significance by comparing the p-values obtained from the SPSS analysis with the set significance threshold. Hypotheses with p-values less than 0.05 were rejected, indicating a statistically significant relationship, while those with p-values greater than 0.05 were accepted, indicating no significant relationship.

Results

Research Questions 1: What is the relationship between depression and Mathematics achievement of senior secondary school students in North Central Nigeria?

Table 1: Correlation between Depression and Mathematics Achievement of Senior Secondary School Students in North Central zone, Nigeria

Variables	N	$\bar{X}$	Std.D	Df	r	Remark
Depression	1200	12.62	3.338	1,198	-753	Negative
Mathematics Achievement	1200	51.57	5.240			Correlation

Table 1 shows the correlation between depression and mathematics achievement of senior secondary school students in North Central Nigeria. The result revealed responses from 1,200 respondents with a degree of freedom (df) of 1,198. The mean scores for depression and mathematics achievement are 12.62 and 51.57, with a corresponding standard deviation of 3.338 and 5.240, respectively. The correlation coefficient (r) is -0.753.

Research Questions 2: What is the relationship between anxiety and Mathematics achievement of senior secondary school students in North Central Nigeria?

Table 2: Correlation between Anxiety and Mathematics Achievement of Senior Secondary School Students in North Central zone, Nigeria

Variables	N	$\bar{X}$	Std.D	Df	r	Remark
Anxiety	1200	29.59	3.645	1,198	-133	negative
Mathematics Achievement	1200	51.57	5.240			Correlation

Table 2 shows the correlation between anxiety and mathematics achievement of senior secondary school students in North Central Nigeria. The result revealed responses from 1,200 respondents with a degree of freedom (df) of 1,198. The mean scores for anxiety and mathematics achievement are 29.59 and 51.57, with a corresponding standard deviation of 3.645 and 5.240, respectively. The correlation coefficient (r) is -0.133.

Hypotheses

The following hypotheses were tested at 0.05 level of significance:

Hypothesis 1: There is no significant relationship between depression and Mathematics achievement of senior secondary school students in North Central Nigeria.

Table 3: Correlation between Depression and Mathematics Achievement of Public Senior Secondary School Students in North Central, Nigeria

Variables	N	$\bar{X}$	Std.Dev.	df	r	r^2	P-value	Decision
Depression*	1200	12.62	3.338	1,198	.753	.567	0.018	Reject
Mathematics Achievement	1200	51.57	5.240					HO_1

Level of significance Alpha (α) < 0.05 shows significant relationship

Table 3 shows the relationship between depression and mathematics achievement of public senior secondary school students in North Central, Nigeria. The result revealed a correlation coefficient of r= 0.753, r^2= 0.567, and a p-value of 0.018, which is less than the 0.05 level of significance. Therefore, the hypothesis is rejected. This implies that there is a significant relationship between depression and mathematics achievement of public senior secondary school students in North Central, Nigeria.

Hypothesis 2: There is no significant relationship between anxiety and Mathematics achievement of senior secondary school students in North Central Nigeria.

Table 4: Correlation between Anxiety and Mathematics Achievement of Public Senior Secondary School Students in North Central, Nigeria

Variables	N	$\bar{X}$	Std D.	Df	r	r^2	P-value	Decision
Anxiety*	1200	29.59	3.645	1,198	.133	.018	0.043	Reject
Mathematics Achievement	1200	51.57	5.240					HO_2

Level of significance Alpha (α) < 0.05 shows significant relationship

Table 4 shows the relationship between anxiety and mathematics achievement of public senior secondary school students in North Central, Nigeria. The result revealed a correlation coefficient of r= 0.133, r^2= 0.018, and a p-value of 0.043, which is less than the 0.05 level of significance. Therefore, the hypothesis is rejected. This implies that there is a significant relationship between anxiety and mathematics achievement of public senior secondary school students in North Central, Nigeria.

Discussion

Findings from the study on Hypothesis one revealed a significant negative relationship between depression and Mathematics achievement among senior secondary school

students in North Central Nigeria. This suggests that students experiencing higher levels of depression tend to achievement poorly in Mathematics. Based on the data obtained, it was observed that depression not only affects concentration and comprehension but also contributes to broader issues such as academic disengagement, increased dropout rates, substance abuse and frustration. This finding aligns with the study by Animba and Obika (2020), which also reported a significant negative relationship between depression and academic performance among secondary school students in Enugu State, regardless of gender. Similarly, Obumse and Egenti (2021) found that poor mental health, characterized by anxiety, insomnia, severe depression, and social dysfunction, significantly undermined students' academic achievement. The present study further supports the conclusion that depression creates a substantial barrier to academic success. Leung et al. (2023) also reported a significant negative association between severe depressive symptoms and academic achievement. Using hierarchical logistic regression models, their study identified the individual contribution of 24 risk factors to severe depression while controlling for other variables, revealing that 7.4% of the students exhibited severe depressive symptoms. These findings collectively emphasize the need for targeted mental health interventions in schools to support students' emotional well-being and academic progress.

The result of the study on hypothesis two revealed a significant relationship between anxiety and Mathematics achievement among senior secondary school students in North Central Nigeria. Based on this finding, it was inferred that higher levels of anxiety are associated with lower mathematics achievement, suggesting that emotional distress hinder students' cognitive engagement and problem-solving ability in the subject. This aligns with the study by Gichohi (2019), which reported a significant negative correlation between anxiety and academic performance among university students, indicating that anxiety undermines academic success across educational levels. Similarly, the findings highlight how increased levels of learning-related anxiety diminish students' chances of excelling academically. Supporting this, Termizi and Mahmud (2022) found that mathematics anxiety among Form Four students was at a moderate level and observed a weak but present link between anxiety and mathematics achievement. Furthermore, the study by Jerry, Desmond, and Rose (2019) confirmed that mathematics anxiety is prevalent among senior secondary two students and significantly impacts their performance in mathematics. These studies collectively support the conclusion that anxiety is a critical psychological factor that negatively influences mathematics achievement.

Conclusion

Based on the findings, the study concluded that students experiencing high levels of depression or anxiety are more likely to struggle with mathematical tasks, which may hinder their overall academic success. The findings highlight the importance of addressing emotional and psychological well-being in schools to improve learning outcomes.

Recommendations

Based on the findings, the following recommendations where made:

1. Schools should establish structured mental health programs by employing trained school counselors and psychologists who offer regular counseling sessions, mental health screenings, and intervention services tailored to students experiencing depression and anxiety. These programs can be integrated into the school timetable and supported through awareness campaigns and teacher referrals.

2. Mathematics teachers should adopt anxiety-reducing strategies by using interactive teaching methods such as group problem-solving, hands-on activities, and digital tools that promote engagement. Personalized instruction, including differentiated tasks and one-on-one support, can help students progress at their own pace. Creating a supportive classroom environment; where mistakes are treated as learning opportunities, and positive reinforcement is consistently applied—can also ease students' anxiety and boost their confidence in mathematics.

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