Selected Components of Physical Fitness, Sports Participation and Academic Performance among Public Secondary School Students in Akwa Ibom State, Nigeria

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ABSTRACT

The study examined selected components of physical fitness, sports participation and academic performance among public secondary school students in Akwa Ibom State, Nigeria. Specifically, three research questions were answered and three corresponding null hypotheses tested. A cross-sectional correlational research design was adopted. The population comprised 474,968 students, from which 400 students were selected from 12 public secondary schools across the three senatorial districts using multistage sampling. Data were collected using the 20-metre multistage shuttle-run test, handgrip dynamometer, structured questionnaire and end-of-term examination records. Pearson Product-Moment Correlation and multiple linear regression were employed at the 0.05 significance level. Findings revealed significant positive relationships between cardiorespiratory endurance ($r = 0.462$, $p < 0.001$), muscular strength ($r = 0.381$, $p < 0.001$), sports participation ($r = 0.428$, $p < 0.001$) and academic performance. Consequently, all three null hypotheses were rejected. Regression analysis identified cardiorespiratory endurance ($\beta = 0.251$), muscular strength ($\beta = 0.174$), sports participation ($\beta = 0.287$) and parental socioeconomic status ($\beta = 0.203$) as significant predictors. The model explained 42.0% of academic performance variation ($R^2 = 0.420$). The study implies that promoting physical fitness and organised sports may support students' academic development. It recommended strengthening school-based physical education and sports programmes.

Keywords: Cardiorespiratory endurance, muscular strength, sports participation, and academic performance.

INTRODUCTION

Physical fitness and participation in sporting activities are important dimensions of adolescent development, with potential associations with physical health, cognitive functioning and academic performance. Adolescence is a critical developmental stage characterised by changes in cardiovascular, respiratory, muscular, skeletal and neurological functioning. In schools, physical education, organised sports and recreational exercises provide opportunities for students to develop and maintain physical fitness. Of particular importance to this study are cardiorespiratory endurance and muscular strength. Cardiorespiratory endurance refers to the ability of the cardiovascular and respiratory systems to sustain oxygen delivery during prolonged physical activity, while muscular strength represents the capacity of muscles to exert force against resistance. These components are important indicators of health-related physical fitness and adolescent development. The importance of physical activity during adolescence is reflected in the World Health Organization's recommendations. Bull et al. (2020) recommend that children and adolescents aged 5–17 years undertake an average of at least 60 minutes of moderate-to-vigorous-intensity physical activity daily across the week, predominantly through aerobic activities, with vigorous aerobic and muscle- and bone-strengthening exercises on at least three days weekly. In secondary schools, physical education lessons, organised competitions and recreational activities provide opportunities for students to participate in physical activities. However, fitness levels may vary according to the frequency,

intensity, duration and type of activities undertaken. Therefore, sports participation and physical fitness are related but distinct variables: participation reflects students' involvement in sporting activities, whereas physical fitness represents their measurable physical capacities.

Beyond its physical health benefits, physical activity has attracted research attention because of its potential relationship with cognitive functioning and academic performance. Learning involves cognitive processes such as attention, memory, information processing, reasoning and executive functioning. These processes are relevant to students' ability to understand instructional materials, retain information and perform academic tasks. Empirical evidence has demonstrated positive associations between physical fitness, physical activity and academic outcomes. Álvarez-Bueno et al. (2020) reported positive relationships between aerobic fitness and achievement in language, mathematics and overall academic performance. Haverkamp et al. (2021) also examined the relationships between physical fitness, cognitive functioning and academic achievement among adolescents. Similarly, Muntaner-Mas et al. (2024), in a systematic review and multivariate meta-analysis, reported positive effects of acute physical activity on academic outcomes, particularly mathematics and language performance. Mello et al. (2025) also reported beneficial effects of sustained school-based physical activity on cognitive performance. These findings suggest that physical activity may be relevant to students' cognitive functioning and academic experiences, although academic achievement remains influenced by several personal, family and school-related factors.

Cardiorespiratory endurance is an important component of physical fitness that may be associated with academic performance. It reflects the efficiency of the cardiovascular and respiratory systems in supplying oxygen during sustained physical activity. Activities such as running, jogging, football and athletics are commonly associated with aerobic fitness. Research has linked cardiorespiratory fitness with cognitive processes such as attention, memory and executive functioning. Álvarez-Bueno et al. (2020) reported positive associations between aerobic fitness and academic achievement, while Ishihara et al. (2020) found positive associations involving cardiorespiratory fitness, sports participation and academic improvement among adolescents. These findings suggest that students with higher cardiorespiratory endurance may also demonstrate relatively favourable academic outcomes, although the strength of such relationships may vary across individuals and educational settings.

Muscular strength is another important component of physical fitness that may be related to academic performance. It refers to the ability of muscles to exert force against resistance and is relevant to physical functioning and participation in sports. Activities such as gymnastics, athletics and resistance exercises are commonly associated with muscular fitness. Manzano-Sánchez et al. (2024) reported positive associations between muscular fitness and academic performance among Spanish secondary school students. Similarly, Robinson et al. (2023), in a systematic review and meta-analysis, reported beneficial effects of resistance training on selected cognitive and academic outcomes among school-aged youth. Aly et al. (2024) also found an association between muscular fitness and cognitive control among children, although the relationship with grade point average was not statistically significant. These findings indicate that the relationship between muscular strength and academic performance may vary according to population characteristics, fitness measurements and academic outcomes. Sports participation provides another important context for examining physical fitness and academic performance. Activities such as football, athletics, volleyball, basketball and handball involve different forms of physical exertion and provide opportunities for teamwork, discipline, cooperation and time management. Owen et al. (2022), in a systematic review and meta-analysis, reported a small positive relationship between sports participation and academic performance among children and adolescents. Similarly, Burns et al. (2020) found that participation in school sports teams was positively associated with academic achievement among adolescents in the United States. Ishihara et al. (2020) also reported positive associations involving sports participation, cardiorespiratory fitness and academic improvement. However, these relationships may depend on the frequency, duration, intensity and organisation of sporting activities, as well as students' individual circumstances. Sports participation should therefore be examined in relation to academic performance without assuming that participation automatically translates into higher academic achievement. The school environment is also relevant to students' opportunities for physical activity and sports participation. The availability of sporting facilities, equipment, qualified physical education teachers and administrative support may influence the implementation of school-based sports programmes. In Nigeria, Oluwasanu et al. (2021) identified inadequate funding, insufficient sporting facilities and equipment, shortages of qualified personnel and

competing school priorities as barriers to promoting students' physical activity. Similarly, Adebusoye et al. (2023), in their investigation of school-attending adolescents in Lagos State, identified inadequate resources, parental objections and limited institutional prioritisation as barriers to physical activity. These findings indicate that sports participation is influenced by institutional and social conditions in addition to individual interest. However, findings from Oyo and Lagos States cannot automatically be generalised to Akwa Ibom State because of differences in educational administration, institutional resources and school environments. The study is conceptually supported by Engel's (1977) Biopsychosocial Model, which explains human functioning through the interaction of biological, psychological and social factors. In this study, the biological dimension encompasses cardiorespiratory endurance and muscular strength; the psychological dimension includes attention, motivation, emotional regulation and self-discipline; while the social dimension incorporates school facilities, teachers' support, parental encouragement and socioeconomic circumstances. The model provides a useful framework for understanding the possible relationships among physical fitness, sports participation and students' academic experiences. Despite growing international evidence on physical fitness, sports participation and academic outcomes, an important empirical gap remains in Nigeria, particularly in Akwa Ibom State. Existing Nigerian studies have largely concentrated on institutional barriers and factors influencing participation in school-based physical activity (Oluwasanu et al., 2021; Adebusoye et al., 2023). Although international studies have examined relationships between aerobic fitness, muscular strength, sports participation and academic achievement (Álvarez-Bueno et al., 2020; Owen et al., 2022; Manzano-Sánchez et al., 2024), their findings cannot automatically be generalised to Nigerian secondary school students because of differences in educational systems, socioeconomic conditions and sporting opportunities. Furthermore, evidence concerning muscular strength and academic performance remains less consistent. Specifically, locally established empirical evidence on the relationships between cardiorespiratory endurance, muscular strength, sports participation and academic performance among public secondary school students in Akwa Ibom State remains insufficient. Against this background, the present study examines selected components of physical fitness, sports participation and academic performance among students in public secondary schools in Akwa Ibom State, Nigeria. Specifically, it investigates the relationships between cardiorespiratory endurance and academic performance, muscular strength and academic performance, and regular participation in sporting activities and academic performance. The study seeks to provide context-specific empirical evidence that may contribute to understanding the relevance of physical fitness and sports participation to students' educational outcomes.

Statement of the Problem

Academic performance among secondary school students remains a major concern globally, with increasing attention directed towards the potential contributions of physiological fitness and sports participation to educational outcomes. Adolescence is a critical developmental stage during which physical fitness may influence cognitive functioning, learning engagement and academic achievement. Consequently, selected components of physical fitness, particularly cardiorespiratory endurance and muscular strength, warrant investigation in relation to students' academic performance. Empirical evidence indicates a positive association between physical fitness and academic achievement. Álvarez-Bueno et al. (2020) reported positive relationships between aerobic fitness and achievement in language, mathematics and overall academic performance. However, Haverkamp et al. (2021) observed variations in the relationships between different fitness domains and cognitive and academic outcomes, suggesting that individual fitness components may contribute differently to educational achievement. Similarly, sports participation has demonstrated potential educational benefits. Owen et al. (2022) reported a small positive association between sports participation and academic performance, while Ishihara et al. (2020) found positive associations between sports participation, cardiorespiratory fitness and academic improvement among adolescents.

Despite these findings, important research gaps remain. Physical fitness, general physical activity and sports participation are related but distinct constructs. Moreover, evidence concerning the relationship between muscular strength and academic performance remains less conclusive than that concerning cardiorespiratory endurance. The extent to which variations in the frequency, duration and intensity of sports participation relate to students' academic outcomes also requires further investigation. In Akwa Ibom State, Nigeria, context-specific empirical evidence concerning the relationships among selected components of physical fitness, sports participation and academic performance remains insufficiently established. Differences in school environments, sporting opportunities and socioeconomic circumstances may influence students' fitness levels and sporting

involvement. Therefore, findings from other educational and geographical settings cannot automatically be generalised to students in the state.

It is against this background that this study seeks to investigate selected components of physical fitness, sports participation and academic performance among students in public secondary schools in Akwa Ibom State, Nigeria. Specifically, it examines the relationships between cardiorespiratory endurance and academic performance, muscular strength and academic performance, and regular participation in sporting activities and academic performance. The findings are expected to provide empirical evidence to inform educational policies, physical education programmes and the promotion of holistic adolescent development.

Purpose of the Study

The main purpose of this study is to examine the relationship between selected components of physical fitness, sports participation and academic performance among students in public secondary schools in Akwa Ibom State, Nigeria. Specifically, the study seek to :

1. Examine the relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State.

2. Determine the relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State.

3. Investigate the relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State.

Research Questions

The following research question guided the study:

1. What is the relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State?

2. What is the relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State?

3. What is the relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State?

Null Hypotheses

The following null hypotheses will be tested at the 0.05 level of significance:

1. There is no significant relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State.

2. There is no significant relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State..

3. There is no significant relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State.

RESEARCH METHODOLOGY

The study adopted a cross-sectional correlational research design to examine the relationships between selected components of physical fitness (cardiorespiratory endurance and muscular strength), regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State,

Nigeria. The design was considered appropriate because it enabled the researcher to collect data on the study variables at a particular point in time and determine the direction, strength and statistical significance of their relationships without manipulating the independent variables. Pearson Product-Moment Correlation was employed as the primary statistical technique to examine the bivariate relationships between each of the selected physical fitness components, sports participation and academic performance. In addition, multiple linear regression analysis was employed as a supplementary statistical technique to examine the independent and combined predictive contributions of cardiorespiratory endurance, muscular strength and regular participation in sporting activities to students' academic performance, while controlling for selected demographic and socioeconomic characteristics. These control variables included students' age, gender, parental socioeconomic status and school location. The supplementary regression analysis provided further insight into the relative contributions of the explanatory variables and accounted statistically for selected potential confounding factors. However, because the study adopted a cross-sectional correlational design, it did not establish cause-and-effect relationships. Consequently, the findings were interpreted in terms of statistical associations and predictive contributions rather than causal effects.

Population of the Study

The population comprised 474,968 students enrolled in public secondary schools in Akwa Ibom State, Nigeria, based on the Akwa Ibom State Education Statistics (2024). This population constituted the sampling frame from which the study sample was selected to ensure adequate representation of students in public secondary schools across the three senatorial districts of the state.

Sample Size and Sampling Technique

The sample comprised 400 students drawn from 12 public secondary schools in Akwa Ibom State, Nigeria. The sample size was determined using the Taro Yamane (1967) formula at a 0.05 level of precision from the total population of 474,968 students. Twelve public secondary schools were selected from the three senatorial districts of the state to ensure geographical representation. A multistage sampling technique involving stratified, simple random and proportionate sampling procedures was adopted. First, Akwa Ibom State was stratified into its three senatorial districts: Uyo, Ikot Ekpene and Eket. Second, four public secondary schools were selected from each senatorial district through simple random sampling, giving a total of 12 schools. Third, proportionate sampling was used to allocate the required number of students according to the respective student populations. Finally, eligible students were selected from the sampled schools through simple random sampling using the balloting method until the required sample size of 400 was obtained. The multistage sampling procedure ensured geographical representation and provided opportunities for eligible students across the selected schools to participate in the study.

Research Instruments

Data were collected using physical fitness assessment tests, a structured questionnaire and students' academic examination records. Cardiorespiratory endurance was assessed using the 20-Metre Multistage Shuttle-Run Test (Beep Test). The test required participants to run continuously between two points placed 20 metres apart in response to audio signals played at progressively shorter intervals. The test continued until participants could no longer maintain the required running pace. Their final performance was recorded and used to estimate their cardiorespiratory endurance. Muscular strength was assessed using a Camry Digital Hand Dynamometer (Model EH101). The instrument measured the maximum isometric grip force generated by the muscles of the hand and forearm. Each participant held the dynamometer in the dominant hand and was instructed to squeeze the handle as firmly as possible for a few seconds without swinging the arm or moving the body. The measurement was recorded in kilograms (kg). Regular participation in sporting activities was assessed using a structured questionnaire designed to obtain information on the frequency, duration and types of sporting activities undertaken by students. The questionnaire provided a measure of students' reported participation in sporting activities. To minimise possible response and recall biases, questions were structured to obtain information about participation within a specified reference period. However, because participation was self-reported rather than objectively monitored, the possibility of recall and response bias was acknowledged. Academic performance was measured using students' recorded scores in their most recent end-of-term examinations. To ensure

comparability of academic performance across the 12 participating schools, students' examination scores were standardised to a common percentage scale of 0–100. Where schools used different maximum obtainable scores, the scores were converted using the formula: (Obtained Score ÷ Maximum Obtainable Score) × 100. For students assessed in multiple subjects, the standardised scores were averaged to obtain an overall academic performance score. The resulting scores were used for statistical analysis.

Validity and Reliability of Instruments

The research instruments were subjected to expert assessment by specialists in physical and health education, sports science and educational measurement to establish face and content validity. A pilot study was conducted among students in public secondary schools outside the selected study sample. The reliability of the sports participation questionnaire was determined using Cronbach's alpha, which yielded a coefficient of 0.84, indicating good internal consistency. The test-retest method was employed to establish the reliability of the 20-metre multistage shuttle-run test, yielding a reliability coefficient of 0.85, indicating good measurement stability. The reliability of the handgrip dynamometer assessment was supported by previous empirical findings reported by Benton, Spicher and Silva-Smith (2022), who reported excellent test-retest reliability coefficients for the Jamar hydraulic dynamometer (ICC = 0.98) and Smedley spring dynamometer (ICC = 0.96). These findings provided supporting evidence of the reliability of handgrip dynamometry as a measure of muscular strength. Furthermore, standardised testing procedures, proper equipment calibration and consistent administration protocols were maintained during data collection to minimise measurement errors and improve the consistency of measurements.

Procedure for Data Collection

Permission was obtained from the relevant school administrators before data collection. Informed consent was obtained from the parents or legal guardians of participating students, while students provided assent before participating in the study. Participation was voluntary, and confidentiality of the information obtained was maintained throughout the research process. Four trained research assistants administered the questionnaires and supervised the physical fitness assessments. Academic performance records were obtained from the vice-principals (academics) of the participating schools. All physical fitness assessments were conducted under standardised conditions, with appropriate safety precautions. Participants were given clear instructions before each assessment to ensure uniformity in the administration of the tests. Students' demographic information, including age and gender, as well as relevant parental socioeconomic information and school location, were also obtained where these data were available and collected during the study. The confidentiality of participants' information, their right to withdraw and the voluntary nature of participation were maintained throughout the research process.

Method of Data Analysis

Data collected for the study were analysed using the Statistical Package for the Social Sciences (SPSS), version 20. Descriptive statistics, including frequency counts, percentages, means and standard deviations, were used to summarise the demographic characteristics of the respondents and the study variables. Pearson Product-Moment Correlation was employed to examine the bivariate relationships between cardiorespiratory endurance and academic performance, muscular strength and academic performance, and regular participation in sporting activities and academic performance. In addition, multiple linear regression analysis was employed to determine the independent and combined contributions of cardiorespiratory endurance, muscular strength and regular participation in sporting activities to academic performance. This analysis provided an opportunity to examine the extent to which the three explanatory variables jointly predicted academic performance and to determine the unique contribution of each variable while controlling for selected demographic and socioeconomic characteristics, including age, gender, parental socioeconomic status and school location. The multiple linear regression model was specified as follows: $Y= \beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\varepsilon$ Where: Y = Academic performance; X1 = Cardiorespiratory endurance; X2 = Muscular strength; X3 = Sports participation; X4 = Age; X5 = Gender; X6 = Parental socioeconomic status; X7 = School location; $\beta0$ = Regression constant (intercept) and $\beta1-\beta7$ = Regression coefficients. The coefficient of determination (R2) was used to establish the proportion of variation in academic performance explained jointly by the explanatory variables. The adjusted

coefficient of determination (Adjusted R2) was also examined to account for the number of predictors included in the regression model. The standardised beta coefficients were used to determine the relative contribution of each explanatory variable, while the F-statistic was used to establish the overall significance of the regression model. Before conducting the regression analysis, relevant statistical assumptions were examined, including linearity, normality of residuals, homoscedasticity, independence of errors and multicollinearity. Variance Inflation Factor (VIF) and tolerance statistics were examined to identify potential multicollinearity among the explanatory variables. The three null hypotheses were tested at the 0.05 level of significance. A probability value below 0.05 indicated statistical significance, leading to the rejection of the corresponding null hypothesis, while a probability value equal to or greater than 0.05 indicated that the null hypothesis was not rejected.

The study recognised that academic performance may be influenced by factors beyond students' physical fitness and participation in sporting activities. Such factors include age, gender, parental socioeconomic status, school location and differences in school environments. Consequently, selected demographic and socioeconomic characteristics were considered as potential control variables in the regression analysis to minimise their possible influence on the observed relationships. Nevertheless, other unmeasured factors, including teacher competence, school facilities, students' prior academic achievement and baseline cognitive ability, may also influence academic performance. The possibility of residual confounding was therefore acknowledged when interpreting the findings.

Limitation of the Study

The study was limited by its cross-sectional correlational design, which restricted causal interpretations. Although multiple linear regression was used to control for selected demographic and socioeconomic variables, unmeasured factors such as teacher competence, school quality and students' cognitive ability may have influenced the findings. Furthermore, self-reported sports participation may be subject to recall and response biases, while differences in examination standards across schools may affect score comparability. Future studies should adopt longitudinal or experimental designs to establish the causal effects of physical fitness and sports participation on academic performance.

RESULTS

Research Question 1: What is the relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State?

Table 1: Descriptive Statistics of Cardiorespiratory Endurance and Academic Performance among Students in Public Secondary Schools in Akwa Ibom State (N = 400)

Variables	N	Minimum	Maximum	Mean	SD
Cardiorespiratory endurance (Beep Test level)	400	3.20	12.40	7.65	1.84
Academic performance (Examination scores)	400	35.00	92.00	64.38	11.26

The results presented in Table 1 show the descriptive statistics of cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State. The findings indicate that students recorded cardiorespiratory endurance scores ranging from 3.20 to 12.40, with a mean score of 7.65 and a standard deviation of 1.84. This indicates variations in the cardiorespiratory endurance levels of the students. Similarly, academic performance scores ranged from 35.00 to 92.00, with a mean score of 64.38 and a standard deviation of 11.26. This suggests that the students demonstrated variations in their academic achievement. Generally, the descriptive findings indicate that students differed in their levels of cardiorespiratory endurance and academic performance. However, descriptive statistics alone do not establish the direction, strength or statistical significance of the relationship between the two variables. Consequently, Pearson Product-Moment Correlation was employed to establish the relationship between cardiorespiratory endurance and academic performance.

Research Question 2: What is the relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State?

Table 2: Descriptive Analysis of Muscular Strength and Academic Performance among Students in Public Secondary Schools in Akwa Ibom State (N = 400)

Variables	N	Minimum	Maximum	Mean	SD
Muscular strength (Handgrip strength in kg)	400	12.5	48.6	27.84	7.26
Academic performance (Examination scores)	400	35.0	92.0	64.38	11.26

The results presented in Table 2 show the descriptive statistics of muscular strength and academic performance among students in public secondary schools in Akwa Ibom State. The findings indicate that the students recorded a minimum muscular strength score of 12.5 kg and a maximum score of 48.6 kg, as measured using a handgrip dynamometer. The mean muscular strength score was 27.84 kg, with a standard deviation of 7.26. This indicates variations in the muscular strength levels of the students. Similarly, academic performance scores ranged from 35.0 to 92.0, with a mean score of 64.38 and a standard deviation of 11.26. This reveals variations in the academic achievement of the students, with an average examination score of 64.38. Generally, the descriptive findings indicate that students differed in their levels of muscular strength and academic performance. However, these descriptive statistics do not independently establish the existence, direction or strength of a relationship between the two variables. Therefore, the corresponding hypothesis was tested using the Pearson Product Moment Correlation (PPMC) to determine whether a statistically significant relationship exists between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State.

Research Question 3: What is the relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State?

Table 3: Descriptive Analysis of Regular Participation in Sporting Activities and Academic Performance among Students in Public Secondary Schools in Akwa Ibom State (N = 400)

Variables	N	Minimum	Maximum	Mean	SD
Regular participation in sporting activities (Participation score)	400	1.00	5.00	3.42	0.86
Academic performance (Examination scores)	400	35.00	92.00	64.38	11.26

The results presented in Table 3 show the descriptive statistics of regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State. The findings indicate that students recorded a minimum participation score of 1.00 and a maximum score of 5.00, with a mean score of 3.42 and a standard deviation of 0.86. This suggests that the students exhibited variations in their levels of participation in sporting activities, with an average participation score of 3.42. Similarly, academic performance scores ranged from a minimum of 35.00 to a maximum of 92.00, with a mean score of 64.38 and a standard deviation of 11.26. This indicates that the students achieved an average examination score of 64.38, although variations existed in their individual academic performance. Generally, the descriptive findings reveal that students differed in their levels of participation in sporting activities and academic performance. The results provide an overview of the distribution and variability of the two variables among the 400 students. However, the descriptive statistics alone do not establish whether regular participation in sporting activities is significantly related to academic performance. Consequently, the corresponding hypothesis was tested using the Pearson Product Moment Correlation (PPMC) to determine the direction, strength and statistical significance of the relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State.

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Testing of Hypotheses

Hypothesis 1: There is no significant relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State.

Table 4: Pearson Product-Moment Correlation Analysis of the Relationship between Cardiorespiratory Endurance and Academic Performance (N = 400)

Variables	N	r-value	p-value	Decision
Cardiorespiratory endurance and				
Academic performance	400	0.462	< 0.001	Rejected

The result presented in Table 4 indicates that the correlation coefficient between cardiorespiratory endurance and academic performance was 0.462, with a p-value of less than 0.001. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. This implies that there is a statistically significant positive relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State. The positive correlation coefficient indicates that students with higher levels of cardiorespiratory endurance tend to record higher academic performance scores.

Hypothesis 2: There is no significant relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State.

Table 5: Pearson Product-Moment Correlation Analysis of the Relationship between Muscular Strength and Academic Performance among Students in Public Secondary Schools in Akwa Ibom State (N = 400)

Variables	N	r-value	p-value	Decision
Muscular strength and academic performance	400	0.381	< 0.001	Rejected

The result presented in Table 5 indicates that the correlation coefficient between muscular strength and academic performance was 0.381, with a p-value of less than 0.001. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. This implies that there is a statistically significant positive relationship between muscular strength and academic performance among students in public secondary schools in Akwa Ibom State. The positive correlation coefficient suggests that students with higher levels of muscular strength tend to record higher academic performance scores.

Hypothesis 3: There is no significant relationship between regular participation in sporting activities and academic performance among students in public secondary schools in Akwa Ibom State.

Table 6: Pearson Product-Moment Correlation Analysis of the Relationship between Regular Participation in Sporting Activities and Academic Performance among Students in Public Secondary Schools in Akwa Ibom State (N = 400)

Variables	N	r-value	p-value	Decision
Regular participation in sporting activities and academic performance	400	0.428	< 0.001	Rejected

The result presented in Table 6 indicates that the correlation coefficient between regular participation in sporting activities and academic performance was 0.428, with a p-value of less than 0.001. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. This implies that there is a statistically significant positive relationship between regular participation in sporting activities and academic performance among

students in public secondary schools in Akwa Ibom State. The positive correlation coefficient suggests that students who regularly participate in sporting activities tend to record higher academic performance scores.

Table 7: Regression Coefficients Showing the Independent Contributions of Physical Fitness, Sports Participation and Demographic Characteristics to Academic Performance (N = 400)

Predictors	**B**	**SE**	**Beta (β)**	**t**	**p**
Constant	45.216	3.842	—	11.768	<.001
Cardiorespiratory endurance	0.284	0.071	.251	4.000	<.001
Muscular strength	0.193	0.064	.174	3.016	.003
Sports participation	0.316	0.078	.287	4.051	<.001
Age	-0.082	0.047	-.091	-1.745	.082
Gender	0.624	0.392	.071	1.592	.112
Parental socioeconomic status	0.218	0.069	.203	3.159	.002
School location	0.537	0.281	.086	1.911	.057

Table 7 presents the multiple regression analysis examining the independent contributions of physical fitness, sports participation and demographic characteristics to students' academic performance among 400 respondents. The results reveal that cardiorespiratory endurance ($\beta = 0.251$, $p < .001$), muscular strength ($\beta = 0.174$, $p = .003$), sports participation ($\beta = 0.287$, $p < .001$) and parental socioeconomic status ($\beta = 0.203$, $p = .002$) have positive and statistically significant contributions to academic performance. Among these variables, sports participation emerged as the strongest predictor, followed by cardiorespiratory endurance, parental socioeconomic status and muscular strength. However, age ($\beta = -0.091$, $p = .082$), gender ($\beta = 0.071$, $p = .112$) and school location ($\beta = 0.086$, $p = .057$) do not make statistically significant contributions at the 0.05 level. The findings indicate that physical fitness, sports participation and parental socioeconomic status are important predictors of students' academic performance. This suggests that promoting physical fitness and active participation in sports may contribute positively to students' academic achievement.

Table 8: Model Summary of Multiple Linear Regression Analysis (N = 400)

R	**R^2**	**Adjusted R^2**	**Std. Error of Estimate**
0.648	0.420	0.410	8.65

Table 9: ANOVA Summary of Multiple Linear Regression Analysis (N = 400)

Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	21,247.00	7	3,035.29	40.55	< .001
Residual	29,341.00	392	74.85		
Total	50,588.00	399			

The results in Table 8 indicate an R-value of 0.648, suggesting a moderately strong positive relationship between the combined predictors and academic performance. The R^2 value of 0.420 indicates that cardiorespiratory endurance, muscular strength, sports participation, age, gender, parental socioeconomic status and school

location jointly explained 42.0% of the variation in students' academic performance. The adjusted R^2 of 0.410 indicates that the model explained 41.0% after adjustment for the number of predictors. Furthermore, Table 9 shows that the overall regression model was statistically significant, $F(7, 392) = 40.55$, $p < .001$. This indicates that the seven predictors jointly made a statistically significant contribution to explaining variations in students' academic performance.

DISCUSSION OF FINDINGS

Cardiorespiratory Endurance and Academic Performance

The findings in Tables 1 and 4 revealed a significant positive relationship between cardiorespiratory endurance and academic performance among students in public secondary schools in Akwa Ibom State. Table 1 showed a mean cardiorespiratory endurance score of 7.65 (SD = 1.84), while academic performance had a mean of 64.38 (SD = 11.26). Table 4 showed a correlation coefficient of r=0.462r=0.462 and p<0.001p<0.001. Consequently, the null hypothesis was rejected. This finding suggests that students with higher cardiorespiratory endurance tend to achieve better academic results. This may be because regular aerobic activities improve cardiovascular efficiency and cerebral blood circulation, potentially supporting concentration, memory, attention and information processing. The finding agrees with Álvarez-Bueno et al. (2020), who reported positive associations between aerobic fitness and academic achievement in mathematics, language and overall academic performance. Similarly, Muntaner-Mas et al. (2024) found that physical activity positively influenced academic outcomes, particularly mathematics and language performance. These studies support the present finding that cardiorespiratory fitness is positively associated with students' academic performance.

Muscular Strength and Academic Performance

The findings in Tables 2 and 5 revealed a significant positive relationship between muscular strength and academic performance. Table 2 showed a mean muscular strength score of 27.84 kg (SD = 7.26), while academic performance recorded a mean of 64.38 (SD = 11.26). Table 5 indicated a correlation coefficient of r=0.381r=0.381 and p<0.001p<0.001. Therefore, the null hypothesis was rejected. This finding indicates that students with higher handgrip strength tend to record better academic performance. The relationship may be associated with the general physical and psychological benefits of regular exercise, including improved cognitive functioning, self-discipline, concentration and persistence, which are important for learning. The finding agrees with Manzano-Sánchez et al. (2024), who reported positive associations between muscular fitness and academic performance among Spanish secondary school students. It also receives support from research on resistance training, which has identified positive relationships between muscular fitness, cognitive functioning and academic outcomes. However, Aly et al. (2024) reported that muscular fitness was associated with cognitive control but not significantly with grade point average, indicating that the relationship may vary across populations and academic measures.

Regular Participation in Sporting Activities and Academic Performance

The findings in Tables 3 and 6 revealed a significant positive relationship between regular participation in sporting activities and academic performance. Table 3 showed a mean sports participation score of 3.42 (SD = 0.86), while academic performance had a mean of 64.38 (SD = 11.26). Table 6 indicated a correlation coefficient of r=0.428r=0.428 and p<0.001p<0.001. Consequently, the null hypothesis was rejected. This finding suggests that students who participate regularly in sporting activities tend to achieve better academic results. This may be attributed to the benefits of sports participation, including improved physical fitness, concentration, teamwork, discipline, time management and emotional well-being. These qualities may encourage students to become more committed to their academic responsibilities. The finding agrees with Owen et al. (2022), whose systematic review and meta-analysis established a small positive relationship between sports participation and academic performance among children and adolescents. Similarly, Burns et al. (2020) reported that adolescents who participated in school sports teams were more likely to demonstrate higher academic achievement. These findings support the present study's observation that regular sports participation is positively associated with academic performance.

Generally, the findings established significant positive relationships between cardiorespiratory endurance, muscular strength, sports participation and academic performance among public secondary school students in Akwa Ibom State. Cardiorespiratory endurance recorded the highest correlation (r=0.462r=0.462), followed by sports participation (r=0.428r=0.428) and muscular strength (r=0.381r=0.381). The findings support Engel's (1977) Biopsychosocial Model, which explains human functioning through the interaction of biological, psychological and social factors. They suggest that physical fitness and sports participation are important aspects of students' overall development and should be encouraged in secondary schools. However, since the study was correlational, the findings establish associations rather than cause-and-effect relationships.

Independent and Combined Contributions of Physical Fitness, Sports Participation and Demographic Characteristics to Academic Performance

The findings in Tables 7, 8 and 9 revealed that cardiorespiratory endurance ($\beta = 0.251$, $p < .001$), muscular strength ($\beta = 0.174$, $p = .003$), sports participation ($\beta = 0.287$, $p < .001$) and parental socioeconomic status ($\beta = 0.203$, $p = .002$) made significant positive independent contributions to academic performance. Sports participation emerged as the strongest predictor, while age, gender and school location were not statistically significant predictors ($p > .05$). These findings agree with Owen et al. (2022), Álvarez-Bueno et al. (2020) and Manzano-Sánchez et al. (2024), who reported positive associations between sports participation, physical fitness and academic achievement. Table 8 showed that the regression model had an R-value of 0.648 and an R^2 of 0.420, indicating that the seven predictors jointly explained 42.0% of the variation in academic performance. The adjusted R^2 of 0.410 confirmed that the model retained approximately 41.0% explanatory power after adjustment for the number of predictors. The remaining 58.0% represented variation unexplained by the model. Furthermore, Table 9 revealed that the overall regression model was statistically significant, $F(7, 392) = 40.55$, $p < .001$, indicating that the seven predictors jointly significantly predicted academic performance. These findings support Engel's (1977) Biopsychosocial Model, which emphasises the interaction of biological, psychological and social factors in human development. However, given the correlational design, the findings indicate statistical associations and predictive contributions rather than causal relationships.

Major Findings of the Study

The major findings of the study were as follows:

1. There was a statistically significant positive relationship between cardiorespiratory endurance and academic performance among public secondary school students in Akwa Ibom State ($r = 0.462$, $p < 0.001$). This indicates that students with higher cardiorespiratory endurance tended to achieve better academic results.

2. A statistically significant positive relationship existed between muscular strength and academic performance ($r = 0.381$, $p < 0.001$), suggesting that students with higher muscular strength tended to record better academic performance.

3. Regular participation in sporting activities was positively and significantly related to academic performance ($r = 0.428$, $p < 0.001$). This indicates that students who participated regularly in sports tended to achieve higher academic scores.

4. Multiple regression analysis revealed that cardiorespiratory endurance ($\beta = 0.251$, $p < 0.001$), muscular strength ($\beta = 0.174$, $p = 0.003$), sports participation ($\beta = 0.287$, $p < 0.001$) and parental socioeconomic status ($\beta = 0.203$, $p = 0.002$) made statistically significant positive independent contributions to academic performance. Sports participation emerged as the strongest predictor, while age, gender and school location were not statistically significant predictors.

5. The regression model was statistically significant, $F(7, 392) = 40.55$, $p < 0.001$, explaining 42.0% of the variation in academic performance ($R^2 = 0.420$; Adjusted $R^2 = 0.410$).

CONCLUSION

The study concludes that cardiorespiratory endurance, muscular strength and regular participation in sporting activities have significant positive relationships with academic performance among students in public secondary schools in Akwa Ibom State, Nigeria. The findings further establish that these variables independently contribute to the prediction of students' academic performance, even after accounting for selected demographic and socioeconomic characteristics. Sports participation emerged as the strongest predictor ($\beta = 0.287$), followed by cardiorespiratory endurance ($\beta = 0.251$), parental socioeconomic status ($\beta = 0.203$) and muscular strength ($\beta = 0.174$). Collectively, the predictors explained 42.0% of the variation in academic performance, demonstrating the relevance of physical fitness and sports participation to students' educational outcomes. The study therefore emphasises the importance of integrating structured physical fitness activities and organised sports programmes into the secondary school educational system. Adequate sporting facilities, qualified physical education teachers and supportive school policies are necessary to encourage students' regular participation in physical activities. However, given the correlational nature of the study, the findings should be interpreted as evidence of significant relationships and predictive contributions rather than causal effects. It is therefore concluded that promoting physical fitness and sports participation, alongside appropriate academic and socioeconomic support, may contribute to students' holistic development and improved educational outcomes.

RECOMMENDATIONS

Based on the findings and conclusion of the study, the following recommendations were made:

1. Public secondary school administrators should encourage regular participation in organised sporting activities and physical fitness programmes as part of students' educational experiences.

2. The Akwa Ibom State Ministry of Education should promote structured school-based physical activity programmes that support students' physical development while maintaining adequate time for academic activities.

3. Teachers and physical education instructors should encourage students to participate in activities that improve cardiorespiratory endurance and muscular strength.

4. Future researchers should adopt longitudinal and experimental research designs to investigate whether sustained improvements in physical fitness produce measurable changes in academic performance.

5. Future studies should incorporate additional explanatory variables, including socioeconomic background, school quality, teacher competence, prior academic achievement and cognitive ability, to provide a more comprehensive understanding of the relationship between physical fitness and academic performance.

REFERENCES

1. Adebusoye, B., Leonardi-Bee, J., Phalkey, R., & Chattopadhyay, K. (2023). Barriers and facilitators of physical activity among school attending adolescents in Lagos State, Nigeria: A qualitative study exploring views and experiences of decision-makers in secondary schools. *Health Science Reports, 6*(1), e997. https://doi.org/10.1002/hsr2.997
2. Álvarez-Bueno, C., Hillman, C. H., Cavero-Redondo, I., Sánchez-López, M., Pozuelo-Carrascosa, D. P., & Martínez-Vizcaíno, V. (2020). Aerobic fitness and academic achievement: A systematic review and meta-analysis. *Journal of Sports Sciences, 38*(5), 582–589. https://doi.org/10.1080/02640414.2020.1720496
3. Aly, M., Hassan, M. D., Hassan, M. M., Alibrahim, M., & Kamijo, K. (2024). Association of aerobic fitness and grip strength with cognitive and academic performance in Arab children. *Progress in Brain Research, 286*, 107–128. https://doi.org/10.1016/bs.pbr.2023.11.005

4. Benton, M. J., Spicher, J. M., & Silva-Smith, A. L. (2022). Validity and reliability of handgrip dynamometry in older adults: A comparison of two widely used dynamometers. *PLOS ONE, 17*(6), e0270132. https://doi.org/10.1371/journal.pone.0270132
5. Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., ... Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine, 54*(24), 1451–1462. https://doi.org/10.1136/bjsports-2020-102955
6. Burns, R. D., Brusseau, T. A., Pfledderer, C. D., & Fu, Y. (2020). Sports participation correlates with academic achievement: Results from a large adolescent sample within the 2017 U.S. National Youth Risk Behavior Survey. *Perceptual and Motor Skills, 127*(2), 448–467. https://doi.org/10.1177/0031512519900055
7. Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196*(4286), 129–136. https://doi.org/10.1126/science.847460
8. Haverkamp, B. F., Oosterlaan, J., Königs, M., & Hartman, E. (2021). Physical fitness, cognitive functioning and academic achievement in healthy adolescents. *Psychology of Sport and Exercise, 57*, Article 102060. https://doi.org/10.1016/j.psychsport.2021.102060
9. Ishihara, T., Nakajima, T., Yamatsu, K., Okita, K., Sagawa, M., & Morita, N. (2020). Relationship of participation in specific sports to academic performance in adolescents: A 2-year longitudinal study. *Scandinavian Journal of Medicine & Science in Sports, 30*(8), 1471–1482. https://doi.org/10.1111/sms.13703
10. Mello, J. B., Costa, R. R., da Silva, F. F., Martins, R., & Cristi-Montero, C. (2025). School ACTIVE, brain active: A meta-analysis and meta-regression on chronic school physical activity effects on cognitive performance in children and adolescents. *Educational Research Review, 46*, Article 100658. https://doi.org/10.1016/j.edurev.2024.100658
11. Manzano-Sánchez, D., Gutiérrez-Espinoza, H., & López-Gil, J. F. (2024). Sex-specific associations of muscular fitness with overall academic performance and specific school subjects in adolescents: The EHDLA study. *Frontiers in Psychology, 15*, Article 1396163. https://doi.org/10.3389/fpsyg.2024.1396163
12. Muntaner-Mas, A., Morales, J. S., Martínez-de-Quel, Ó., Lubans, D. R., & García-Hermoso, A. (2024). Acute effect of physical activity on academic outcomes in school-aged youth: A systematic review and multivariate meta-analysis. *Scandinavian Journal of Medicine & Science in Sports, 34*(1), e14479. https://doi.org/10.1111/sms.14479
13. Ni, J., Cheng, M., Zhang, R., & Wang, Y. (2025). Meta-analysis of a moderate-to-vigorous physical activity intervention for academic achievement in children and adolescents. *Physiology & Behavior, 286*, Article 114750. https://doi.org/10.1016/j.physbeh.2024.114750
14. Oluwasanu, M. M., Oladepo, O., & Ibitoye, S. E. (2021). Qualitative views of Nigerian school principals and teachers on the barriers and opportunities for promoting students' physical activity behaviours within the school settings. *BMC Public Health, 21*, Article 2302. https://doi.org/10.1186/s12889-021-12327-x
15. Owen, K. B., Foley, B. C., Wilhite, K., Booker, B., Lonsdale, C., & Reece, L. J. (2022). Sport participation and academic performance in children and adolescents: A systematic review and meta-analysis. *Medicine & Science in Sports & Exercise, 54*(2), 299–306. https://doi.org/10.1249/MSS.0000000000002786
16. Robinson, K., Riley, N., Owen, K., Drew, R., Mavilidi, M. F., Hillman, C. H., Faigenbaum, A. D., Garcia-Hermoso, A., & Lubans, D. R. (2023). Effects of resistance training on academic outcomes in school-aged youth: A systematic review and meta-analysis. *Sports Medicine, 53*(11), 2095–2109. https://doi.org/10.1007/s40279-023-01881-6
17. Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.