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The Relationship Between Physical Activity Levels, Sleep Quality and Academic Performance Among University Students in Delta State, Nigeria

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Abstract

Background: There has been a noticeable decline in academic performance globally. This study examined the relationship between physical activity level, sleep quality, and academic performance among undergraduate students in Delta State, Nigeria. ***Methods:*** A cross-sectional descriptive survey was conducted using a multi-stage sampling technique and a structured, validated, self-administered questionnaire. Data were analyzed using chi-square tests, Pearson correlation, and multiple linear regression at $p < 0.05$. ***Results:*** 69.0% of the respondents had a moderate physical activity level. Mean sleep duration was 5.96 ± 1.40 hours; 57.2% reported good and 21.3% reported poor overall sleep quality. Mean CGPA was 3.30 ± 0.84. Physical activity level was significantly associated with sleep quality ($\chi^2 = 21.38$, $p = 0.001$), and sleep quality was significantly associated with academic performance ($\chi^2 = 43.95$, $p = 0.001$). Physical activity, sleep quality, and academic performance were positively correlated ($r = 0.291$-0.472, $p < 0.01$). Multiple regression showed that sleep quality ($\beta = 0.418$, $p = 0.001$) and physical activity level ($\beta = 0.208$, $p = 0.001$) jointly predicted academic performance, explaining 28.7% of its variance ($R^2 = 0.287$, $F = 84.52$, $p = 0.001$). ***Conclusion:*** Sleep quality and physical activity are significant, independent predictors of academic performance among undergraduate students in Delta State, with sleep quality exerting the stronger influence.

Keywords: physical activity; sleep quality; academic performance; undergraduate students

Introduction

Physical activity and sleep quality are modifiable lifestyle behaviours with well-characterized effects on the physiological and cognitive development of university students [1]. Physical activity, defined as any bodily movement that increases energy expenditure above resting levels, supports cere-

bral blood flow and neuroplasticity and is associated with improved attention, memory, and cognitive flexibility [2, 3]. Aerobic activity in particular has been linked to enhanced neurocognitive functioning and learning outcomes [4, 5], and systematic reviews report consistent benefits of physical activity for concentration, classroom behaviour, and academic outcomes [6-8]. Despite this evidence, physical inactivity remains common among university students because of academic workload and sedentary study habits [9].

Sleep quality, a multidimensional construct encompassing duration, latency, disturbances, and restfulness, is similarly critical for memory consolidation, cognitive processing, and emotional regulation [10-12]. Sleep architecture strengthens neural pathways underlying learning and retention [13, 14], and sleep consistency and quality have been associated with better academic performance among college students [15]. However, many students experience short sleep duration and poor sleep quality driven by academic stress, irregular schedules, and excessive device use [16, 17], with downstream effects on attention, working memory, and executive control [18, 19].

A growing body of evidence also points to a bidirectional relationship between physical activity and sleep: regular activity reduces sleep latency and improves sleep efficiency [20], whereas sedentary behaviour is associated with poorer sleep [21], and sleep quality appears to partly mediate the cognitive benefits of physical activity [22, 23]. Academic performance, commonly measured through grade point average, is therefore best understood as the outcome of multiple interacting lifestyle and cognitive factors, with healthy lifestyle behaviours, including regular activity and adequate sleep, consistently associated with better academic outcomes [24-26]. These relationships are conceptually grounded in sleep-recovery accounts that frame sleep as a restorative neurobiological process central to memory consolidation, and in arousal-performance frameworks that situate physical activity as a modulator of cognitive readiness for academic demands [11, 25].

Within Nigeria, evidence on these relationships remains limited. A high prevalence of poor sleep quality has been reported among Nigerian undergraduates, with an associated reduction in academic performance [27], but few studies have examined the combined influence of physical activity and sleep quality on academic outcomes in this population, and none, to the best of our knowledge, within Delta State specifically. Environmental and socio-cultural conditions distinctive to Nigerian university settings, including communal hostel living, irregular electricity supply, and high smartphone use, may shape these relationships differently from contexts represented in the existing literature [28]. This study therefore examined the relationship between physical activity level, sleep quality, and academic performance among undergraduate students in Delta State, with the specific objectives of assessing physical activity level, determining sleep quality, assessing academic performance, and examining the bivariate and combined associations among these three variables.

Materials and Methods

Study design and setting

This study employed a cross-sectional descriptive survey design. It was conducted among undergraduate students attending universities in Delta State, a state in the South-South geopolitical zone of Nigeria with several public and private universities serving students from diverse socio-economic, cultural, and academic backgrounds.

Study population and eligibility criteria

The target population comprised undergraduate students across faculties, departments, and levels of study (200-500 level) in the selected universities. Students in the universities in Delta State come from various ethnicities within and outside Nigeria.

Inclusion Criteria

Students were eligible for inclusion if they were registered undergraduates aged 18 years and above, in 200-500 level, available during data collection, and provided informed consent.

Exclusion Criteria

Students were excluded if they were postgraduate or 100-level students, had a self-reported diagnosed sleep disorder or chronic medical condition likely to affect sleep or physical activity, were absent during data collection, or declined participation or submitted incomplete questionnaires.

Sample size determination

The minimum sample size was calculated using the Cochran formula for cross-sectional surveys, $n = Z^2pq/d^2$, where Z = 1.96 (95% confidence level), p = 0.5 (estimated prevalence, unknown), q = 1 − p, and d = 0.05 (margin of error). This gave a minimum sample of 384 participants; a 10% allowance for non-response and incomplete questionnaires yielded a final sample size of 423.

Sampling technique

A multi-stage sampling technique was used. In the first stage, seven universities in Delta State were purposively selected. In the second stage, the total sample was distributed across the universities by quota (Table 1). In the third stage, convenience sampling was used to recruit available, accessible, and willing respondents within each university. Questionnaires were administered both in person (lecture halls, hostels, libraries) and online (Google Forms shared through student platforms) until the quota for each university was met.

University	*Location*	*Sample Allocated*
Delta State University	Abraka	100
Southern Delta University	Ozoro	95
Federal University of Petroleum Resources	Effurun	60
University of Delta	Agbor	55
Dennis Osadebay University	Asaba	50
Western Delta University	Oghara	35
Novena University	Ogume	28
Total		423

Table 1: Distribution of the sample across the seven selected universities in Delta State.

Instrumentation

Data were collected using a structured, self-administered questionnaire comprising four sections. Section A captured sociodemographic characteristics. Section B assessed physical activity (engagement, frequency, and duration of structured exercise), with items adapted from constructs in the International Physical Activity Questionnaire [29]. Section C assessed sleep pattern and sleep quality across domains consistent with the Pittsburgh Sleep Quality Index, including duration, latency, disturbances, and daytime dysfunction [30]. Section D captured self-reported CGPA, self-rated academic performance, and respondents' perceptions of the influence of physical activity and sleep on their academic outcomes.

Validity and reliability

Content validity was established through review by physiology and public health professionals, with item modifications made on the basis of their feedback. A pilot study among undergraduates not included in the main study was used to assess internal consistency using Cronbach's alpha; a coefficient of ≥ 0.70 was considered acceptable.

Statistical analysis

Data were coded and analysed in IBM SPSS version 25.0. Descriptive statistics (frequency, percentage, mean, standard deviation) summarised demographic, physical activity, sleep, and academic performance variables. Chi-square tests examined associations between categorical variables; Pearson correlation assessed the strength and direction of association among composite scores for physical activity, sleep quality, and academic performance; and multiple linear regression examined the combined predictive influence of physical activity and sleep quality on academic performance. Statistical significance was set at $p < 0.05$.

Ethical considerations

Ethical approval for the study was obtained from the appropriate departmental/institutional review authority. Participation was voluntary; informed consent was obtained from all respondents, anonymity and confidentiality were maintained throughout, and respondents were informed of their right to withdraw at any stage without consequence.

Results

Sociodemographic characteristics

Of the 423 respondents, the majority (51.8%) were aged 21-25 years, and females constituted 54.1% of the sample. Respondents were drawn from seven universities, with Delta State University, Abraka (23.6%) and Southern Delta University, Ozoro (22.5%) contributing the largest shares. Most respondents (53.2%) were in 400 level (Table 2).

Variable	*Category*	*n*	*%*
Age group	17-20 years	112	26.5
	21-25 years	219	51.8
	26-30 years	73	17.3
	31 years and above	19	4.5
Sex	Male	194	45.9
	Female	229	54.1
University	Delta State University, Abraka	100	23.6
	Southern Delta University, Ozoro	95	22.5
	Federal University of Petroleum Resources, Effurun	60	14.2
	University of Delta, Agbor	55	13.0
	Dennis Osadebay University, Asaba	50	11.8
	Western Delta University, Oghara	35	8.3
	Novena University, Ogume	28	6.6
Level of study	200 level	81	19.1
	300 level	100	23.6
	400 level	225	53.2
	500 level	17	4.0
Total		423	100.0

Table 2: Sociodemographic characteristics of respondents (n = 423).

Physical activity level

More than half of respondents (55.8%) engaged in structured physical exercise, most commonly 2-3 days per week (40.2%; mean 2.43 ± 1.34 days/week) for 30-60 minutes per session (45.6%; mean 43.1 ± 18.2 minutes). Overall, 69.0% of respondents had a moderate physical activity level, 15.8% had a high level, and 15.1% had a low level (Table 3; Figure 1A). Physical activity level differed sig-

nificantly across the seven universities ($\chi^2 = 18.92$, df = 12, p = 0.041; Table 6), with the highest proportion of high-activity respondents recorded at Southern Delta University, Ozoro (23.2%) and the lowest at University of Delta, Agbor (12.7%).

Variable	*Category*	*n*	*%*	*Mean ± SD*
Engagement in structured exercise	Yes	236	55.8	—
	No	187	44.2	
Days of exercise/week	0-1 day	144	34.0	2.43 ± 1.34
	2-3 days	170	40.2	
	4-5 days	82	19.4	
	6-7 days	27	6.4	
Duration/session	< 30 min	98	23.2	43.1 ± 18.2
	30-60 min	193	45.6	
	61-90 min	89	21.0	
	> 90 min	43	10.2	
Overall physical activity level	Low	64	15.1	—
	Moderate	292	69.0	
	High	67	15.8	
Total		423	100.0	

Table 3: Physical activity characteristics of respondents (n = 423).

Sleep quality

Mean sleep duration was 5.96 ± 1.40 hours, with 43.3% of respondents sleeping 5-6 hours per night and only 6.1% sleeping more than 8 hours. Overall sleep quality was rated good or very good by 74.0% of respondents (57.2% good, 16.8% very good) and poor or very poor by 26.0% (Table 4; Figure 1B). Despite generally favourable self-rated sleep quality, many respondents reported sleep disturbances: 22.2% often or always had difficulty falling asleep, 42.1% often or always woke up tired or unrefreshed, and 30.7% often or always felt sleepy during lectures. Sleep quality varied significantly by university ($\chi^2 = 14.76$, df = 6, p = 0.022; Table 6), with the highest proportion of good/very good sleepers at Southern Delta University, Ozoro (81.1%) and the lowest at Novena University, Ogume (67.9%).

Variable	*Category*	*n*	*%*	*Mean ± SD*
Sleep duration/night	< 5 hours	91	21.5	5.96 ± 1.40 h
	5-6 hours	183	43.3	
	7-8 hours	123	29.1	
	> 8 hours	26	6.1	
Difficulty falling asleep	Never	115	27.2	1.95 ± 0.81
	Sometimes	214	50.6	
	Often	68	16.1	
	Always	26	6.1	
Waking up tired/unrefreshed	Never	51	12.1	2.41 ± 0.87
	Sometimes	194	45.9	
	Often	128	30.3	
	Always	50	11.8	

Feeling sleepy during lectures	Never	79	18.7	2.21 ± 0.85
	Sometimes	214	50.6	
	Often	86	20.3	
	Always	44	10.4	
Overall sleep quality	Very poor	20	4.7	2.87 ± 0.73
	Poor	90	21.3	
	Good	242	57.2	
	Very good	71	16.8	
Total		423	100.0	

Table 4: Sleep pattern and sleep quality characteristics of respondents (n = 423).

Academic performance

The mean CGPA was 3.30 ± 0.84; most respondents reported a CGPA of 2.50-3.49 (39.5%) or 3.50-4.49 (32.9%), while 4.7% reported a CGPA below 2.00. Self-rated academic performance was good or excellent for 47.5% of respondents and poor or average for the remainder (Table 5; Figure 1C). Most respondents believed that physical activity (75.4%) and sleep quality (84.4%) influence their academic performance. Academic performance also differed significantly by university ($\chi^2 = 16.84$, df = 6, p = 0.010; Table 6), with the highest proportion of good/excellent performers at Southern Delta University, Ozoro (60.0%) and the lowest at Novena University, Ogume (32.1%).

Variable	***Category***	***n***	***%***	***Mean ± SD***
Current CGPA range	< 2.00	20	4.7	3.30 ± 0.84
	2.00-2.49	46	10.9	
	2.50-3.49	167	39.5	
	3.50-4.49	139	32.9	
	≥ 4.50	51	12.1	
Self-rated academic performance	Poor	53	12.5	2.91 ± 0.80
	Average	169	40.0	
	Good	141	33.3	
	Excellent	60	14.2	
Believes PA improves academic performance	Yes	319	75.4	—
	No	104	24.6	
Believes poor sleep impairs academic performance	Yes	357	84.4	—
	No	66	15.6	
Total		423	100.0	

Table 5: Academic performance characteristics of respondents (n = 423).

Associations among physical activity, sleep quality, and academic performance

Physical activity level was significantly associated with sleep quality ($\chi^2 = 21.38$, df = 2, p = 0.001), and sleep quality was significantly associated with academic performance ($\chi^2 = 43.95$, df = 1, p < 0.001) (Table 6). Pearson correlation analysis showed positive associations between physical activity and sleep quality (r = 0.318, p < 0.01), physical activity and academic performance (r = 0.291, p < 0.01), and a stronger association between sleep quality and academic performance (r = 0.472, p < 0.01) (Table 7).

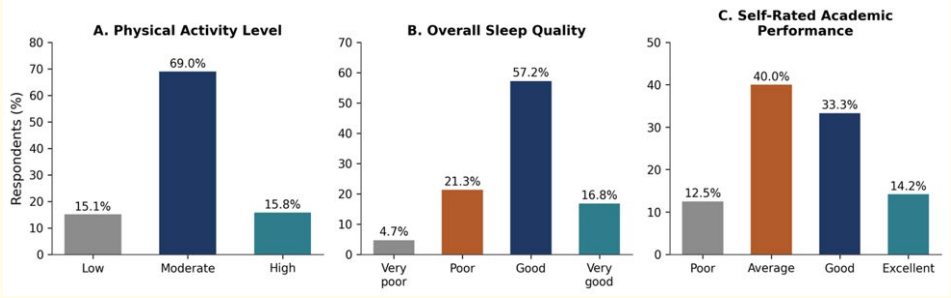

Figure 1: Distribution of overall physical activity level (A), overall sleep quality (B), and self-rated academic performance (C) among respondents (n = 423).

Association tested	χ^2	*df*	*p*	*Decision*
University and physical activity level	18.92	12	0.041	Significant
University and sleep quality	14.76	6	0.022	Significant
University and academic performance	16.84	6	0.010	Significant
Physical activity level and sleep quality	21.38	2	0.001	Significant
Sleep quality and academic performance	43.95	1	0.001	Significant

Table 6: Chi-square analysis of associations among study variables.

Variable	*Mean ± SD*	*1*	*2*	*3*
1. Physical activity level	2.94 ± 1.20	1.000	0.318**	0.291**
2. Sleep quality	1.60 ± 0.49	0.318**	1.000	0.472**
3. Academic performance	3.30 ± 0.84	0.291**	0.472**	1.000
***Correlation is significant at the 0.01 level.*				

Table 7: Correlation matrix of physical activity level, sleep quality, and academic performance.

Predictors of academic performance

Multiple linear regression showed that physical activity level and sleep quality jointly and significantly predicted academic performance ($F(2,420) = 84.52$, $p < 0.001$), accounting for 28.7% of the variance ($R^2 = 0.287$; adjusted $R^2 = 0.284$). Sleep quality was the stronger predictor ($\beta = 0.418$, $t = 7.84$, $p < 0.001$), followed by physical activity level ($\beta = 0.208$, $t = 3.90$, $p < 0.001$) (Table 8; Figure 2).

Predictor	*B*	*SE*	*β*	*t*	*p*
Constant	1.302	0.208	—	6.26	0.001
Physical activity level	0.191	0.049	0.208	3.90	0.001
Sleep quality	0.431	0.055	0.418	7.84	0.001

Model summary.

R	R^2	*Adjusted* R^2	*F*	*p*
0.536	0.287	0.284	84.52	0.001

Table 8: Multiple regression analysis showing the influence of physical activity level and sleep quality on academic performance.

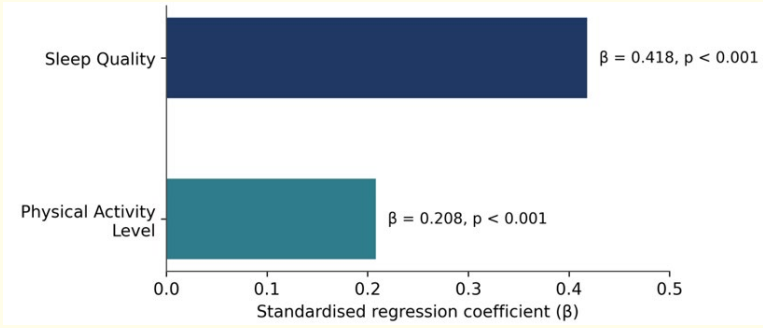

Figure 2: Standardised regression coefficients (β) for physical activity level and sleep quality as predictors of academic performance (R^2 = 0.287, F = 84.52, p < 0.001).

Discussion

This cross-sectional study examined the relationship between physical activity, sleep quality, and academic performance among 423 undergraduate students across seven universities in Delta State. The predominantly young-adult sample (51.8% aged 21-25 years) and the near-equal representation of two flagship universities, Delta State University, Abraka and Southern Delta University, Ozoro, provided a reasonable basis for institutional comparison.

The finding that most respondents (69.0%) had a moderate physical activity level, with only 15.8% achieving a high level, is consistent with reports that university environments often discourage vigorous activity through academic workload and sedentary study routines [9]. Regular activity supports cerebral blood flow, glucose metabolism, and neurotransmitter balance important for attention and learning [3], and aerobic activity has been linked to improved inhibitory control among college students through combined physical and cognitive engagement [31]. The significantly higher proportion of high-activity students at Southern Delta University, Ozoro relative to other institutions, including Abraka, suggests that institutional factors, such as access to recreational facilities and a campus culture that supports movement, may shape students' physical activity behaviour.

Although most respondents rated their sleep quality as good or very good (74.0%), the concurrent reports of short sleep duration (mean 5.96 ± 1.40 hours) and frequent sleep disturbances, including waking up tired (42.1%) and daytime sleepiness during lectures (30.7%), suggest that self-rated sleep quality may not fully capture underlying sleep insufficiency. This pattern aligns with evidence that insufficient sleep impairs memory-formation processes [32] and that adequate sleep is essential for memory consolidation among university students [11, 13]. The more favourable sleep profile observed at Southern Delta University, Ozoro may be linked to its comparatively higher physical activity levels, consistent with evidence that exercise improves sleep quality by regulating circadian rhythm, reducing stress, and increasing slow-wave sleep [20].

The mean CGPA of 3.30 ± 0.84 indicates generally moderate-to-good academic performance, and most respondents recognised the influence of physical activity (75.4%) and sleep (84.4%) on their academic outcomes, an awareness that did not always translate into healthier sleep practices given the disturbances reported above. The better self-reported academic performance at Southern Delta University, Ozoro relative to other institutions, including Abraka, mirrors the pattern observed for physical activity and sleep quality at that institution, supporting the proposition that institutional environment and lifestyle behaviours act jointly on academic outcomes [24].

Consistent with the study hypotheses, physical activity level was positively correlated with sleep quality (r = 0.318), and both were positively correlated with academic performance, with sleep quality showing the stronger association (r = 0.472 versus r = 0.291). The regression model confirmed that sleep quality was the stronger independent predictor of academic performance (β = 0.418) relative

to physical activity (β = 0.208), jointly explaining 28.7% of the variance. This pattern is consistent with accounts that position sleep as central to memory consolidation and neural restoration [14], and with prior evidence that sleep quality, more than physical activity, accounts for variation in academic performance among university students [15, 33, 34]. The smaller, but still significant, contribution of physical activity is consistent with evidence that exercise supports academic outcomes partly through its beneficial effects on sleep [22, 23].

These findings should be interpreted in light of several limitations. The cross-sectional design precludes causal inference, and reliance on self-reported measures of physical activity, sleep, and CGPA may have introduced recall and social-desirability bias. The use of convenience sampling within each university may also limit the generalisability of findings to all undergraduate students in the state.

Conclusion and Recommendations

This study found that physical activity level and sleep quality were significantly and independently associated with academic performance among undergraduate students in Delta State, with sleep quality exerting the stronger influence. Most students had a moderate physical activity level and self-rated good sleep quality, yet many continued to report short sleep duration and recurrent sleep disturbances. Institutional differences, most notably the more favourable physical activity, sleep, and academic profiles observed at Southern Delta University, Ozoro, suggest that campus environment and facilities may shape students' lifestyle behaviours and, in turn, their academic outcomes.

Universities in Delta State should invest in functional recreational and sporting facilities, promote structured physical activity programmes, and implement sleep-hygiene awareness campaigns addressing late-night screen use and irregular sleep schedules. Academic timetabling that reduces excessive workload-related sleep deprivation may further support students' cognitive and academic functioning. Future research should employ longitudinal designs and objective measures of physical activity and sleep to clarify the causal pathways linking these behaviours to academic performance.

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Declaration of conflict of interest

The authors wish to declare that there are no potential conflicts of interest that could partially or fully prejudice the research report.

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