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RESEARCH ARTICLE

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Psycho-academic variables as predictors of Mathematics Students' anxiety in test taking in public Secondary Schools in Uyo Local Government Area.

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Abstract

This study was on psycho-academic variables as predictors of Mathematics Students' anxiety in test taking in public secondary schools in Uyo Local Government Area. Three research questions and three null hypotheses were formulated to guide the study. The correlational research design was used for the study. The population of the study consisted of all the 2155 SS2 students in public secondary schools in Uyo Local Government Area. Simple random sampling technique was used in selecting 250 SS2 students for the study. Data was collected using a researcher developed instrument named, "Psycho-Academic Variables and Mathematics Students' Anxiety in Test Taking Questionnaire (PAVMSATTQ)". The instrument was further subjected to face validity by three experts; two in Educational psychology and one in Measurement and Evaluation, Faculty of Education, University of Uyo.. The reliability of the instrument was determined by randomly selecting 25 students who were not part of the study sample to respond to the instrument. Data generated was subjected to Cronbach Alpha Statistics to determine the internal consistency of the test instrument. The instrument was considered reliable for the study as it had a reliability coefficient of 0.87. Data analysis was done using simple linear regression statistics. The findings of the study revealed problem-solving skills, critical thinking skills and attitude significantly predict Mathematics Students' anxiety in test taking in public secondary schools. Recommendations were made among others that Principals should encourage students to possess a positive attitude towards Mathematics since it could help reduce their anxiety in test taking.

Keywords: *Psycho-academic variables, Problem-solving skills, Critical thinking skills and Attitude Students' anxiety in test taking.*

Introduction

Mathematics is often perceived as a challenging subject, and this perception can lead to significant anxiety, particularly during assessments. Test anxiety in mathematics can have a detrimental impact on students' performance, reducing their ability to demonstrate their true understanding and skills. Anxiety can interfere with cognitive processes, making it difficult for students to concentrate, recall information, and apply their knowledge effectively. Students' anxiety in test-taking is a widespread phenomenon that affects learners across various educational levels and disciplines. This form of anxiety, often referred to as test anxiety, encompasses a range of emotional, physiological, and cognitive reactions that students experience before, during, and after examinations. The pressure to perform well, fear of failure, and high academic expectations can trigger significant stress, which in turn can impair a student's ability to concentrate, recall information, and perform to the best of their abilities (James, 2021). Test anxiety is not merely a temporary discomfort; it can have long-lasting effects on students' academic trajectories, self-esteem, and overall well-being. According to Udoh (2019), the roots of students' anxiety in test taking are multifaceted, involving both internal and external factors such as psycho-academic variables. These variables, including problem-solving skills, critical thinking skills, and attitudes towards mathematics, play significant roles in shaping students' experiences and outcomes in mathematics education.

Problem-solving skills are a fundamental component of mathematics education. These skills involve the ability to identify, analyze, and solve problems using logical and systematic approaches. Effective problem-solving requires not only mathematical knowledge but also cognitive flexibility, creativity, and persistence. Students who possess strong problem-solving skills are typically more confident in their abilities to tackle mathematical challenges, which can reduce their anxiety levels during tests (Iweka, 2020). Conversely, students who struggle with problem-solving may experience heightened anxiety, as they may feel overwhelmed and uncertain about their ability to succeed. Another psycho-academic variables is Critical thinking skills.

Critical thinking skills are closely related to problem-solving and are essential for success in mathematics. Critical thinking involves the ability to evaluate information, make reasoned judgments, and draw logical conclusions. It requires students to question assumptions,

consider multiple perspectives, and use evidence-based reasoning. In mathematics, critical thinking is crucial for understanding concepts, interpreting problems, and applying appropriate methods to find solutions (Okon, 2022). Students with well-developed critical thinking skills are better equipped to handle the complexities of mathematical tasks and are less likely to experience test anxiety (Edem, 2019). They can approach problems methodically and confidently, reducing the likelihood of feeling overwhelmed during assessments. Attitude towards mathematics is another psycho-academic variables.

Attitude towards mathematics is another important psycho-academic variable that influences test anxiety. Students' attitudes are shaped by their experiences, beliefs, and perceptions of the subject. A positive attitude towards mathematics is associated with higher levels of motivation, engagement, and resilience. Students who view mathematics as interesting, useful, and manageable are more likely to approach it with enthusiasm and persistence (Samuel, 2018). This positive outlook can buffer against test anxiety, as students feel more prepared and capable of handling assessment tasks. On the other hand, negative attitudes towards mathematics, often stemming from past failures or negative experiences, can exacerbate anxiety. Students who perceive mathematics as difficult, irrelevant, or intimidating are more likely to experience fear and stress during tests, which can hinder their performance (Kpolovie, 2016).

James (2018), conducted a study on the relationship between problem solving skills and students' anxiety in Universities in South South, Nigeria. The researcher adopted a correlation survey research design. Two research questions and two null hypotheses were formulated to guide the study. The sample for the study was 224 fourth year students selected through non-proportionate stratified random sampling technique across the seven (7) faculties. The instruments for the study were students' motivation for attending university scale (SMAUS) and human capital acquisition scale (HCAS). The internal consistency of the instrument was computed using Cronbach Alpha and the reliability coefficient index of 0.71 and 0.63 respectively for the two instruments. Data generated was analyzed with Pearson product moment correlation statistics. The results showed positive significant relationship between problem solving skills and students' anxiety in Universities.

Adedeji (2017) conducted study on the impact of critical thinking and attitude on students' academic achievement and test anxiety in Mathematics in secondary schools in Nigeria. The

design of the study was ex-post facto type of survey research type. The sample size for the study was 450 SSII students which was selected through simple random technique. The instrument for data collection was Critical Thinking, Attitude And Students' Test Anxiety Questionnaire (CTASTAQ). The data collected were analyzed using Pearson product moment correlation statistics. The results revealed that critical thinking and attitude significantly relate with students' academic achievement and test anxiety in Mathematics among secondary school students.

Researches by numerous authors has shown that interventions aimed at improving problem-solving and critical thinking skills, as well as fostering positive attitudes towards mathematics, can be effective in reducing Students' anxiety in test taking. These interventions may include targeted instruction, practice opportunities, and feedback that emphasize the development of these skills and attitudes. For example, problem-based learning and inquiry-based approaches can enhance problem-solving and critical thinking by engaging students in authentic and meaningful tasks that require active exploration and reasoning. Additionally, efforts to create a positive and supportive classroom climate, such as encouraging growth mindset, providing constructive feedback, and addressing students' emotional needs, can help improve attitudes towards mathematics and reduce anxiety. In public secondary schools, where resources and support may be limited, addressing Students' anxiety in test taking through the enhancement of psycho-academic variables is particularly important. Hence, this study was designed to determine whether Psycho-academic variables predict Mathematics Students' anxiety in test taking in public secondary schools in Uyo Local Government Area.

Mathematics in secondary schools cultivates critical thinking and problem-solving skills essential for academic success and everyday decision-making. It provides a strong foundation for advanced studies in science, technology, engineering, and mathematics (STEM) fields, opening doors to diverse career opportunities. Beyond the classroom, mathematics enhances logical reasoning and analytical abilities, which are invaluable in various professional and personal contexts. Despite all these benefits, it has been observed by many stakeholders and researchers that many students have no interest in Mathematics. Those that indicated interest hardly perform well. Many students failed mathematics examination because of anxiety when taking the examination. In an attempt to address this unsatisfactory

situation, the government and many experts in the field of education have been wanting to know the reason behind these challenges and have come up with so many factors through the researches that could predict Mathematics Students' anxiety in test taking such as; school environment, teachers' qualities, lack of instructional material and have tried to salvage the situations. However, despite the efforts in improving the Mathematics Students' anxiety in test taking, the trend has persisted and the challenge, still worrisome. Consequence to this, the researcher try to consider if Psycho-Academic variables could predict Mathematics Students' anxiety in test taking. Hence the topic; "Psycho-academic variables as predictors of Mathematics Students' anxiety in test taking in public secondary schools in Uyo Local Government Area".

Research Questions

The following research questions were formulated to guide the conduct of the study:

1. To what extent does problem solving skills predict Mathematics Students' anxiety in test taking?
2. To what extent does critical thinking skills predict Mathematics Students' anxiety in test taking?
3. To what extent does attitude predict Mathematics Students' anxiety in test taking?

Hypotheses

The following null hypotheses were formulated for this study and tested at .05 alpha level of significance

1. Problem solving skills do not significantly predict Mathematics Students' anxiety in test taking.
2. Critical thinking skills do not significantly predict Mathematics Students' anxiety in test taking.
3. Attitude do not significantly predict Mathematics Students' anxiety in test taking.

Research methods

The Correlational research design was adopted in the study. This is a design that have crucial importance that must be applied in any investigation that is directly aimed at prediction of criterion variables on the basis of known value of predictor variables (Kpolovie, 2016). The design was considered appropriate since the researcher is interested in determining how Psycho-academic variables predict Mathematics Students' anxiety in test taking. The study was conducted in secondary schools in Uyo Local Government area. The population

comprised of the 2155 Senior secondary school two (SSS2) students in Uyo Local Government area of Akwa Ibom State in 2023/2024 academic year. There are fourteen (15) public senior secondary schools. (Source: Akwa Ibom State Secondary Education Board, Uyo, 2024). Simple random sampling technique was used in selecting 250 SS2 students for the study.

Data was collected using a researcher developed instrument named, "Psycho-Academic Variables and Mathematics Students' Anxiety in Test Taking Questionnaire (PAVMSATTQ)". The PAVMSATTQ had 25 items on Psycho-Academic Variables and Mathematics Students' Anxiety in Test Taking. The sub-variables such as problem solving skills, critical thinking skills and attitude had 5 items each and Students' Anxiety in Test Taking had 10 items. The PAVMSATTQ was developed using four point likert scale as shown Strongly agree (SA)- 4points, agree (A)- 3points, Disagree (D)- 2points and Strongly disagree (SD)- 1point. The instrument was further subjected to face validity by three experts; two in Educational psychology and one in Measurement and Evaluation, Faculty of Education, University of Uyo. Construct validity of the instrument was also done. The reliability of the instrument was determined by randomly selecting 25 students who were not part of the study sample to respond to the instrument. Data generated was subjected to Cronbach Alpha Statistics to determine the internal consistency of the test instrument. The instrument was considered reliable for the study as it had a reliability coefficient of 0.87. Data collected was analyzed using Simple Linear Regression Statistics. The R and R^2 Values (coefficient) of Simple Linear Regression Statistic was used to answer the research questions based on the interpretation scale of + or -1 while the null hypotheses were tested using sig.-value at 0.05 alpha level of significance

Results

To what extent does problem solving skills predict Mathematics Students' anxiety in test taking?

Table 1: Simple Linear Regression Analysis of problem-solving skills and Mathematics Students' anxiety in test taking

Variables	R	R^2	Extent of Prediction	Adjusted R^2	Remarks
Problem solving skills Students' anxiety in test taking	0.943	0.890	89.0%	0.890	Very High Extent of Prediction

Source: Researcher's survey (2024)

In Table 1, the results reveal that R-value is 0.943 and R^2 is 0.890. The R-value of 0.943 indicates positive and very high extent of prediction, while R^2 value of 0.890 which is the coefficient of determination show the extent of prediction on how problem solving skills predict Mathematics Students' anxiety in test taking. In addition, 89.0% variance in Mathematics Students' anxiety in test taking is predicted by their problem solving skills. This means that problem solving skills very highly predicts Mathematics Students' anxiety in test taking.

Research Question 2

To what extent does critical thinking skills predict Mathematics Students' anxiety in test taking?

Table 2: Simple Linear Regression Analysis of critical thinking skills and Mathematics Students' anxiety in test taking

Variables	R	R^2	Extent of Prediction	Adjusted R^2	Remarks
Critical thinking skills Students' anxiety in test taking	0.570	0.324	32.4%	0.322	Moderate Extent of Prediction

Source: Researcher's survey (2024)

In Table 2, the results reveal that R-value is 0.570 and R^2 is 0.324. The R-value of 0.570 indicates positive and moderate extent of prediction, while R^2 value of 0.324 which is the coefficient of determination show the extent of prediction on how critical thinking skills predict Mathematics Students' anxiety in test taking. In addition, 32.4% variance in Mathematics Students' anxiety in test taking is predicted by critical thinking skills. This means that critical thinking skills moderately predict Mathematics Students' anxiety in test taking.

Research Question 3

To what extent does attitude predict Mathematics Students' anxiety in test taking?

Table 3: Simple Linear Regression Analysis of attitude and Mathematics Students' anxiety in test taking

Variables	R	R^2	Extent of Prediction	Adjusted R^2	Remarks
Attitude Students' anxiety in test taking	0.849	0.721	72.1%	0.720	Very High Extent of Prediction

Source: Researcher's survey (2023)

In Table 4.3, the results reveal that R-value is 0.849 and R^2 is 0.721. The R-value of 0.849 indicates positive and very high extent of prediction, while R^2 value of 0.721 which is the coefficient of determination show the extent of prediction on how attitude predict Mathematics Students' anxiety in test taking. In addition, 72.1% variance in Mathematics Students' anxiety in test taking is predicted by attitude. This means that attitude very highly predicts Mathematics Students' anxiety in test taking.

Hypothesis 1

Problem solving skills do not significantly predict Mathematics Students' anxiety in test taking.

Table 4: Result for Simple Linear Regression Analysis of Prediction of Problem solving skills and Mathematics Students' anxiety in test taking

Variables	Sources of Variation	Sum of Square	Df	MS	p-cal	p-crit	Decision at p<.05
Problem solving skills	Regression	231.429	1	231.429			
Students' anxiety in test taking	Residual	28.571	248	.115	.000*	.05	Reject $H_0$1

*= Significant at .05 alpha level. Source: Researcher's survey (2024)

The results of Table 4 show that the calculated p- value of .000 is less than the critical p-value of .05 level of significance, with 1 and 248 degree of freedom. With this result, the null hypothesis that "Problem solving skills do not significantly predict Mathematics Students' anxiety in test taking" was rejected. This means Problem solving skills significantly predict Mathematics Students' anxiety in test taking.

Hypothesis 2

Critical thinking skills do not significantly predict Mathematics Students' anxiety in test taking.

Table 5:Result for Simple Linear Regression Analysis of Prediction of Critical thinking skills and Mathematics Students' anxiety in test taking

Variables	Sources of Variation	Sum of Square	Df	MS	p-cal	p-crit	Decision at p<.05
Students' attitudes	Regression	84.366	1	84.366			
Academic performance	Residual	175.634	248	.708	.000*	.05	Reject $H_0$2

*= Significant at .05 alpha level. Source: Researcher's survey (2024)

The results of Table 4.7 show that the calculated p- value of .000 is less than the critical p- value of .05 level of significance, with 1 and 248 degree of freedom. With this result, the null hypothesis that "Critical thinking skills do not significantly predict Mathematics Students' anxiety in test taking" was rejected. This means Critical thinking skills significantly predict Mathematics Students' anxiety in test taking.

Hypothesis 3

Attitude do not significantly predict Mathematics Students' anxiety in test taking.

Table 8: Result for Simple Linear Regression Analysis of Prediction of Attitude and Mathematics Students' anxiety in test taking

Variables	Sources of Variation	Sum of Square	Df	MS	p-cal	p-crit	Decision at p<.05
Attitude Students' anxiety in test taking	Regression	187.392	1	187.392	.000*	.05	Reject $H_0$3
	Residual	72.608	248	.293			

*= Significant at .05 alpha level. Source: Researcher's survey (2023)

The results of Table 8 show that the calculated p- value of .000 is less than the critical p- value of .05 level of significance, with 1 and 248 degree of freedom. With this result, the null hypothesis that "Attitude do not significantly predict Mathematics Students' anxiety in test taking" was rejected. This means Attitude significantly predict Mathematics Students' anxiety in test taking.

Discussion of Findings

Problem solving skills and Mathematics Students' anxiety in test taking

The result of hypothesis one revealed that, Problem solving skills do not significantly predict Mathematics Students' anxiety in test taking. It was also revealed that Problem solving skills very highly predicts Mathematics Students' anxiety in test taking. This finding could be attributed to the fact that strong skills enable students to approach complex problems with confidence, reducing fear and uncertainty. When students are adept at breaking down problems and finding solutions, they experience less stress and feel more prepared for exams. Conversely, a lack of problem-solving skills can heighten anxiety, as students may feel overwhelmed and unsure of how to tackle challenging questions. The findings of this study agreed with the findings of James (2018), who reported that there is a significant relationship between problem solving skills and students' anxiety in Universities in South South, Nigeria.

Critical Thinking skills and Mathematics Students' anxiety in test taking

The result of hypothesis two revealed that, Critical thinking skills do not significantly predict Mathematics Students' anxiety in test taking. It was also revealed that Critical thinking skills moderately predicts Mathematics Students' anxiety in test taking. This finding could be attributed to the fact that Critical thinking skills enable students to analyze and evaluate problems logically, leading to greater confidence and reduced anxiety. When students can effectively assess questions and apply reasoned strategies, they feel more prepared and less intimidated by tests. Conversely, weak critical thinking skills can increase anxiety, as students may struggle to understand and solve complex problems under exam conditions. The findings of this study agreed with the findings of Adedeji (2017) who reported that there is a significant impact of critical thinking on test anxiety in Mathematics in secondary schools.

Attitude and Mathematics Students' anxiety in test taking

The result of hypothesis three revealed that, Attitude do not significantly predict Mathematics Students' anxiety in test taking. It was also revealed that attitude very highly predicts Mathematics Students' anxiety in test taking. This finding could be attributed to the fact that a positive attitude towards the subject can boost confidence and reduce stress. Students who view mathematics as a challenge they can overcome are likely to approach tests with less anxiety and more determination. Conversely, a negative attitude can heighten anxiety, as students may feel defeated before even beginning the test, affecting their performance and overall experience. The findings of this study agreed with the findings of Adedeji (2017) who reported that there is a significant impact of attitude on test anxiety in Mathematics in secondary schools.

Conclusion

Based on the findings, it was concluded that problem solving skills, critical thinking skills and attitude significantly predict Mathematics Students' anxiety in test taking. Hence, psycho-academics variables help to reduce Mathematics Students' anxiety in test taking.

Recommendations

Based on the findings, the following recommendations were made;

1. Teachers should encourage students to possess problem solving skills since it help them to reduce Mathematics anxiety in test taking.

2. Teachers should encourage students to possess critical thinking skills since it help them to reduce Mathematics anxiety in test taking.
3. Principals should encourage students to possess a positive attitude towards Mathematics since it could help reduce their anxiety in test taking.

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