

Stress Management as a Predictor of Secondary School Students' Academic Achievement in Biology in Anambra State, Nigeria

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Abstract

The study investigated stress management as a predictor of secondary school students' academic achievement in Biology in Anambra State, Nigeria. A predictive correlational design was adopted. The population comprised 42,572 Senior Secondary Two (SS2) students offering Biology, from which a sample of 1,000 students was drawn using multistage sampling. The instrument for data collection was the Coping Orientation to Problems Experienced Questionnaire (COPEQ), adapted from Carver, Scheier and Weintraub (1989), which measured fourteen dimensions of stress management. Students' Biology achievement scores were obtained from teachers' records. The COPEQ was validated by three experts and yielded a Cronbach's alpha reliability coefficient of 0.81. Data were analysed using simple and multiple linear regression. The findings revealed that stress management significantly predicted 1.2% of the variance in Biology achievement, with a positive unstandardised coefficient ($B = 0.078$). All fourteen dimensions of stress management contributed significantly to the prediction, with positive reinterpretation, self-blame, and use of informational support making the strongest contributions. It was concluded that while stress management is a significant predictor of Biology achievement, its effect is modest, and any active coping behaviour, whether adaptive or maladaptive, appears to be better than passivity. Recommendations included that Biology teachers should encourage students to verbalise academic frustrations and seek help, and that school counsellors should design stress-management interventions that normalise active engagement with academic pressure.

Keywords: *Stress management, academic achievement, Biology, coping strategies, secondary school, Nigeria*

Introduction

Biology is a core science subject in Nigerian secondary schools, underpinning careers in medicine, agriculture, and environmental conservation. However, student performance in Biology has remained persistently below expectations, as reflected in West African Senior School Certificate Examination (WASSCE) reports (WAEC, 2021, 2024). While factors such as inadequate laboratory facilities and teacher-centred instruction have been extensively studied, psychological variables, particularly how students manage academic stress, have received less attention. Stress, defined as a physiological and psychological response to perceived challenges (Wang & Saudino, 2022), is particularly relevant in the Nigerian context where examination pressure, heavy workloads, and high familial expectations are prevalent (Eneogu & Ugwu, 2022). Stress management, according to Ilonze (2024), involves strategies that regulate and reduce stress, thereby enhancing cognitive functioning. In Biology, which demands memorisation of complex terminology, understanding of

hierarchical systems, and application of concepts, effective stress management may be critical for maintaining concentration, memory retrieval, and problem-solving ability. Stress management comprises a range of coping strategies. Lazarus and Folkman's (1984) transactional model distinguishes problem-focused coping (active coping, planning, seeking informational support, positive reinterpretation) and emotion-focused coping (venting, seeking emotional support, humour, acceptance, self-blame, religion) as well as avoidance coping (self-distraction, denial, substance use, behavioural disengagement). Each strategy may influence academic achievement differently. For instance, positive reinterpretation, reframing a challenging topic as an opportunity to learn, may enhance intrinsic motivation, whereas self-blame, despite its maladaptive reputation, might reflect personal responsibility that drives effort. Understanding which coping dimensions predict Biology achievement most strongly is essential for designing targeted interventions. Empirical reviews on stress management and academic achievement have yielded consistent findings. Owoyele (2009) found a strong positive relationship between stress management skills and undergraduate academic achievement in Nigerian universities. Abdulrahman and Kawthara (2019) reported that relaxation, lifestyle management, and meditation strategies significantly correlated with academic performance among university undergraduates in Kwara State. Amaefule (2021) documented that guided imagery, time management, and healthy lifestyle strategies were significantly related to secondary school students' academic achievement in Onitsha South, Nigeria. Yazdanpanah and Marashian (2023) provided experimental evidence that cognitive-behavioural stress management training improved academic achievement among university entrance examination applicants in Iran. Okoro (2024) identified learning security, adequate counselling services, and avoidance of unnecessary competitions as stress management strategies among university students in Delta State, Nigeria. However, no previous study has simultaneously examined the relative contributions of fourteen distinct stress management dimensions to Biology achievement among secondary school students in Anambra State, a gap the present study seeks to address

Purpose of the Study

The purpose of the study was to determine stress management as a predictor of secondary school students' academic achievement in Biology in Anambra State. Specifically, the study sought to determine:

- 1 The predictive value of stress management on students' academic achievement scores in Biology.
- 2 The relative contribution of the dimensions of stress management (active coping, use of informational support, planning, positive reinterpretation, venting, use of emotional support, humour, acceptance, self-blame, religion, self-distraction, denial, substance use, behavioural disengagement) to the prediction of academic achievement in Biology.

Research Questions

The following research questions guided the study:

1. What is the predictive value of stress management on secondary school students' academic achievement in Biology?
2. What are the relative contributions of the fourteen dimensions of stress management to the prediction of secondary school students' academic achievement in Biology?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. Stress management is not a significant predictor of students' academic achievement in Biology.

2.The relative contributions of the dimensions of stress management to the prediction of students' academic achievement in Biology are not significant.

Method

The study adopted a predictive correlational research design, which is appropriate for examining the relationship between predictor variables and a dependent variable without manipulation, and for determining the extent to which variance in the dependent variable can be explained by the predictors (Nworgu, 2015). The study was conducted in Anambra State, Nigeria, a region with a well-developed educational infrastructure and a high concentration of public secondary schools, making it suitable for investigating cognitive and psychological predictors of academic achievement. The population comprised all 42,572 Senior Secondary Two (SS2) students offering Biology in public secondary schools in Anambra State during the 2025/2026 academic session (source: Planning, Research and Statistics Department, Post Primary Schools Services Commission, Awka, 2024). SS2 students were chosen because they have accumulated sufficient academic experience to exhibit measurable stress management patterns and their Biology achievement scores for three terms were readily available in school records. A multistage sampling procedure was employed to obtain a sample of 1,000 students. First, five education zones (Aguata, Onitsha, Nnewi, Awka and Ogidi) were randomly selected from the six zones in the state. Second, within each selected zone, five public secondary schools were selected using simple random sampling, giving a total of 25 schools. Third, within each school, the first 40 students offering Biology whose three-term achievement scores for the 2024/2025 academic session were available in teachers' folders were purposively selected, yielding 1,000 participants (458 males, 542 females). This multistage approach ensured geographical representation and accessibility of academic records. The instrument for data collection was the Coping Orientation to Problems Experienced Questionnaire (COPEQ), adapted from Carver, Scheier and Weintraub (1989). The COPEQ is a 60-item multidimensional tool that measures fourteen coping strategies: active coping, use of informational support, planning, positive reinterpretation, venting, use of emotional support, humour, acceptance, self-blame, religion, self-distraction, denial, substance use, and behavioural disengagement. Each dimension consists of four items, and responses are rated on a 4-point Likert scale ranging from 1 ("I haven't been doing this at all") to 4 ("I have been doing this a lot"). Scores for each scale are summed, with higher scores indicating more frequent use of that coping strategy. The COPEQ was validated by three experts – two from the Department of Science Education and one from the Department of Educational Foundations (Measurement and Evaluation Unit) at Nnamdi Azikiwe University, Awka – who assessed item clarity, relevance, and appropriateness for SS2 students. The reliability of the COPEQ was established using Cronbach's alpha, which yielded a coefficient of 0.81, indicating acceptable internal consistency. Students' academic achievement in Biology was obtained from teachers' record folders; the average score from three terms (first, second, and third terms) of the 2024/2025 academic session was computed for each student. Ten research assistants, who were colleagues of the researcher and worked closely with Biology teachers in the sampled schools, were trained on the study procedures. They obtained permission from school heads, collected students' Biology scores, and administered the COPEQ to the 1,000 students under standardised conditions, collecting the questionnaires immediately to ensure a high return rate. Data were analysed using simple linear regression to determine the predictive value of overall stress management, and multiple linear regression to determine the relative contributions of the fourteen dimensions. All null hypotheses were tested at the 0.05 significance level, and hypotheses were rejected when the p-value was ≤ 0.05 .

Results

Research Question 1: What is the predictive value of stress management on secondary school students' academic achievement in Biology?

Table 1: Prediction of Students' Achievement score in Biology by Stress Management (SM)

Model	R	R ²	Adjusted R ²	Unstandardized coefficients (B)	Std. Error
Constant				62.327	
SM	.109 ^a	.012	.011	.078	14.812

a. Predictors: (Constant), Stress management

Table 1 shows that there is a low positive relationship ($R = 0.109$) between stress management and achievement in Biology. Also, the R-Square value of .012 indicates that 1.2 percent of the variance in students' Biology achievement score is predicted by stress management. The unstandardized coefficient B of .078 shows that a unit rise in stress management increases achievement score in Biology by 7.8%.

Research Question 2: What are the relative contribution of the dimensions of stress management (active coping, use of informational support, planning, positive reinterpretation, venting, use of emotional support, humour, acceptance, self-blames, religion, self-distraction, denial, substance use, behavioural disengagement) to prediction of secondary school students' academic achievement in Biology?

Table 2: Contributions of the Dimensions of Stress management in the Prediction of Achievement scores in Biology

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	67.628	3.130		21.604	.000
Active Coping	2.868	.795	.221	3.607	.000
Use of Informational Support	3.402	.501	.293	6.788	.000
Planning	1.153	.438	.102	2.631	.009
Positive Interpretation	7.455	1.391	.505	5.360	.000
Venting	1.710	.651	.133	2.626	.009
Use of Emotional Support	2.383	.756	.192	3.151	.002
Humour	.915	.360	.095	2.542	.011
Acceptance	1.292	.548	.107	2.357	.019
Self-Blames	4.737	1.440	.318	3.291	.001
Religion	1.369	.455	.121	3.008	.003
Self-Distraction	1.875	.625	.145	2.999	.003
Denial	1.878	.762	.146	2.463	.014
Substance Use	2.598	.650	.201	3.995	.000
Behavioural Disengagement	1.606	.751	.124	2.138	.033

Table 2 shows the standardized beta coefficient which indicates predictive correlation between individual dimensions of stress management and achievement score in Biology. The unstandardized B coefficient shows the predictive value of each dimension of stress management which indicates their relative contribution to achievement score in Biology. Table 4.2 shows that achievement in Biology increases by 2.868 whenever a students' active coping increases by one unit, by 3.402 for every unit increase in use of informational support,

1.153 for every unit increase in planning, 7.455 for positive interpretation, 1.710 for venting, 2.383 for use of emotional support, .915 for humour, 1.292 for acceptance, 4.737 for self-blames, 1.369 for religion, 1.875 for self-distraction, 1.878 for denial, 2.598 for substance use and 1.606 for a unit increase in behavioural disengagement. The order of relative contribution to achievement score in Biology from the highest to lowest by each dimension of stress management therefore is; positive interpretation, self-blames, use of informational support, active coping, substance use, use of emotional support, denial, self-distraction, venting, behavioural disengagement, acceptance, planning, and humour.

Hypothesis 1: Stress management is not a significant predictor of achievement scores of students in Biology.

Table 3: Significance of Prediction of Achievement score in Biology by Students' Stress management

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	2641.103	1	2641.103	12.038	.001 ^b
1 Residual	218956.336	998	219.395		
Total	221597.439	999			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Stress management

Table 3 shows that stress management is a significant predictor of achievement scores in Biology, $F(1, 998) = 12.038$ $p < .05$. The null hypothesis was therefore rejected meaning that stress management is a significant predictor of secondary school students' achievement scores in Biology. Since stress management is a significant predictor of achievement scores in Biology, the regression model ($Y = a + bX$) for the prediction of achievement score in Biology as derived from Table 1, where constant = 62.327 and b value = .078 is:

$$\text{Achievement} = 62.327 + 078 (\text{SM})$$

Where, Achievement = Achievement score in Biology and SM = Stress management.

Hypothesis 2: The relative contributions of the dimensions of stress management (active coping, use of informational support, planning, positive reinterpretation, venting, use of emotional support, humour, acceptance, self-blames, religion, self-distraction, denial, substance use, behavioural disengagement) to prediction of students' academic achievement in Biology will not be significant.

Table 4: Significance of Prediction of Achievement score in Biology by the Individual Dimensions of Students' Stress management

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	31833.000	14	2273.786	11.802	.000 ^b
1 Residual	189764.439	985	192.654		
Total	221597.439	999			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Behavioural Disengagement, Humour, Planning, Religion, Use of Informational Support, Acceptance, Self-Distraction, Venting, Use of Emotional Support, Substance Use, Denial, Active Coping, Positive Interpretation, Self-Blames

Table 4 shows that all the individual dimension of stress management jointly predicted the students' achievement scores in Biology significantly, $F(14, 985) = 11.802$, $p < .05$. However, data contained in Table 2 shows the significance of the contributions of the individual dimensions to the prediction of achievement scores in Biology.

Table 2 shows that all the dimensions of stress management are a significant predictor of achievement scores in Biology, active coping $t(14, 985) = 3.607, p < 0.05$, use of information support $t(14, 985) = 6.788, p < 0.05$, planning $t(14, 985) = 2.631, p < 0.05$, positive interpretation $t(14, 985) = 5.360, p < 0.05$, venting $t(14, 985) = 2.626, p < 0.05$, use of emotional support $t(14, 985) = 3.151, p < 0.05$, humour $t(14, 985) = 2.542, p < 0.05$, acceptance $t(14, 985) = 2.357, p < 0.05$, self-blame $t(14, 985) = 3.291, p < 0.05$, religion $t(14, 985) = 3.008, p < 0.05$, self-distraction $t(14, 985) = 2.999, p < 0.05$, denial $t(14, 985) = 2.463, p < 0.05$, substance use $t(14, 985) = 3.995, p < 0.05$, and behavioural disengagement $t(14, 985) = 2.138, p < 0.05$. Thus, all the dimensions of stress management are significant contributors to the achievement score of students in Biology in the following order of significance: positive interpretation, self-blames, use of informational support, active coping, substance use, use of emotional support, denial, self-distraction, venting, behavioural disengagement, religion, acceptance, planning, and humour. However, since the joint prediction of all the dimensions of stress management in the prediction of achievement score in Biology is significant, the regression model ($Y = a + bX_1 + cX_2 + cX_3 \dots$) for the prediction of achievement score in Biology as derived from Table 2 is as follows:

$$\text{Achievement} = 67.628 + 2.868 (\text{ACTP}) + 3.402(\text{UIS}) + 1.153(\text{PLN}) + 7.455(\text{POI}) + 1.710(\text{VNT}) + 2.383(\text{UES}) + .915(\text{HUM}) + 1.292(\text{ACEPT}) + 4.737(\text{SEB}) + 1.369(\text{REL}) + 1.875(\text{SED}) + 1.878(\text{DEN}) + 2.598(\text{SBU}) + 1.606(\text{BEHS})$$

Where, Achievement = Achievement score in Biology and ACTP = active coping, UIS = Use of informational support, PLN = Planning, POI= Positive Interpretation, VNT = Venting, UES = Use of emotional support, HUM = Humour, ACEPT = Acceptance, SEB = Self-blame, REL = Religion, SED = Self-distraction, DEN = Denial, SBU = Substance use, BEHS = Behavioural Disengagement

Discussion

The finding that stress management significantly predicts Biology achievement, though explaining only a small proportion of variance, can be understood through the cognitive demands of the subject itself. Biology requires students to retain voluminous terminology, understand hierarchical systems from cells to ecosystems, and apply concepts to unfamiliar scenarios, all of which place considerable strain on working memory. When students employ any form of active coping, they likely reduce the cognitive load imposed by worry and self-doubt, thereby freeing mental resources for understanding complex processes such as photosynthesis or genetic inheritance. Moreover, students who actively manage their stress are more likely to persist through difficult topics rather than disengage, and this persistence translates into more sustained study habits across an academic year. A second explanation lies in the transactional nature of stress appraisal within the Nigerian secondary school context, where Biology is often perceived as a challenging subject with high examination stakes. Students who perceive academic stressors as challenges rather than threats are more likely to activate coping strategies, and this positive appraisal itself may enhance their academic self-efficacy in Biology. The cultural emphasis on educational achievement in Anambra State may also mean that students who openly acknowledge and address their stress are viewed favourably by teachers, potentially receiving more instructional support and encouragement. The present finding aligns with Owoyele (2009), who reported a strong positive relationship between stress management skills and undergraduate academic achievement in Nigerian universities, as well as with Abdulrahman and Kawthara (2019), who found that relaxation, lifestyle, and meditation strategies significantly correlated with academic performance among university undergraduates in Kwara State. Amaefule (2021) similarly documented that guided imagery, time management, and healthy lifestyle strategies related significantly to secondary school students' academic achievement in Onitsha

South, confirming that the predictive role of stress management extends across educational levels within Nigeria. Yazdanpanah and Marashian (2023) provided experimental evidence that stress management training improved academic achievement among university entrance examination applicants, which supports the directional interpretation that stress management causally influences achievement. The finding that positive reinterpretation contributed most strongly to Biology achievement can be explained by the nature of biological concepts, which often appear abstract or disconnected from daily experience until reframed in relatable terms. A student who learns to view a difficult topic like meiosis not as an obstacle but as an intellectually interesting puzzle is more likely to invest the sustained attention required for mastery. Self-blame, despite its maladaptive reputation, emerged as the second strongest contributor, which may reflect that students who take personal responsibility for poor performance are simultaneously acknowledging their agency in improving; this internal attribution could motivate increased study effort in Biology specifically. The presence of substance use and denial as positive predictors, while concerning, might indicate that students who resort to these strategies are nonetheless actively responding to stress rather than withdrawing academically, and any behavioural response may be better than complete disengagement when facing challenging Biological processes. The relatively weaker contributions of planning and humour suggest that these strategies may be less applicable to the specific stressors of Biology learning, which often involve cumulative understanding rather than discrete tasks that can be easily scheduled. Planning may prove ineffective when the underlying difficulty is conceptual misunderstanding rather than time management, and humour might be culturally inappropriate or ineffective in the serious academic environment of Nigerian secondary schools. The significant contribution of seeking informational support underscores that Biology, with its specialised vocabulary and hierarchical concepts, is a subject where asking for explanations from teachers or peers directly addresses the source of academic stress. The distinct hierarchy of coping dimensions observed in this study likely reflects a unique interplay between the cognitive demands of Biology and the socio-cultural expectations of students in Anambra State. Abdulrahman and Kawthara (2019) found that relaxation, lifestyle, and meditation strategies each showed positive relationships with academic performance, supporting the general notion that multiple coping dimensions matter. Amaefule (2021) specifically identified guided imagery, time management, and healthy lifestyle as significantly related to academic performance, which partially aligns with the present finding that planning and active coping contributed positively, though the present study found planning to be among the weaker predictors. The absence in previous literature of a detailed ranking of fourteen coping dimensions for Biology achievement highlights the novelty of the present contribution and suggests that future research should examine whether the observed hierarchy replicates in other science subjects.

Conclusion

The study concluded that stress management is a significant but modest predictor of secondary school students' achievement in Biology in Anambra State. All fourteen dimensions of stress management, including both adaptive and maladaptive strategies, positively contributed to achievement, indicating that active engagement with academic stress is more important than the specific strategy employed. The strongest predictors were positive reinterpretation, self-blame, and use of informational support.

Recommendations

1. Biology teachers should encourage students to verbalise academic frustrations and actively reframe challenging topics, as positive reinterpretation was the strongest predictor.
2. School counsellors should design stress-management interventions that normalise active

coping, even in imperfect forms, while gradually replacing maladaptive strategies (e.g., substance use) with adaptive ones (e.g., help-seeking).

3. Parents and teachers should be sensitised to the finding that self-blame, though uncomfortable, can be a precursor to effort; they should guide students to transform self-criticism into constructive problem-solving rather than shaming.

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