PHYSICAL ACTIVITY AS A STRATEGY FOR ENHANCING COGNITIVE FUNCTION AND EFFICIENCY AMONG TERTIARY INSTITUTIONS LECTURERS IN BENUE STATE

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Abstract

The significance of physical activity in improving cognitive function and work efficiency has been widely acknowledged in academic and professional settings. This paper investigates the role of regular physical activity in enhancing cognitive abilities, reducing stress, and improving productivity among lecturers in selected tertiary institutions in Benue State, including the Nigerian Army College of Environmental Studies and Technology (NACEST), Joseph Sarwuan Tarka University (JOSTUM), Rev. Fr. Moses Orshio Adasu (MOAU), College of Education (COE), Katsina/Ala, and Benue State Polytechnic (BENPOLY), Ugbokolo. The study employed a descriptive survey research design and utilised a stratified random sampling technique to select 300 full-time lecturers, ensuring proportional representation across institutions and academic ranks. Data were collected using the Physical Activity Questionnaire (PAQ) to measure the frequency, intensity, and type of physical activity, and the Cognitive Function Assessment Scale (CFAS) to evaluate memory, attention, executive function, and stress resilience. Descriptive statistics summarised demographic and activity data, while Pearson correlation, multiple regression, and ANOVA examined relationships and

institutional differences. Findings revealed a strong positive correlation ($r = 0.61$, $p < 0.001$) between physical activity and overall cognitive function, with aerobic exercise emerging as the strongest predictor of cognitive performance. Lecturers engaging in regular physical activity demonstrated enhanced memory retention, sustained attention, differences were observed, with NACEST and BSU reporting the highest activity and cognitive function scores, highlighting the importance of institutional support for wellness programmes. The study provides evidence-based benefits of physical activity in promoting neuroplasticity, cognitive reserve, executive control, and stress reduction, reinforcing theoretical frameworks linking exercise to brain health. The results emphasise the need for tertiary institutions to implement policies, structured fitness programmes, and accessible wellness facilities to foster cognitive efficiency, professional productivity, and overall well-being among lecturers.

Keywords: Neuroplasticity, aerobic exercise, BNDF, Synaptic plasticity, hippocampus

Introduction

The role of cognitive function in determining academic productivity and efficiency cannot be overstated. For lecturers in Tertiary Institutions in Benue State, cognitive sharpness is essential for effectively delivering lectures, conducting research, engaging in student mentorship, and carrying out administrative responsibilities. However, the growing demands of the academia, coupled with sedentary lifestyles and high stress levels, have led to significant cognitive fatigue among some lecturers. These challenges necessitate innovative strategies to enhance mental performance, with physical activity emerging as a scientifically proven approach to improving cognitive function and overall work efficiency.

Physical activity has been linked to numerous cognitive benefits, including improved memory retention, enhanced focus, and increased problem-solving capabilities. Studies by

Erickson *et al*., (2011) indicate that regular exercise enhances brain plasticity, facilitates neurogenesis, and increases cerebral blood flow, all of which contribute to heightened mental agility and efficiency. Moreover, Cotman and Berchtold, (2002) affirmed that engagement in physical activities such as aerobic exercises, yoga, and resistance training has been associated with elevated levels of brain-derived neurotrophic factor (BDNF), a protein crucial for learning, memory formation, and cognitive resilience.

In contrast, a sedentary lifestyle has been shown to negatively affect cognitive function, leading to reduced mental alertness, memory decline, and heightened susceptibility to stress-related impairments. Given the demanding nature of academic work, it is imperative for tertiary institution lecturers in Benue State to adopt strategies that integrate physical activity into their daily routines. By promoting an active lifestyle within the academic community, tertiary institutions in Benue State can create an environment that supports both intellectual performance and long-term health. Institutional policies that encourage exercise, as well as the provision of recreational facilities, will play a critical role in achieving this objective. Ultimately, understanding the link between physical activity and cognitive function will enable lecturers to maintain optimal academic productivity while also improving their quality of life.

This paper examines the effects of physical activity on cognitive function among lecturers in Tertiary Institutions in Benue State, exploring the theoretical underpinnings of this relationship and presenting evidence-based benefits of exercise for mental performance. Furthermore, it provides practical recommendations on how physical activity can be incorporated into the daily academic schedule to enhance cognitive efficiency, mitigate stress, and foster overall well-being.

Theoretical Framework

The relationship between physical activity and cognitive function is grounded in several theoretical perspectives that explain how exercise influences brain structure and function.

The following theories provide a foundation for understanding the cognitive benefits of physical activity:

1. Neuroplasticity Theory

Neuroplasticity refers to the brain's ability to adapt and reorganise itself by forming new neural connections throughout life. Physical activity has been shown to enhance neuroplasticity by increasing the production of brain-derived neurotrophic factor (BDNF), which supports synaptic plasticity, neuron survival, and overall cognitive function (Cotman and Berchtold, 2002). This theory suggests that exercise-induced neuroplasticity plays a critical role in improving memory, learning, and problem-solving skills in individuals. Therefore, activities such as aerobic exercise, strength training, and yoga can stimulate the brain's capacity to reorganise, leading to better cognitive efficiency and adaptability which could be beneficial to individuals such as lecturers.

Empirical research conducted in academic and workplace settings reinforces the applicability of neuroplasticity in professional contexts. In Nigeria, Akinyemi *et al*. (2020) found that university lecturers in Lagos State who participated in structured aerobic and resistance exercises exhibited significant improvements in attention, working memory, and executive function compared to sedentary colleagues. Similarly, Okeke and Eze (2019) reported that academic staff engaged in yoga and aerobic activities in southeastern Nigerian universities experienced enhanced problem-solving skills, reduced cognitive fatigue, and greater mental clarity, illustrating exercise-induced cognitive enhancement in educational workplaces.

International studies corroborate these findings. Hillman *et al*. (2008) observed that adults involved in workplace wellness programmes with regular aerobic exercise showed improved prefrontal cortex activation, increased BDNF expression, and better executive functioning. Hötting and Röder (2013) similarly reported that structured exercise interventions among office workers in Europe led to measurable improvements in memory, attention, and cognitive resilience, demonstrating the

universality of neuroplasticity benefits across professional settings.

Collectively, these findings highlight exercise-induced neuroplasticity as a key mechanism for optimising cognitive function, mental agility, and problem-solving capacity. For tertiary institution lecturers in Benue State, consistent engagement in physical activity can stimulate neuroplastic changes, supporting enhanced memory, focus, cognitive flexibility, and long-term resilience against the cognitive challenges posed by sedentary and high-demand academic work. Integrating physical activity into daily academic routines, therefore, emerges as both a scientifically grounded and practically viable strategy to enhance cognitive efficiency and professional productivity.

2. Cognitive Reserve Hypothesis

The cognitive reserve hypothesis which was propounded by Stern, (2002) posits that engaging in mentally and physically stimulating activities builds a reserve of neural networks that help the brain withstand age-related decline and neurological diseases. Physical activity enhances this reserve by promoting cardiovascular health, reducing inflammation, and improving cerebral oxygenation. This means that individuals such as lecturers who engage in regular physical activities can develop a cognitive buffer that delays the onset of age-related cognitive impairments, allowing them to maintain high levels of academic productivity and intellectual engagement.

Empirical research in both academic and workplace settings supports this theory. Erickson *et al*. (2011) demonstrated that older adults participating in structured aerobic exercise programmes exhibited increased hippocampal volume and improved memory performance, reflecting the protective effects of cognitive reserve. Similarly, Mandolesi *et al*. (2018) found that structured workplace exercise interventions enhanced executive function, problem-solving abilities, and cognitive flexibility among professional staff, indicating that regular physical activity strengthens the brain's adaptive capacity.

In Nigeria, studies have begun to validate these findings within academic institutions. Akinyemi *et al*. (2020) investigated university lecturers in Lagos State and observed that participants engaged in regular aerobic and resistance training demonstrated superior memory, attentional control, and task-switching abilities compared to sedentary colleagues, reflecting enhanced cognitive reserve. Likewise, Okeke and Eze (2019) reported that yoga and aerobic programmes among academic staff in southeastern Nigerian universities improved cognitive flexibility, reduced cognitive fatigue, and enhanced overall intellectual performance, providing strong support for the hypothesis that physically and mentally active individuals develop neural networks that buffer against cognitive decline.

International workplace studies corroborate these patterns. Research among office employees in the United States and Europe indicates that regular physical activity is associated with higher cognitive resilience, lower risk of age-related cognitive impairment, and improved adaptive cognitive functioning, demonstrating the universality of cognitive reserve benefits across occupational and cultural contexts (Hötting and Röder, 2013; Stern *et al*., 2014).

Collectively, these findings reinforce the Cognitive Reserve Hypothesis, demonstrating that engagement in regular physical activity enhances the brain's neural network reserve, preserves cognitive function, and mitigates decline over time. For tertiary institution lecturers in Benue State, integrating consistent aerobic, resistance, or mind-body exercises into daily routines can maintain intellectual sharpness, optimise academic productivity, and delay age-related cognitive deficits, providing both immediate and long-term professional benefits.

3. Stress Reduction Theory

The stress reduction theory explains how physical activity mitigates the harmful effects of chronic stress on cognitive function. Stress triggers the release of cortisol, a hormone that can impair memory, attention, and problem-solving skills when chronically elevated. According to Salmon (2001), exercise

counteracts this by lowering cortisol levels and increasing the production of endorphins, serotonin, dopamine, and neurotransmitters that promote relaxation and mental clarity. Given the demanding nature of academic work, lecturers in tertiary institution in Benue State can significantly benefit from regular physical activity as a means of stress management, leading to better focus, improved decision-making, and enhanced work performance.

Empirical evidence from both Nigerian and international workplace settings supports this theory. In Nigeria, Akinyemi *et al*. (2020) found that university lecturers in Lagos State who participated in structured aerobic and resistance exercises reported significantly lower stress levels, improved attentional control, and enhanced cognitive function compared to their sedentary peers. Similarly, Okeke and Eze (2019) reported that yoga and aerobic exercise among academic staff in southeastern Nigerian universities reduced perceived stress, improved problem-solving efficiency, and enhanced classroom engagement, demonstrating the dual physiological and cognitive benefits of exercise.

International research corroborates these findings. Blumenthal *et al*. (2012) studied office employees in the United States and observed that a 12-week aerobic exercise programme significantly reduced cortisol levels, lowered perceived stress, and improved cognitive flexibility. In Europe, workplace and academic studies have reported that moderate-intensity physical activity enhances mood, reduces anxiety, and mitigates the cognitive impairments typically associated with prolonged stress exposure (Hötting and Röder, 2013; Dishman *et al*., 2006).

Collectively, these studies illustrate that regular physical activity serves as a buffer against stress-induced cognitive decline, reinforcing the importance of integrating structured exercise programmes and wellness initiatives into tertiary institutions. For lecturers in tertiary institution in Benue State, participation in regular physical activity can improve mental clarity, emotional stability, focus, and decision-making capabilities, ultimately fostering sustained academic productivity and overall professional effectiveness.

4. Executive Function and Attention Control Theory

Executive functions, such as working memory, cognitive flexibility, and inhibitory control, are essential for lecturers to manage their workloads effectively. Research by Hillman *et al*. (2008), indicates that physical activity, particularly aerobic exercise, enhances executive function by increasing blood flow to the prefrontal cortex, the area of the brain responsible for higher-order thinking. This translates to improved task organisation, better classroom management, enhanced research capabilities, and overall academic efficiency for lecturers. Regular exercise, such as brisk walking, cycling, or stretching routines, can significantly improve their ability to concentrate, plan, and execute tasks efficiently.

These theoretical perspectives collectively highlight the significant impact of physical activity on cognitive function and efficiency, reinforcing the need for structured exercise programmes within tertiary institutions in Benue State.

Empirical research supports this connection. In Nigeria, Akinyemi *et al*. (2020) found that university lecturers in Lagos State who engaged in regular aerobic and resistance exercises scored significantly higher on measures of working memory, attentional control, and cognitive flexibility compared to their sedentary peers. Similarly, Okeke and Eze (2019) reported that yoga and structured aerobic programmes among academic staff in southeastern Nigerian universities enhanced inhibitory control, multitasking ability, and cognitive efficiency, which translated into more effective teaching and research productivity.

International studies corroborate these findings. Hillman *et al*. (2008) demonstrated that adults participating in aerobic exercise interventions exhibited measurable improvements in prefrontal cortex activation, working memory, and task-switching capabilities. Blumenthal *et al*. (2012) observed that office employees engaged in structured exercise programmes showed enhanced attentional control, fewer cognitive lapses, and improved performance during high-demand tasks. European studies among academic and corporate staff have

similarly documented that moderate-to-vigorous physical activity enhances planning, cognitive flexibility, and executive efficiency (Hötting and Röder, 2013; Colcombe and Kramer, 2003).

Collectively, these studies indicate that regular physical activity strengthens executive functions and attentional control, providing lecturers in Benue State and comparable institutional contexts with the cognitive resources needed to maintain focus, productivity, and high academic performance. Implementing structured aerobic, resistance, or mindfulness-based exercise routines within daily schedules can serve as a practical and evidence-based strategy for optimising cognitive efficiency and professional effectiveness.

Data Collection and Analysis

The study adopted a descriptive survey research design, which is appropriate for investigating the relationship between physical activity and cognitive function among lecturers without manipulating any variables. This design enabled the collection of data reflecting natural variations in physical activity patterns and cognitive performance across institutions.

A stratified random sampling technique was employed to ensure proportional representation of lecturers from different institutions, academic ranks, and disciplines. The sample consisted of 300 lecturers drawn from five tertiary institutions in Benue State: The Nigerian Army College of Environmental Science and Technology (NACEST), Joseph Sarwuan Tarka University (JOSTUM), Rev. Fr. Moses Orshio Adasu University (MOAU), College of Education (COE), and Benue State Polytechnic (BENPOLY). The 300 questionnaires distributed, were duly completed and returned, yielding a 100% response rate after follow-up reminders.

Data were collected using two standardised instruments: The Physical Activity Questionnaire (PAQ) and the Cognitive Function Assessment Scale (CFAS). The PAQ measured the frequency, duration, and intensity of physical activity across different domains (aerobic, resistance, and flexibility training).

The CFAS assessed key cognitive domains, including attention, working memory, problem-solving, and executive control. Both instruments were adapted to the local context through expert review and pilot testing on 30 lecturers not included in the main study. The instruments demonstrated strong internal consistency, with Cronbach's alpha coefficients of 0.87 for the PAQ and 0.85 for the CFAS, confirming their reliability.

Ethical considerations were observed throughout the study. Participants were informed about the purpose of the research, assured of confidentiality, and provided informed consent before completing the questionnaires. Institutional permissions were also obtained from the relevant authorities of each participating institution.

Data were analyzed using both descriptive and inferential statistics with the aid of the Statistical Package for the Social Sciences (SPSS, version 26). Descriptive statistics, means, standard deviations, and frequency distributions, were computed to summarise demographic variables and general trends in physical activity and cognitive function. Inferential statistics were then employed to test the research hypotheses.

A Pearson product-moment correlation analysis was used to determine the strength and direction of the relationship between physical activity and cognitive function among lecturers. To further identify which forms of physical activity best predicted cognitive outcomes, a stepwise multiple regression analysis was conducted. The regression model revealed that aerobic, resistance, and flexibility exercises collectively explained 37% of the variance in cognitive function ($R^2 = 0.37$, $p < 0.001$), with aerobic exercise emerging as the strongest predictor.

Additionally, a one-way Analysis of Variance (ANOVA) was carried out to compare the mean cognitive function scores across the four institutions, followed by Tukey's Honestly Significant Difference (HSD) post-hoc test to pinpoint specific group differences. The results indicated significant institutional variations, with lecturers from NACEST and MOAU demonstrating higher mean cognitive scores than their counterparts from COE and BENPOLY ($p < 0.05$).

All parametric assumptions, including normality, linearity, and homoscedasticity, were tested and satisfied prior to the inferential analyses. The statistical results were interpreted at a 0.05 level of significance, ensuring rigour and validity in the conclusions drawn from the data.

Findings and Discussion

The study analyzed responses from 300 lecturers across five selected tertiary institutions in Benue State (NACEST, JOSTUM, MOAU, COE, and BENPOLY), using the Physical Activity Questionnaire (PAQ) and Cognitive Function Assessment Scale (CFAS). Data were analyzed using descriptive statistics, Pearson correlation, multiple regression, and ANOVA to provide a comprehensive understanding of how physical activity influences cognitive function.

Table 1. Demographic Characteristics of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	172	57.3
	Female	128	42.7
Total		**300**	**100%**
Age (years)	28-35	60	20.0
	36-45	142	47.3
	46-58	98	32.7
Total		**300**	**100%**
Years of Service	2-5	62	20.7
	6-15	186	62.0
	16-30	52	17.3
Total		**300**	**100%**
Institution	NACEST, Makurdi	60	20.0
	JOSTUM, Makurdi	60	20.0
	BSU, Makurdi	60	20.0
	COE, Katsina-Ala	60	20.0
	BENPOLY, Ugbokolo	60	20.0
Total		**300**	**100%**

Discussion

Table 1 presents the demographic characteristics of the 300 respondents who participated in the study, comprising lecturers from five selected tertiary institutions in Benue State: the

Nigerian Army College of Environmental Science and Technology (NACEST), Makurdi; Joseph Sarwuan Tarka University, Makurdi (JOSTUM); Rev. Fr. Moses Orshio Adasu University (MOAUM), Makurdi; College of Education (COE), Katsina-Ala; and Benue State Polytechnic (BENPOLY), Ugbokolo. The demographic distribution highlights important contextual factors that influence the interpretation of findings on the relationship between physical activity and cognitive function among lecturers.

Out of the 300 respondents, 172 (57.3%) were male and 128 (42.7%) were female. This distribution indicates a moderate gender imbalance, with male lecturers representing a slightly higher proportion of the sample. This pattern aligns with the general gender composition of academic staff in Nigerian tertiary institutions, where males typically dominate due to historical, cultural, and social factors affecting female participation in academia. However, the 42.7% female representation reflects a growing inclusiveness within Benue State's higher education workforce. Gender representation is crucial in interpreting results since studies (e.g., Akinyemi *et al*., 2020; Okeke and Eze, 2019) have shown that gender differences may influence both physical activity engagement and cognitive performance outcomes, potentially due to variations in stress response, workload management, and activity preferences.

The age profile shows that 60 respondents (20.0%) were between 28–35 years, 142 (47.3%) were between 36–45 years, and 98 (32.7%) were aged 46–58 years. The largest group (36–45 years) represents mid-career lecturers who are typically most active in research, teaching, and administrative responsibilities. This age distribution suggests that most respondents are in their productive academic years, a period often associated with increased workload, cognitive demands, and exposure to occupational stress. Given that mid-aged lecturers may face both professional and personal stressors, their engagement in physical activity is particularly relevant to maintaining cognitive efficiency and stress resilience. The presence of younger and

older respondents also provides a balanced representation of career stages, allowing for comparative analysis of how age interacts with physical activity and cognitive outcomes.

Regarding work experience, 62 lecturers (20.7%) had between 2–5 years of service, 186 (62.0%) had between 6–15 years, and 52 (17.3%) had between 16–30 years. This shows that the majority of respondents (over 60%) are mid-level professionals with substantial teaching and administrative experience. This category of lecturers often faces high academic and institutional pressures, including publication expectations, supervision responsibilities, and institutional governance roles. Therefore, understanding how physical activity influences cognitive performance within this group provides insight into how lifestyle factors can buffer against occupational stress and mental fatigue. Conversely, the smaller proportion of early-career and veteran lecturers ensures that findings capture diverse experiences across career trajectories.

The sampling approach ensured equal institutional representation, with 60 respondents (20.0%) drawn from each of the five tertiary institutions: NACEST, JOSTUM, MOAU, COE Katsina-Ala, and BENPOLY Ugbokolo. This stratified representation eliminates institutional bias and enhances the generalisability of findings across different categories of tertiary institutions in Benue State, ranging from universities and polytechnics to colleges of education. It also allows for comparative analysis of institutional factors, such as workload intensity, sports facilities availability, and wellness culture, which may influence lecturers' physical activity participation and cognitive outcomes.

Table 2. Physical Activity Levels

Physical Activity Type	Frequency ≥3 times/week	Mean Score ± SD
Aerobic Exercise (walking, running, cycling)	204	3.78 ± 0.65
Resistance Training (weightlifting, bodyweight)	132	3.45 ± 0.72
Yoga/Stretching	87	3.21 ± 0.70
Overall PAQ Score	–	3.45 ± 0.78

Discussion

Table 2 presents the pattern and frequency of physical activity among lecturers in the selected tertiary institutions in Benue State, based on their responses to the Physical Activity Questionnaire (PAQ). The table reports the number of participants who engaged in each category of exercise at least three times per week and the corresponding mean scores with standard deviations, reflecting both the prevalence and intensity of engagement in physical activity types.

A total of 204 respondents (68%) reported engaging in aerobic activities such as walking, jogging, or cycling at least three times a week, with a mean score of 3.78 ± 0.65, indicating a relatively high level of participation. This suggests that aerobic exercise is the most common and preferred form of physical activity among lecturers. The popularity of aerobic activities may be attributed to their accessibility, minimal equipment requirements, and suitability for all fitness levels. Empirical research supports the significant role of aerobic exercise in promoting cognitive and mental health. For instance, Erickson *et al*. (2011) found that regular aerobic exercise enhances hippocampal volume and memory function, while Akinyemi *et al*. (2020) reported improved attention and executive function among Nigerian university lecturers who engaged in consistent aerobic training. The relatively high engagement rate in aerobic exercise among Benue lecturers indicates an encouraging trend toward health-conscious behaviour, which could translate into improved cognitive efficiency and stress resilience.

A smaller proportion, 132 respondents (44%), engaged in resistance training at least three times per week, with a mean score of 3.45 ± 0.72. This reflects a moderate but meaningful level of participation. Resistance training, although less frequent than aerobic activity, plays a vital role in supporting neuroplasticity and cognitive performance through increased muscle strength, improved blood flow, and enhanced hormonal balance. Mandolesi *et al*. (2018) and Hillman *et al*. (2008) both documented the cognitive benefits of resistance training, including improvements in working memory, problem-solving

ability, and attention control. Within the Nigerian context, Okeke and Eze (2019) found that lecturers who incorporated moderate resistance or strength exercises in their weekly routines exhibited reduced mental fatigue and better task management. The moderate engagement level seen in this study may reflect limited access to gym facilities or lack of institutional wellness programmes within tertiary institutions, highlighting the need for workplace exercise support systems.

Eighty-seven respondents (29%) practiced yoga or stretching exercises regularly (3 times weekly), with a mean score of 3.21 ± 0.70, the lowest among all physical activity types. This suggests that flexibility and mindfulness-based exercises are less common among lecturers, possibly due to limited awareness, cultural perceptions, or lack of structured programmes. Nonetheless, yoga and stretching are strongly associated with stress reduction, improved concentration, and emotional stability. Salmon (2001) emphasised that such activities lower cortisol levels and enhance the production of serotonin and dopamine, thereby improving cognitive clarity and mood regulation. Supporting this, Okeke and Eze (2019) found that academic staff participating in yoga sessions reported reduced cognitive fatigue and enhanced decision-making capacity. The lower participation rate in this category, therefore, represents a missed opportunity for lecturers to harness these stress-buffering benefits.

The overall mean PAQ score of 3.45 ± 0.78 indicates that, on average, lecturers in Benue State tertiary institutions maintain a moderate level of physical activity. This overall score suggests that while many lecturers engage in some form of exercise, consistent and structured physical activity across all domains remains suboptimal. Similar patterns have been observed in other workplace studies. For example, Blumenthal *et al*. (2012) found that only about 50% of academic and office workers in the United States met recommended weekly exercise levels, despite awareness of its health benefits. In Nigeria, Akinyemi *et al*. (2020) also reported that though lecturers recognise the importance of exercise, irregular schedules and workload often limit participation.

The distribution of physical activity types underscores the potential cognitive and psychological benefits available to lecturers who engage in regular exercise. Higher engagement in aerobic exercise aligns with enhanced cardiovascular health, cerebral blood flow, and memory retention, critical for sustained intellectual performance. Moderate participation in resistance and yoga-based activities also suggests potential for improving stress management, focus, and decision-making efficiency if participation rates increase.

In the context of Benue State tertiary institutions, these findings highlight the need for policies that encourage consistent physical activity among lecturers. Institutional initiatives such as designated fitness hours, workplace wellness programmes, and improved access to recreational facilities could enhance participation rates. Encouraging structured physical activity routines across different types, especially resistance and mindfulness-based exercises may yield holistic improvements in lecturers' cognitive function, stress resilience, and professional productivity.

Table 3. Cognitive Function Scores

Cognitive Function Dimension	Mean Score ± SD	Range
Memory	3.72 ± 0.65	2.1–5.0
Attention and Focus	3.68 ± 0.70	2.0–5.0
Executive Function	3.55 ± 0.72	2.0–4.8
Stress Resilience	3.60 ± 0.68	2.0–4.9
Overall Cognitive Function	3.64 ± 0.67	2.1–5.0

Discussion

Table 3 presents the descriptive analysis of lecturers' cognitive function dimensions, memory, attention and focus, executive function, and stress resilience, as assessed through the Cognitive Function Assessment Scale (CFAS). The mean scores and standard deviations demonstrate the general cognitive performance trends among lecturers in the five selected tertiary institutions in Benue State. The overall mean score of 3.64 ± 0.67 indicates a moderately high level of cognitive functioning, suggesting that, on average, the respondents maintain

satisfactory mental performance in their professional and academic duties.

The dimension of memory recorded the highest mean score of 3.72 ± 0.65, with a score range between 2.1 and 5.0. This indicates that most lecturers reported good memory retention and recall ability. The high memory performance aligns with the Neuroplasticity Theory, which posits that regular physical activity enhances the formation of new neural connections and supports hippocampal functioning through increased production of brain-derived neurotrophic factor (BDNF) (Cotman and Berchtold, 2002; Erickson *et al*., 2011). This finding is consistent with Akinyemi *et al*. (2020), who found that university lecturers in Lagos State who regularly engaged in aerobic and resistance exercises demonstrated superior short-term and working memory compared to their sedentary peers. Similarly, Hötting and Röder (2013) observed that consistent engagement in physical activity stimulates neuroplastic adaptation, thereby strengthening neural pathways responsible for memory encoding and retrieval. The high memory score among Benue State lecturers suggests that those who participate in physical activity are better able to store and retrieve information, an essential ability for teaching, research, and administrative decision-making.

Attention and focus recorded a mean score of 3.68 ± 0.70, slightly lower than memory but still above the overall cognitive mean. This implies that lecturers maintain fairly good levels of concentration and sustained attention during work-related activities. These findings correspond with the Executive Function and Attention Control Theory (Hillman *et al*., 2008), which suggests that physical activity improves cerebral blood flow to the prefrontal cortex, the brain region responsible for attentional control and cognitive regulation. Empirical evidence reinforces this relationship: Okeke and Eze (2019) reported improved attentional focus and reduced mental fatigue among lecturers in southeastern Nigerian universities following consistent yoga and aerobic exercise routines. Internationally, Blumenthal *et al*. (2012) and Colcombe and Kramer (2003) also

found that physically active professionals displayed enhanced selective attention and cognitive flexibility. Therefore, the elevated attention and focus scores observed in this study may reflect the beneficial effects of regular physical activity in maintaining alertness and concentration in high-demand academic environments.

The mean score for executive function was 3.55 ± 0.72, the lowest among the four cognitive dimensions, though still indicative of moderate cognitive control and problem-solving ability. Executive function encompasses cognitive flexibility, planning, organisation, and inhibitory control, skills crucial for effective teaching, research, and administrative duties. The slightly lower score suggests that while lecturers possess adequate cognitive regulation, multitasking and complex decision-making under workload pressure may pose challenges. This pattern aligns with Mandolesi *et al*. (2018) and Hillman *et al*. (2008), who found that while physical activity enhances executive performance, sustained and structured exercise routines are required to produce stronger and more lasting effects. Within the Nigerian academic context, Akinyemi *et al*. (2020) also noted that lecturers with inconsistent physical activity routines showed less improvement in executive performance compared to those with structured exercise habits. Hence, the moderately high but not optimal executive function score highlights the need for consistent, institutionally supported physical activity programmes to strengthen higher-order thinking and planning abilities among lecturers.

Stress resilience recorded a mean score of 3.60 ± 0.68, suggesting that lecturers moderately manage work-related stress and maintain psychological balance. This finding strongly supports the Stress Reduction Theory (Salmon, 2001), which posits that physical activity mitigates stress by reducing cortisol levels and promoting the release of endorphins, serotonin, and dopamine, neurochemicals that improve mood and cognitive clarity. The results align with Okeke and Eze (2019), who found that lecturers participating in regular yoga and aerobic activities reported lower stress levels and higher emotional stability.

Additionally, Blumenthal *et al*. (2012) demonstrated that employees in workplace fitness programmes exhibited reduced perceived stress and improved stress recovery compared to inactive workers. The moderate stress resilience among Benue lecturers likely reflects the dual effect of physical activity and adaptive coping mechanisms in managing academic pressure, though institutional workload demands may still limit optimal stress regulation for some.

The overall mean cognitive function score of 3.64 ± 0.67 suggests that lecturers in Benue State maintain a generally healthy cognitive profile, supported by moderate to high levels of physical activity. These findings reinforce the theoretical linkages established in the Neuroplasticity Theory, Cognitive Reserve Hypothesis, Stress Reduction Theory, and Executive Function Theory. They imply that regular engagement in physical activity not only enhances neural efficiency but also sustains the mental agility required for effective teaching, research, and administrative productivity. The observed range (2.1–5.0) further indicates individual variations likely influenced by exercise intensity, lifestyle factors, and institutional environment.

These findings underscore the importance of promoting workplace-based physical activity interventions. Tertiary institutions in Benue State and Nigeria at large, should prioritise fitness-friendly infrastructure, structured wellness programmes, and time allocations for physical activity to optimise cognitive outcomes among lecturers. As evidenced by both local and international studies (Akinyemi *et al*., 2020; Mandolesi *et al*., 2018; Hillman *et al*., 2008), regular physical exercise plays a critical role in fostering memory, attention, and stress regulation, key cognitive processes underpinning professional excellence.

Table 4. Correlation Between Physical Activity and Cognitive Function

Cognitive Function Dimension	Pearson r	p-value
Overall Cognitive Function	0.61	<0.001
Memory	0.58	<0.001
Attention and Focus	0.54	<0.001
Executive Function	0.49	<0.001
Stress Resilience	0.56	<0.001

Discussion

Table 4 presents the correlation analysis examining the relationship between physical activity and various dimensions of cognitive function among lecturers in selected tertiary institutions in Benue State. The Pearson correlation coefficients (r) and corresponding p-values indicate the strength and significance of these associations.

The results show a strong and statistically significant positive correlation between overall physical activity levels and overall cognitive function ($r = 0.61$, $p < 0.001$). This finding implies that lecturers who engage more frequently in physical activities, such as aerobic exercise, resistance training, and stretching, tend to exhibit higher overall cognitive functioning. The significance level ($p < 0.001$) underscores that the observed relationship is not due to chance but reflects a genuine association between physical activity and mental performance.

Breaking down the results further, the correlation between physical activity and memory ($r = 0.58$, $p < 0.001$) is particularly noteworthy. This suggests that regular physical activity contributes to improved recall and information retention, consistent with previous research by Colcombe and Kramer (2003), who found that aerobic fitness enhances hippocampal volume and memory performance among adults. Similarly, Akinyemi *et al*. (2020) observed that physically active university lecturers in southwestern Nigeria demonstrated superior short- and long-term memory retention compared to sedentary peers.

The correlation between physical activity and attention/ focus ($r = 0.54$, $p < 0.001$) indicates that physically active lecturers maintain better concentration and are less prone to

distraction during academic tasks. This aligns with Hillman *et al*. (2008), who reported that moderate aerobic exercise improves attentional control and cognitive flexibility through increased prefrontal cortex activation.

The association between physical activity and executive function ($r = 0.49$, $p < 0.001$) further supports the Executive Function and Attention Control Theory. Lecturers who exercise regularly tend to demonstrate enhanced decision-making, planning, and problem-solving skills, abilities crucial for managing teaching, research, and administrative responsibilities. Similar findings were reported by Okeke and Eze (2019), who found that structured aerobic and mindfulness programmes improved task organisation and inhibitory control among academic staff in southeastern Nigeria.

Lastly, the positive correlation between physical activity and stress resilience ($r = 0.56$, $p < 0.001$) confirms that regular engagement in exercise helps mitigate the cognitive impacts of chronic stress. This supports the Stress Reduction Theory, as physical activity is known to lower cortisol levels while boosting endorphins and serotonin, promoting emotional stability and mental clarity (Salmon, 2001). Comparable results have been documented by Blumenthal *et al*. (2012), who found that employees participating in exercise programmes exhibited improved mood regulation and cognitive endurance under work-related stress.

Overall, the findings in Table 4 provide compelling empirical evidence that physical activity serves as a significant predictor of cognitive health among lecturers. The strong correlations across all cognitive dimensions, memory, attention, executive function, and stress resilience, demonstrate that maintaining an active lifestyle enhances not only mental sharpness but also academic efficiency and professional performance. These outcomes reinforce the need for institutional policies that promote workplace fitness programmes, sports participation, and health-friendly environments within tertiary institutions in Benue State and beyond.

Table 5. Regression Analysis: Predicting Cognitive Function

Predictor	Beta (β)	t-value	p-value	Interpretation
Aerobic Exercise	0.42	7.12	<0.001	Strongest predictor of cognitive function
Resistance Training	0.31	4.85	<0.01	Moderate predictor

Discussion

Table 5 presents the results of a multiple regression analysis conducted to determine the extent to which different types of physical activity predict cognitive function among lecturers in selected tertiary institutions in Benue State. The predictors included aerobic exercise and resistance training, both of which were assessed for their independent contributions to overall cognitive performance. The table reports the standardised beta coefficients (â), t-values, and corresponding p-values, offering insight into the relative strength and significance of each predictor.

The results reveal that aerobic exercise emerged as the strongest and most significant predictor of cognitive function (â = 0.42, t = 7.12, $p < 0.001$). This finding underscores the pivotal role of regular aerobic activities, such as brisk walking, jogging, cycling, or swimming, in enhancing key cognitive domains including memory, attention, and executive function. The high beta value indicates that even small increases in aerobic exercise frequency or intensity can lead to meaningful improvements in overall cognitive performance. This is consistent with the Neuroplasticity Theory and Executive Function and Attention Control Theory, both of which emphasise that aerobic activity stimulates cerebral blood flow, increases oxygen delivery, and promotes neural growth in the prefrontal cortex and hippocampus, regions associated with learning and decision-making (Hillman *et al*., 2008; Colcombe and Kramer, 2003).

Empirical evidence from both local and international research supports this outcome. For instance, Akinyemi *et al*. (2020) found that Nigerian university lecturers who engaged in aerobic activities at least three times per week scored higher in working

memory and problem-solving tests than their sedentary counterparts. Similarly, Hötting and Röder (2013) demonstrated that aerobic exercise enhances neural plasticity, leading to improved cognitive flexibility and information processing speed among adult professionals. The strong statistical significance ($p < 0.001$) in this study confirms that aerobic activity has a robust and direct positive effect on cognitive outcomes among lecturers.

The second predictor, resistance training, also showed a significant positive relationship with cognitive function, though its predictive strength was comparatively moderate ($\hat{a} = 0.31$, $t = 4.85$, $p < 0.01$). This suggests that strength-based exercises, such as weightlifting, push-ups, and squats, contribute meaningfully to cognitive well-being, albeit to a lesser degree than aerobic activities. Resistance training enhances brain health through mechanisms involving improved insulin sensitivity, neurotrophic factor release, and reduced inflammation, all of which support neural integrity and cognitive processing (Cassilhas *et al*., 2007). Supporting this finding, Okeke and Eze (2019) observed that lecturers who incorporated resistance workouts into their weekly routines exhibited improved concentration, mental endurance, and inhibitory control compared to non-participants.

In summary, the regression analysis clearly demonstrates that both aerobic and resistance exercises are significant predictors of cognitive performance, with aerobic activity being the most influential factor. These findings reinforce the multidimensional cognitive benefits of physical activity and highlight its relevance within academic institutions. Encouraging regular engagement in both aerobic and resistance exercises among lecturers could, therefore, serve as a strategic intervention for enhancing mental agility, reducing cognitive fatigue, and promoting overall academic productivity.

From a practical standpoint, the results advocate for the institutionalisation of structured physical fitness programmes, such as staff wellness initiatives, walking clubs, and gym access to optimise the cognitive and professional output of academic

personnel in Benue State's tertiary institutions and across Nigeria.

Table 6. Institutional Comparisons

Institution	Mean PA Score	Mean Cognitive Function Score
NACEST, Makurdi	3.68	3.78
JOSTUM, Makurdi	3.50	3.65
BSU, Makurdi	3.65	3.72
COE, Katsina-Ala	3.25	3.50
BENPOLY, Ugbokolo	3.30	3.52

Discussion

Table 6 presents a comparative analysis of mean Physical Activity (PA) scores and Cognitive Function scores across the five tertiary institutions included in the study: NACEST, Makurdi; JOSTUM, Makurdi; MOAUM, Makurdi; COE, Katsina-Ala; and BENPOLY, Ugbokolo. This table provides an institutional overview of how engagement in physical activity correlates with cognitive performance, thereby highlighting variations in lifestyle practices and their cognitive outcomes within the academic workforce of Benue State.

The results reveal noticeable institutional differences in both physical activity participation and cognitive function. NACEST, Makurdi recorded the highest mean PA score (3.68) and the highest mean cognitive function score (3.78). This indicates that lecturers in NACEST are more physically active and consequently exhibit better cognitive performance than their counterparts in other institutions. This may be attributed to NACEST's structured wellness programmes, accessible sports facilities, and the institution's military-affiliated discipline culture, which encourages regular exercise and fitness engagement among staff. The findings align with earlier studies emphasising the role of institutional support and environmental factors in fostering consistent physical activity habits (Akinyemi *et al*., 2020; Mandolesi *et al*., 2018).

MOAUM, Makurdi follows closely, with a mean PA score of 3.65 and a cognitive function score of 3.72. As a large state university with established recreational and sports facilities,

MOAU lecturers appear to maintain relatively active lifestyles, translating into improved cognitive capabilities, including enhanced attention, working memory, and executive control. These findings corroborate Hillman *et al*. (2008) and Erickson *et al*. (2011), who reported that aerobic and structured physical activities significantly enhance neurocognitive functioning by improving hippocampal volume and prefrontal cortex activity.

JOSTUM, Makurdi ranks third, with moderate PA (3.50) and cognitive function (3.65) scores. While the institution's agricultural and technical focus likely encourages some level of physical engagement, the results suggest a need for more organised fitness initiatives among lecturers. Nonetheless, the relatively balanced scores indicate that moderate physical activity still contributes meaningfully to cognitive health, consistent with the Cognitive Reserve Hypothesis (Stern, 2002), which posits that consistent mental and physical activity builds neural resilience and cognitive efficiency.

In contrast, COE, Katsina-Ala and BENPOLY, Ugbokolo recorded the lowest mean scores, COE with PA (3.25) and cognitive function (3.50), and BENPOLY with PA (3.30) and cognitive function (3.52). These lower averages may reflect limited access to sports and recreational facilities, heavier workloads, or lower institutional emphasis on physical wellness programmes. The reduced activity levels correspond with slightly diminished cognitive function, reinforcing evidence that sedentary behaviour is linked to slower information processing, higher stress levels, and reduced executive functioning (Dishman *et al*., 2006; Hötting and Röder, 2013).

A comparative analysis of the data further supports the strong positive association between physical activity and cognitive function observed throughout this study (as established in Tables 4 and 5). Institutions with higher mean physical activity scores consistently demonstrated better cognitive outcomes, confirming that physical exercise is a crucial determinant of mental performance and academic productivity among lecturers.

Overall, the institutional comparison highlights the influence of organisational culture, facility availability, and wellness awareness on lecturers' physical activity behaviour and cognitive health. Institutions such as NACEST and MOAU exemplify the cognitive and professional benefits that stem from promoting physical wellness among academic staff. Therefore, the study recommends that all tertiary institutions in Benue State, particularly COE Katsina-Ala and BENPOLY Ugbokolo, should invest in staff fitness programmes, sports infrastructure, and health education campaigns. These initiatives would not only improve physical health but also strengthen cognitive functioning, enhance teaching effectiveness, and foster sustained intellectual engagement across academic environments.

Benefits of Physical Activity on Cognitive Function

1. Enhanced Memory and Learning Ability

Regular physical activity stimulates neurogenesis and strengthens synaptic plasticity in the hippocampus, a key brain region responsible for learning and memory. Studies by Erickson *et al*., (2011) have demonstrated that aerobic exercises such as running and swimming promote better recall, faster information processing, and improved long-term memory storage. For tertiary institutions in Benue State lecturers, engaging in physical activity can enhance their ability to absorb and retain complex academic material, improving their teaching effectiveness and research output.

2. Improved Concentration and Focus

Exercise increases cerebral blood flow, delivering essential oxygen and nutrients to brain regions responsible for attention and executive function. A research by Hillman *et al*., (2008) suggests that physical activity enhances neural connectivity and strengthens attentional networks, leading to sustained focus and reduced cognitive fatigue. Lecturers who participate in regular exercise can maintain higher levels of concentration,

allowing them to efficiently grade papers, develop lesson plans, and conduct research without mental exhaustion.

3. Delayed Cognitive Decline and Neuroprotection
As individuals age, cognitive decline becomes a major concern, particularly in professions requiring continuous intellectual engagement. Physical activity has been shown to delay age-related cognitive deterioration by preserving neural integrity, increasing brain volume, and reducing the risk of neurodegenerative disorders like Alzheimer's and dementia (Barnes *et al*., 2003). By maintaining an active lifestyle, tertiary institution lecturers in Benue State can safeguard their cognitive abilities and sustain high academic performance throughout their careers.

Strategies for Integrating Physical Activity into Tertiary Institutions Lecturers' Daily Routine in Benue State

1. Incorporating Active Breaks into the Workday
Lecturers often spend long hours seated while preparing to deliver lectures, marking scripts, or attending meetings. Prolonged sedentary behaviour is linked to physical and cognitive fatigue. To counter this, lecturers can integrate short physical activity breaks into their work schedules. These breaks can include stretching exercises, brief walks, or deep breathing exercises. Evidence suggests that such breaks enhance blood circulation, reduce muscular stiffness, improve posture, and rejuvenate mental alertness (Hillman, Erickson and Kramer, 2008). Institutions should promote policies that encourage a culture of micro-breaks, such as inserting 5-10 minutes of movement for every hour of sitting.

2. Development and Promotion of Faculty Wellness Programmes
Establishing comprehensive wellness programmes that cater specifically to faculty members is essential. These programmes could include guided fitness routines, morning aerobic sessions,

health education workshops, and regular fitness challenges. Faculty wellness initiatives help reduce stress, improve interpersonal relationships, and foster team spirit. Research has shown that faculties that participate in group-based physical activities report higher levels of job satisfaction and cognitive readiness (Mandolesi *et al*., 2018).

3. Provision and Accessibility of On-Campus Fitness Facilities

For physical activity to become a habitual practice, convenience and accessibility are crucial. Tertiary institutions in Benue State should provide fitness-friendly infrastructure such as gyms, walking trails, and open green spaces. These facilities should be accessible before and after working hours and should cater to a wide range of physical needs. Availability of lockers, shower facilities, and fitness instructors can further boost participation.

4. Promotion of Active Transportation

Lecturers who reside close to their institutions should be encouraged to adopt walking or cycling as a mode of commuting. Active transportation not only contributes to cardiovascular and muscular health but also improves cognitive performance through increased blood flow and endorphin release. Tertiary Institutions in Benue State can support this by providing secure bicycle parking spaces, fitness maps, and safety education on active commuting.

5. Use of Standing Desks and Walking Meetings

Standing desks are proven to reduce sedentary time and improve energy levels. Institutions should explore equipping academic offices with adjustable standing desks to encourage upright posture during work. Moreover, converting some administrative or departmental meetings into walking meetings can promote light physical activity while simultaneously encouraging creative thinking and active engagement (Tomporowski *et al*., 2011).

6. Structured Exercise Programmes and Fitness Classes
Institutions should invest in structured physical activity programmes tailored to staff schedules. Scheduled yoga sessions, resistance training, cardio routines, or martial arts classes led by trained professionals provide consistency and motivation. Regular participation in such activities not only enhances physical health but also has significant positive effects on brain structure and function (Erickson *et al*., 2014).

7. Institutional Policy and Wellness Leadership
Tertiary Institutions in Benue State should formally integrate physical activity into their institutional policy. Leadership can play a critical role by modeling behaviour, endorsing participation, and allocating budgets to wellness initiatives. Policies could include incentives for regular participation, fitness competitions, and inclusion of wellness components in annual performance reviews.

8. Integration into Professional Development Programmes
Continuing Professional Development (CPD) activities should incorporate physical wellness modules. Educating faculty on the importance of physical activity and offering practical sessions within CPD programmes will reinforce its relevance to professional efficacy. Framing fitness as part of lifelong learning and intellectual sharpness ensures its adoption as a personal and professional responsibility.

9. Monitoring, Evaluation, and Feedback Mechanisms
To ensure sustainability and improvement, institutions must track the impact of physical activity initiatives through surveys, attendance records, cognitive assessments, and performance evaluations. Feedback from participants can inform programme redesigns to better suit the dynamic academic environment. Data-driven evaluation mechanisms will ensure the effectiveness and long-term integration of these initiatives.

Conclusion

The findings of this study affirm that physical activity is a powerful and multidimensional determinant of cognitive function and occupational efficiency among lecturers in tertiary institutions in Benue State. The study established that lecturers who engage consistently in aerobic, resistance, and flexibility exercises exhibit markedly higher performance in key cognitive domains such as memory, attention, executive control, and stress resilience. These outcomes substantiate the central argument of the study's theoretical framework, particularly the Neuroplasticity Theory and Cognitive Reserve Hypothesis, which posit that regular physical activity enhances neural connectivity, brain adaptability, and resilience against cognitive decline.

The empirical results of the study, which revealed a strong positive correlation ($r = 0.61$, $p < 0.001$) between physical activity and cognitive function, reinforce global and local evidence that exercise-induced physiological changes translate into cognitive and emotional benefits. This finding echoes earlier studies by Erickson *et al*. (2011) and Mandolesi *et al*. (2018), which demonstrated that physical activity increases hippocampal volume and improves executive function through enhanced neurogenesis and cerebral blood flow. Similarly, Nigerian-based research by Akinyemi *et al*. (2020) and Okeke and Eze (2019) validated that structured exercise interventions among university lecturers significantly improve memory retention, problem-solving ability, and stress regulation.

Institutional comparisons further provided nuanced insights into the contextual dynamics influencing cognitive outcomes. NACEST and Rev. Fr. Moses Orshio Adasu (MOAU) lecturers recorded the highest mean scores for both physical activity and cognitive performance, reflecting the presence of more accessible wellness programmes, sports infrastructure, and institutional awareness of health promotion. In contrast, College of Education (COE) Katsina-Ala and Benue State Polytechnic (BENPOLY) Ugbokolo recorded comparatively lower scores. This disparity highlights how environmental and institutional

factors, such as lack of gym facilities, limited recreational spaces, and inadequate health promotion policies, can constrain the potential cognitive and occupational benefits of physical activity. These findings align with Hötting and Röder (2013) and Dishman *et al*. (2006), who emphasised the role of organisational support in facilitating sustainable exercise habits and cognitive enhancement among employees.

Conclusively, this study emphasises that promoting physical activity among academic staff is both a cognitive health necessity and an occupational performance strategy. Lecturers represent a cognitively intensive workforce whose intellectual output and decision-making capacity are central to institutional development. Therefore, integrating structured physical activity programmes into staff development and welfare policies is essential. Tertiary institutions in Benue State should institutionalise workplace wellness initiatives, such as establishing on-campus fitness centers, organising staff sports clubs, providing incentives for active commuting, and scheduling periodic health and fitness workshops, to promote long-term cognitive vitality and academic productivity.

Furthermore, the study recommends longitudinal and intervention-based research to explore the lasting cognitive and psychological impacts of specific physical activity regimens among academic professionals in Nigeria. Such future studies should also examine gender, age, and workload differentials in exercise participation and cognitive response. In the long term, embedding physical activity into the institutional culture of tertiary education can foster a healthier, more efficient, and cognitively empowered academic workforce, thereby contributing to sustainable educational quality and human capital development in Benue State and beyond.

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