



Correlation Between Reach and Endurance Adversity Intelligence Quotients on Achievement in Physics among Secondary School Students in North-Central, Plateau State, Nigeria

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Abstract

This study examined Correlation between Reach and Endurance adversity intelligence Quotients on academic achievement in Physics Concepts among secondary school Students in North-Central, Plateau State, Nigeria. The Study was Guided by three research questions and corresponding null hypotheses tested at 0.05 alpha level, the study was underpinned by Resilience Theory Masten (2001) and Hardiness Theory Kobasa (1979), adopted correlational survey research design with population of 22,959 SSIII students in 2024/2025 academic session. Using Taro Yamane's formula, 387 students were sampled by multiple procedure. Data were collected using two validated instruments namely: Physics Students' Adversity Quotient Questionnaire (PSAQQ) and Physics Students' Academic Achievement Proforma (PSAAP), with Content Validity Index (CVI) = 0.86, Content Validity Ratio (CVR) = 0.87, and Cronbach's alpha reliability of 0.82 for PSAQQ. Mean and standard deviation, linear and multiple regression were used for data analysis of the research questions and hypotheses respectively. Findings showed high level mean score for endurance (3.64), moderate level mean score for reach (3.44). AIQ components had a significant relationship with Physics academic achievement: reach ($r=0.17$, $p<0.05$), endurance ($r=0.16$, $p<0.05$). The composite relationship is revealed by the multiple linear regression model summary revealed ($r=0.20$; adjusted $R^2=0.03$), with significant predictive relationship $F(2, 384)=3.85$; $p<0.05$). Based on the results it was recommended that reach and endurance AIQ components should be utilized by physics teachers in their pursuit to enhance academic achievement.

Key Words: Reach and endurance AIQ, Secondary school, Academic achievement in physics.

Introduction

Physics forms the foundation of technological innovation and is crucial to national development. It underpins nearly every aspect of life, from the functioning of the human eye through the electromagnetic rays of light powering vision to walking, washing clothes where it absorbs the soapy water through capillarity and breakdown the dirt in cloth thereby making it clean and cooking food through effect of heat either by conduction, convection or radiation to make the raw molecules of food well cooked and delicious (Tyos & Fwangle, 2025). Everyday activities such as the friction enabling us to walk or the blotting of ink on paper through a phenomenon called capillarity are practical Physics applications. Thus, Physics is central to life, and everyone should have a basic understanding of it. Studying Physics can lead to careers in bio-engineering, manufacturing, mining, and construction. In today's digital age, Physics education in secondary schools is crucial, as



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scientific literacy anchored in Physics is essential for all, not just those pursuing Science Technology Engineering and Mathematics (STEM) careers (Frolova et al., 2020; Fasanya & Abdulwaheed, 2023). Despite the importance of Physics to humanity and national development, students' academic achievement in the subject at senior secondary level has remained persistently poor. The 2023 West African Examination Council (WAEC) Chief Examiners' Report noted that fewer than 50% of Physics candidates obtained a credit pass or higher grade required for university admission into Physics dependent fields. This poor performance was attributed to weak student drive, ineffective teaching and learning methods. National WAEC data from 2010 to 2017 shows only an average of four in every ten obtain credit pass while an average of six in every ten failed (Plateau State Ministry of Education, 2024). While this trend of achievement looks partly fair, more effort is required to improve, surpass and sustain it so that Nigeria can take her place among other comity of nations as regards to Science Technology Engineering and Mathematics (STEM) programmes and careers (Knowles et al. 2018). Low enrolment and poor academic achievement in Physics have been attributed partly to the difficult and abstract nature of some concepts in the subject as well as the mathematical/quantitative nature of the subject (Okoronka, 2018). Further, the Physics subject achievement data from 2022 to 2024 at national level revealed only an average of three in every ten obtain credit pass while an average seven in every ten failed, indicating a very low number of students meeting the University admission threshold (PSME, 2024). This raised concerns about students' potential for securing admission into higher institutions to study courses in STEM fields which have stringent requirements. This pattern mirrors the national trend and poses a challenge for Nigeria's aspirations in STEM within the global digital landscape (Knowles et al. 2018; Frolova, et al. 2020). Researchers like, Usman and Jilang (2018); Usman and Mankilik (2019) had affirmed that students' Senior Secondary Certificate Examination (SSCE) Physics results have generally been poor nationally and specifically in Plateau State. Understanding the factors affecting students' academic achievement is crucial for educators and policymakers. Influential factors include individual determination, coping strategies, teacher-student interactions, classroom environment, and socio-economic status. One factor that may be under explored for students' success is the reach and endurance dimensions of adversity intelligence, which may also influence success in every area of human endeavor. Adversity Intelligence Quotient (AIQ) reflects a student's capacity to overcome obstacles, problems, challenges and maintain focus on goals without allowing the situation to overwhelmed the individual's success academically (Stoltz, 1997). Integrating reach and endurance dimensions of AIQ into education can help students build resilience, improve coping skills, and drive academic success through exposure to challenging tasks and guided support (Tripathi & Bajpai, 2022).

The proponent of adversity intelligence quotient maintained that in a world of several challenges and problems especially this present generation where natural disasters like wild fire, hurricane, tsunami, volcanic eruptions and ethnic clashes tamper with normal life calls for adversity intelligence which comprises reach and endurance in this study (Stoltz, 1997). Students may dearly need this intelligence utilized maximally to cope in such difficult times were hunger and pressure from hardship due to global economic meltdown is affecting almost the whole world. This study specifically researches the dimensions of reach and endurance as further discussed, Suryandari and Yuliana, (2021) define the Reach Adversity Intelligence Quotient (RAIQ) dimension as the extent to which difficulties impact one's life. Wang et al. (2021) undertook a study on the analysis of the adversity quotient of students in Macao: A cross-section and correlation study. The study reveals that reach adversity quotient scores were negatively correlated with the coping style of nursing students in Macao. Once again, Mohd and Mohd (2020) undertook a study on the development of the adversity



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quotient index of pre-service teachers in the Institute of Teacher Education Font and the result shows pre-service (students) teachers reach adversity intelligence quotient dimension is at moderate level. Hence from these, one may sustain that the RAIQ dimension is to envision beyond immediate challenges and difficulties; innovate and implement effective strategies to overcome difficulty. Furthermore, Singh and Parveen (2018) maintained that the Endurance Adversity Intelligence Quotient (EAIQ) dimension is how extended to the difficulties and obstacles are tolerated by any person. Also, Espanola (2016) conducted a study and results revealed that EAIQ and academic performance show a weak positive correlation with each other and are not significant. Again, in another study, Mwivanda, (2021) investigated the relationship between adversity intelligence and students' academic performance in public secondary schools in Kenya and the study revealed that the endurance adversity intelligence dimension had a strong positive correlation and significant influence on students' academic performance. On the contrary, Wang, et al. (2021) undertook a study on analysis of the adversity quotient of students in Macao: A cross-section and correlational study. The study reveals that endurance adversity quotient scores were negatively correlated with coping style scores of students in Macao. Regardless of the recognition of students' AIQ as one of the determining factors for academic success as expressed by different researchers, some findings show a positive relationship between adversity intelligence and academic achievement while some otherwise, there is a dearth research based evidence exploring the relationship between students' adversity intelligence dimensions of reach, endurance and academic achievement in first subjects like Physics generally (Mwivanda , 2021; Wang et al. 2021). This study fills a gap, as most adversity intelligence studies globally focus more on other subjects, with limited research on Physics, particularly in Plateau State, North-Central Nigeria. The region faces unique educational challenges, including limited resources, inadequate teacher training, insecurity, and socio-cultural factor impacting student academic achievement. Against this backdrop, there was a need to conduct this research on students' adversity intelligence dimensions of reach, endurance and academic achievement in Physics among secondary schools in Plateau State, Nigeria.

Objectives of the Study

The objectives of the study were, to determine the:

1. Effect of Reach AIQ on academic achievement in Physics among secondary school Students in North-Central region of Plateau State, Nigeria
2. Effect of Endurance AIQ on academic achievement in Physics among secondary school Students in North-Central region of Plateau State, Nigeria
3. Correlation between Reach and Endurance AIQ on academic achievement in Physics among secondary school Students in North-Central region of Plateau State, Nigeria

Research Questions

- RQ₁: What is the level of reach AIQ in Physics Concepts among senior secondary school Students in North-Central Plateau State?
- RQ₂: What is the level of Endurance AIQ in Physics Concepts among senior secondary school Students in North-Central Plateau State?
- RQ₃: What is the mean Academic achievement score among in Physics Concepts among senior secondary school Students in North-Central Plateau State?

Null Hypotheses

- H₀₁: There is no significant relationship between reach AIQ and academic achievement in Physics concepts among senior secondary school students in North-Central Plateau State.



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H₀₂: There is no significant relationship between endurance AIQ and academic achievement in Physics concepts among senior secondary school students in North-Central Plateau State.

H₀₃: There is no significant relationship between Reach and Endurance AIQ on academic achievement in Physics among senior secondary school Students in North-Central Plateau State.

Literature Review

The study was underpinned by Resilience Theory (Masten, 2001) and Hardiness Theory (Kobasa, 1979). Resilience Theory (RT), as proposed by Masten (2001), defines resilience as the capacity of individuals to successfully adapt or bounce back from adversity, stress, or risk, using internal strengths and external resources, emphasizing ordinary adaptive processes and protective factors like supportive teachers and self-efficacy. Hardiness Theory (HT) by Kobasa (1979), posited as a personality style or pattern associated with continued good health and performance under stress, that enables stress resistance and performance sustainability, comprising commitment, control, and challenge. These theories explain how students navigate academic adversity in Physics, a subject requiring abstract reasoning and problem-solving. Adversity Intelligence Quotient (AIQ) measures students' resilience capacities, capturing the interplay of psychological resilience and hardiness. Students with high AIQ reinterpret setbacks constructively, persevere under challenges, and maintain academic achievement despite difficulties. In Plateau State, Nigeria, where insecurity, poverty, and displacement create learning barriers, fostering resilience and hardiness may enhance Physics academic achievement. The integrated framework of RT and HT offers insights into students' adaptive functioning, shedding light on why some students succeed in Physics despite obstacles. This study examines how resilience and hardiness contribute to academic achievement in Physics among senior secondary schools in Plateau State, Nigeria.

The *reach* component of the Adversity Intelligence Quotient (AIQ) refers to how individuals perceive the extent to which adversity affects various areas of their lives, including academics. Tripathi and Bajpai (2022) define reach as the perceived spread of adversity across life domains. High-reach individuals compartmentalize adversity, preventing it from impacting unrelated areas, while low-reach individuals allow it to spill over, amplifying stress. Singh and Parveen (2018) describe RAIQ as one's perception of how adversity extends beyond the initial issue. Suryandari and Yuliana (2021) observe that low-RAIQ individuals exaggerate problems, disrupting their peace, while high-RAIQ individuals limit adversity's scope and cope better. Hence from these definitions, one may say that the RAIQ dimension is to; (i) envision beyond immediate challenges and difficulties. (ii) Innovate and implement effective strategies to overcome difficulty. (ii) Maintain holistic well-being, ensuring no aspect of life is compromised. Tripathi and Bajpai (2022) found a strong positive correlation between RAIQ and academic achievement ($r = 0.61, p < 0.05$) among Indian secondary school students. Mohd and Mohd (2020) reported a moderate RAIQ level in pre-service teachers. Espanola (2016) found a weak, non-significant positive correlation between RAIQ and academic performance. Similarly, Matore & Khairani (2019) reported a very weak but significant correlation. In contrast, Mwivanda (2021) found a strong positive correlation between RAIQ and academic performance in Kenyan secondary students. However, Wang et al. (2021) found a negative correlation between RAIQ and coping styles among Macao nursing students. These varying findings suggest the need for further research, especially among underrepresented secondary school populations. Given the inconsistent findings, more research is necessary to clarify RAIQ's role in academic outcomes. Further, *Endurance Adversity Intelligence Quotient (EAIQ)* reflects a student's ability to persist through prolonged challenges, playing a crucial role in academic success. Tripathi and Bajpai (2022) define endurance as how long one perceives adversity to last, influencing hope, optimism, and perseverance. High



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EAIQ individuals view adversity as temporary and believe solutions exist. Singh and Parveen (2018) describe EAIQ as the tolerance level for prolonged challenges. Matore et al. (2020) identify EAIQ indicators as the ability to anticipate challenge duration and seek solutions. High EAIQ scorers remain optimistic, believing every challenge ends eventually. Suryandari and Yuliana (2021) highlight that low EAIQ individuals see adversity as long-term, causing helplessness and pessimism, while high EAIQ individuals maintain resilience and positivity. From these definitions and discussions raised on the endurance adversity intelligence quotient dimension it is likely to opined that EAIQ is the ability to stay focused on any venture of importance not minding any distraction and hardship until the desired outcomes are obtained at hand. Tripathi and Bajpai (2022) found a low but significant positive correlation between EAIQ and academic achievement ($r = 0.29, p < 0.05$). Mwivanda (2021) observed a strong positive correlation between EAIQ and academic performance. Conversely, Espanola (2016) found a weak, non-significant correlation. Mohd and Mohd (2020) reported a high EAIQ level among pre-service teachers. However, Wang et al. (2021) found a negative correlation between EAIQ and coping styles among Macao nursing students. Similarly, Yazon (2019) reported a negative correlation between EAIQ and math proficiency in pre-service teachers. Given the mixed findings, further research is warranted to understand both RAIQ and EAIQ's full impact within the AIQ framework.

Research Methodology

This study employed a correlational survey design to examine relationships among variables without manipulation, enabling the identification of positive or negative associations (Bhandari, 2022). The study was conducted in Plateau State, Nigeria, comprising 17 Local Government Areas in the north-central region (NEWMAP, 2019). The population consisted of 22,959 SSIII Physics students in 311 public senior secondary schools, from which a sample of 387 students was drawn using Yamane's formula through a multistage sampling procedure (Yamane, 1973). Two instruments were used for data collection: The Physics Students' Adversity Quotient Questionnaire (PSAQQ) and the Physics Students' Academic Achievement Proforma (PSAAP). The PSAQQ was adapted from the Adversity Quotient Profile developed by Stoltz (1997) and structured on a five-point Likert scale to assess reach and endurance dimensions in Physics learning. The adapted PSAQQ has the following response modes Very High Level (VHL) = 5 points, High Level (HL) = 4 points, Moderate Level (ML) = 3 points, Low Level (LL) = 2 points and Very Low Level (VLL) = 1 point, Stoltz (1997). The PSAAP was used to obtain students recorded academic scores across three terms for the 2023/2024 session. The instruments were validated by experts in educational psychology, measurement and evaluation, and Physics education. Content validity indices were satisfactory (CVI = 0.85; CVR = 0.87), indicating adequacy (Genareo, 2023). Reliability of the PSAQQ was established through test-retest, yielding a Cronbach's alpha of 0.815, with subscale coefficients of 0.756 and 0.754, demonstrating good internal consistency (Taber, 2018). Data were collected through direct administration of instruments to respondents. Descriptive statistics (mean and standard deviation) were used to answer the research questions. The decision rule was based on real limits of numbers of; Very High Level (VHL) 4.50-5.00, High Level (HL) 3.50-4.49, Moderate Level (ML) 2.50-3.49, Low Level 1.50-2.49, Very Low Level 0.10-1.49. Hypotheses were tested using linear and multiple regression analyses at a 0.05 level of significance. The decision rule is based on predefined P-value at 0.05 level of alpha significance; when calculated ($P < 0.05$), the decision is to reject the null hypothesis that there is a statistically significant relationship. If the p-value ($P > 0.05$), the decision is that the null hypothesis was not rejected, that there is no statistically significant relationship.

Presentation of Results



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The results are presented in order of objectives, research questions and null hypotheses:

Research Question One:

What is the level of reach AIQ in Physics Concepts among senior secondary school Students in North-Central Plateau State?

Answering Research Question One:

Table 1: Mean and Standard Deviation of Reach AIQ Level Among Students Offering Physics in Senior Secondary School in Plateau State

S/N	ITEM (n = 387)	Mean	S. D	Remark
1	Difficulties in Physics are temporal and can be overcome.	3.39	1.01	ML
2	When I encounter a challenging Physics problem. I do not let it affect my overall confidence in the subject.	3.33	0.98	ML
3	I separate my performance in Physics from my abilities in other subjects.	3.43	1.02	ML
4	I view setbacks in Physics as isolated incident rather than signs of failure.	3.45	1.06	ML
5	My struggle in Physics do not define my overall academic capability.	3.41	1.04	ML
6	I am able to maintain focus on my Physics goals, even when faced with challenges.	3.48	1.10	ML
7	One poor performance in Physics does not predict my future results.	3.44	1.13	ML
8	I classify my experience in Physics from my experiences in other areas of life.	3.49	0.94	ML
9	I often remind myself that challenges in Physics are part of learning process.	3.47	0.93	ML
10	I am confident that I can improve my Physics skills, regardless of setback.	3.49	0.97	ML
	Grand Mean	3.44	1.02	ML

Source: (Field Survey Work, 2025)

Data on Table 1 examines the level of reach AIQ among the students. The overall mean score is 3.44 with a standard deviation of 1.02, indicating a Moderate Level (ML) of reach AIQ.

Null Hypotheses

H₀₁: There is no significant relationship between reach AIQ and academic achievement in Physics concepts among senior secondary school students in North-Central Plateau State.

Testing Hypothesis One:

Table 2a: Summary of Linear Regression Analysis of Relationship between Reach AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1729.704	1	1729.704	9.434	.002 ^b
	Residual	70587.970	385	183.345		
	Total	72317.674	386			

Source: (Field Survey Work, 2025)

a. Dependent Variable: Students' Academic Achievement

b. Predictors: (Constant), reach AIQ

Table 2a (ANOVA summary) reveals the overall model is statistically significant, with $F(1, 385) = 9.434$, $p = 0.002$ ($p < 0.05$), meaning reach AIQ explains variance in Physics achievement beyond

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chance. This suggests the predictor improves model fit compared to an intercept-only model. The linear regression analysis rejects the null hypothesis (Ho3), indicating a significant positive relationship between reach AIQ and students' academic achievement in Physics among senior secondary schools in Plateau State.

Table 2b: Model Summary of Relationship between Reach AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.155 ^a	.024	.021	13.54051

Source: (Field Survey Work, 2025)

a. Predictors: (Constant), reach AIQ

Table 2b shows a moderate correlation ($R = 0.155$) and modest explanatory power, as reach AIQ accounts for about 2.1% of the variance in academic achievement ($R^2 = 0.021$). The standard error of the estimate (13.54051) indicates typical prediction errors around 13.54 units on the achievement scale.

Table 2c: Coefficient of Beta of Relationship between Reach AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error			
1	(Constant)	52.734	4.456		11.835	.000
	reach AIQ	3.385	1.102	.155	3.072	.002

Source: (Field Survey Work, 2025)

a. Dependent Variable: Students' Academic Achievement

Table 2c confirms the positive effect: for each one-unit increase in reach AIQ, Physics achievement rises by 3.385 units (unstandardized $B = 3.385$, $SE = 1.102$, $t = 3.072$, $p = 0.002$), with a standardized beta of 0.155 showing small-to-moderate influence in standard deviation terms. The constant (52.734, $p < 0.001$) represents baseline achievement without reach AIQ.

Research Question Two:

RQ2: What is the level of Endurance AIQ in Physics Concepts among senior secondary school Students in North-Central Plateau State?

Answering Research Question Two:

Table 3: Mean and Standard Deviation of Level of Endurance AIQ among Students Offering Physics in Senior Secondary School in Plateau State.

S/N	ITEM (n = 387)	Mean	S. D	Remark
1	I focus on my Physics, even when I encounter difficult concepts.	3.62	0.92	HL
2	When faced with challenging Physics problems, I am determined to find a solution.	3.67	0.93	HL
3	Persistence is essential for mastering Physics.	3.53	0.94	HL
4	Even after making mistakes in Physics, I continue to try until I understand the material.	3.59	1.03	HL
5	I am confident in my ability to overcome obstacles in Physics.	3.75	0.95	HL
6	I often seek additional resources (tutoring, online) when I struggle with Physics topics.	3.56	1.01	HL
7	I view challenging Physics tasks as opportunities to improve my skills.	3.89	1.02	HL
8	I maintain a positive attitude when faced with Physics assignments.	3.71	0.97	HL



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9	I am willing to spend extra time studying Physics when I find it challenging.	3.62	1.00	HL
10	I improve my Physics skills in the face of setback.	3.49	1.26	ML
	Grand Mean	3.64	1.00	HL

Source: (Field Survey Work, 2025)

Data on Table 3 evaluates the level of endurance AIQ among Physics students in senior secondary schools in Plateau State. The overall mean score is 3.64 with a standard deviation of 1.00, indicating a High Level (HL) of endurance.

Hypothesis Two:

H₀₂: There is no significant relationship between endurance AIQ and academic achievement in Physics concepts among senior secondary school students in North-Central Plateau State.

Testing Hypothesis Two:

Table 4a: Summary of Linear Regression Analysis of Relationship between Endurance AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1978.260	1	1978.260	10.828	.001 ^b
	Residual	70339.415	385	182.700		
	Total	72317.674	386			

Source: (Field Survey Work, 2025)

a. Dependent Variable: Students' Academic Achievement

b. Predictors: (Constant), endurance AIQ

Table 4a shows that the regression analysis yielded $F(1,385) = 10.828, p = .001$. Since the p-value is less than the 0.05 level of significance, the regression model is statistically significant. This means endurance AIQ significantly predicts students' academic achievement in Physics. The null hypothesis is rejected. Endurance component of AIQ has a significant influence on students' academic achievement in Physics.

Table 4b: Model Summary of Relationship between Endurance AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.165 ^a	.027	.025	13.51665

Source: (Field Survey Work, 2025)

a. Predictors: (Constant), endurance AIQ

Table 4b presents a correlation coefficient of $R = .165$, indicating a positive relationship between endurance AIQ and students' academic achievement. The adjusted $R^2 = .025$ shows that endurance AIQ accounts for approximately 2.5% of the variation in students' academic achievement in Physics after adjusting for sample size and model bias, while about 97.5% of the variation is explained by other variables not included in the model. The standard error of estimate (13.52) reflects the average prediction error. Endurance component of AIQ has a weak positive predictive strength on students' academic achievement in Physics.

Table 4c: Coefficient of Beta of Relationship between Endurance AIQ and Students' Academic Achievement in Physics in Secondary Schools of Plateau State

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	52.654	4.190		12.565	.000
	Endurance AIQ	3.422	1.040	.165	3.291	.001

Source: (Field Survey Work, 2025)



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a. Dependent Variable: Students’ Academic Achievement

Table 4c indicates that endurance AIQ significantly contributes to students’ academic achievement ($\beta = .165, t = 3.291, p = .001$). This implies that a one standard deviation increase in endurance AIQ leads to a 0.165 standard deviation increase in students’ achievement. The unstandardized coefficient ($B = 3.422$) shows that a one-unit increase in endurance AIQ increases the achievement score by about 3.422 units, while the constant value (52.654) represents the predicted achievement score when endurance component of AIQ is zero. Endurance AIQ positively and significantly predicts students’ academic achievement in Physics, though the magnitude of the effect is small.

Answering Research Question Three:

R_{Q3}: What is the mean Academic achievement score among in Physics Concepts among senior secondary school Students in North-Central Plateau State?

Table 5: Mean and Standard Deviation of Academic Achievement Score Among Students offering Physics in Senior Secondary School in Plateau State

Variable	N	Mean	S. D
students’ academic achievement	387	56.3514	13.75302

Source: (Field Survey Work, 2025)

Table 5 data reports the mean academic achievement score among students offering Physics in senior secondary schools in Plateau State. With a sample size of 387 students, the mean academic achievement score is 56.35, with a standard deviation of 13.75. This shows that on average, students’ achievement in Physics is moderate with a considerable variation in their academic achievement levels.

Hypothesis Three:

H₀₃: There is no significant relationship between Reach and Endurance AIQ on academic achievement in Physics among senior secondary school Students in North-Central Plateau State.

Testing Hypothesis Three:

Table 6a: Summary of ANOVA from Multiple Regression Analysis of Relationship between Adversity Intelligence Quotient (Reach and Endurance) and Students’ Academic Achievement in Physics

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2802.369	2	700.592	3.850	.004 ^b
	Residual	69515.306	384	181.977		
	Total	72317.674	386			

Source: (Field Survey Work, 2025)

a. Dependent Variable: Students’ Academic Achievement

b. Predictors: (Constant), Reach, and Endurance.

The analysis results in Table 6a summarize an ANOVA-based multiple linear regression analysis used to determine if there is a significant predictive relationship between students’ adversity intelligence quotient (including reach and endurance) and academic achievement in Physics. The results showed that $F(4, 382) = 3.850, P=0.004 < 0.05$. As the P-value (0.004) is below the 0.05 significance threshold and therefore, the null hypothesis was rejected. This implies that AIQ four sub-variables is significant to students’ academic achievement in Physics with a positive significant relationship between adversity intelligence quotient and academic achievement in Physics in senior secondary schools of Plateau State.



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Table 6b: Model Summary from Multiple Regression Analysis of Relationship between Adversity Intelligence Quotient (Reach and Endurance) and Students’ Academic Achievement in Physics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.197 ^a	.039	.029	13.48989

Source: (Field Survey Work, 2025)

a. Predictors: (Constant), Reach, Endurance.

Table 6b presents a model summary illustrating how the independent variable explains the variance in the dependent variable. The results indicate that 2.9% of the variation in academic achievement can be attributed to adversity intelligence quotient, including reach, and endurance. The r-value of 0.197^a indicates a weak positive relationship between adversity intelligence quotient and academic achievement.

Table 6c: Coefficients of Beta from Multiple-Linear Regression Analysis of Relationship between Adversity Intelligence Quotient (Reach and Endurance) and Students’ Academic Achievement in Physics

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error			
1	(Constant)	46.098	5.259		8.766	.000
	Reach AIQ	1.045	1.500	.048	.696	.487
	Endurance AIQ	.655	1.705	.032	.384	.701

Source: (Field Survey Work, 2025)

a. Dependent Variable: Students’ academic achievement

Table 6c presents the individual contributions of reach and endurance components of AIQ to students’ academic achievement in Physics when all variables are considered together in a multiple regression model. The constant value (B = 46.098, t = 8.766, p = .000) represents the predicted academic achievement score when reach and endurance dimensions are held at zero.

For the individual predictors, Reach AIQ produced $\beta = .048$, t = .696, p = .487, which is not statistically significant because the p-value exceeds the 0.05 level. This suggests that Reach AIQ does not make a meaningful unique contribution to academic achievement when the other dimensions are included in the model. Endurance AIQ had $\beta = .032$, t = .384, p = .701, which is also not significant. Therefore, endurance AIQ does not independently predict students’ academic achievement in Physics after accounting for reach and endurance dimensions of AIQ. Overall, although each AIQ dimension earlier showed relationships with achievement individually, the multiple regression results indicate that none of the AIQ components makes a significant unique contribution to students’ academic achievement in Physics when considered simultaneously. This suggests that their predictive effects overlap and none stands out as an independent predictor in the combined model.

Discussion of Findings

This study examined the relationship between reach and endurance components of AIQ and academic achievement in Physics in secondary schools in Plateau State, Nigeria. The results indicated that students demonstrated a level of the reach dimension found to be moderate. Reach reflects students’ ability to prevent academic setbacks from affecting other aspects of their functioning. Although the correlation coefficient indicates a weak positive relationship, it was statistically significant (p < 0.05). This suggests that students who are able to compartmentalize



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academic difficulties may experience slight improvements in academic achievement. The finding is consistent with previous studies (Tripathi & Bajpai, 2022; Mwivanda, 2021; Matore & Khairani, 2019). This contrasts with studies reporting non-significant relationships (Espanola, 2016) and negative relationships (Wang et al., 2021; Yazon, 2019). Endurance recorded a high mean level (3.64), indicating that students generally perceived academic challenges as temporary and manageable. The dimension showed a statistically significant relationship with Physics academic achievement. Although the explained variance was modest, the weak positive relationship suggests that persistence and sustained effort contribute meaningfully to academic success in Physics. Students who view difficulties as transient are more likely to remain engaged during demanding tasks such as numerical problem-solving and conceptual analysis. This result is consistent with the findings of Mwivand (2021); Tripathi and Bajpai (2022), who reported positive and significant relations between endurance and academic outcomes. However, it diverges from studies that found non-significant relationships (Espanola, 2016) and studies with negative relationships (Wang et al. 2021; Yazon, 2019). When the two dimensions were examined collectively through multiple regression analysis, the model was statistically significant, but the total variance explained was relatively small. This indicates that while reach and endurance dimensions jointly relate to Physics achievement, their predictive power is limited. The weak overall correlation suggests that other variables which were not in the model may exert stronger influences on students' academic outcomes. This may be the reason why individual beta coefficients in the regression model were not statistically significant when controlled simultaneously, reach and endurance demonstrated relative contribution among the predictors with a value of 4.80% and 3.2% respectively.

Conclusion

The study therefore concludes that reach and endurance components of AIQ may enhance persistence and adaptive coping in learning Physics by strengthening students' resilience through integrated improvements and learning support systems since the strength of relationship is weak.

Recommendations

1. It was recommended that reach AIQ components should be utilized by physics educators in their pursuit to enhance academic achievement in Physics.
2. Since endurance dimensions of AIQ significantly relate with Physics academic achievement, teachers should sustain endurance among students in problem-solving activities to balance adversity resilience with academic competence.

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