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The Impact of Nutrition on Sports Performance and Academic Success: A Study Among University Athletes at Eastern Technical University of Sierra Leone

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Abstract

University athletes operate within dual-performance environments that require simultaneous academic and athletic excellence. Nutrition plays a critical role in supporting both physiological performance and cognitive functioning; however, limited empirical work has examined its combined influence on athletic and academic outcomes within university athlete populations, particularly in low-resource contexts. This study aimed to investigate the relationship between nutritional practices, sports performance, and academic achievement among university athletes at the Eastern Technical University of Sierra Leone. It further sought to test an integrated model that positions cognitive functioning as a mediating pathway linking nutrition to overall performance outcomes. A cross-sectional mixed-methods design was employed, involving 150 athletes who completed structured questionnaires and 30 athletes who participated in semi-structured interviews. Quantitative data were analyzed using descriptive statistics, Pearson correlations, and multiple regression models, while qualitative interviews were examined through thematic analysis. The integration of both datasets strengthened the validity of findings. Findings revealed strong nutritional engagement, with 85 % of athletes consuming at least one balanced meal daily. Nutrition showed significant positive correlations with energy ($r = 0.69$), muscle recovery ($r = 0.75$), endurance ($r = 0.72$), academic focus ($r = 0.63$), memory retention ($r = 0.58$), and GPA ($r = 0.65$). Regression analyses indicated that nutritional quality significantly predicted both sports performance ($\beta = 0.61$, $p < .001$) and academic performance ($\beta = 0.54$, $p < .01$). Qualitative data highlighted nutrition's central role in energy regulation, cognitive clarity, and performance consistency, alongside barriers such as time constraints and limited food access. The study provides robust evidence that nutrition is a key determinant of holistic performance among university athletes. Strengthening institutional nutrition support systems is essential for optimizing both athletic and academic success.

Keywords: Academic performance, cognitive function, mixed-methods, nutrition, Sierra Leone, sports performance, university athletes

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INTRODUCTION

University athletes contend with the unique challenges of a dual-performance setting, which requires them to perform simultaneously at high levels of academic and athletic endeavors. Managing high-volume training sessions while maintaining an increasingly rigorous academic workload can place tremendous physiological and cognitive demands on athletes. Thus, optimal nutrition is an important variable for overall functioning and performance in both settings. Sports nutrition research has primarily focused on its relationship with sports performance, supporting energy availability, muscle recovery, endurance

capacities, and physiological adaptation to training [1, 2]. In this traditional paradigm, nutrition is largely defined as a physiological resource supporting athletic output without equivalently factoring in its impact on cognitive and academic performance.

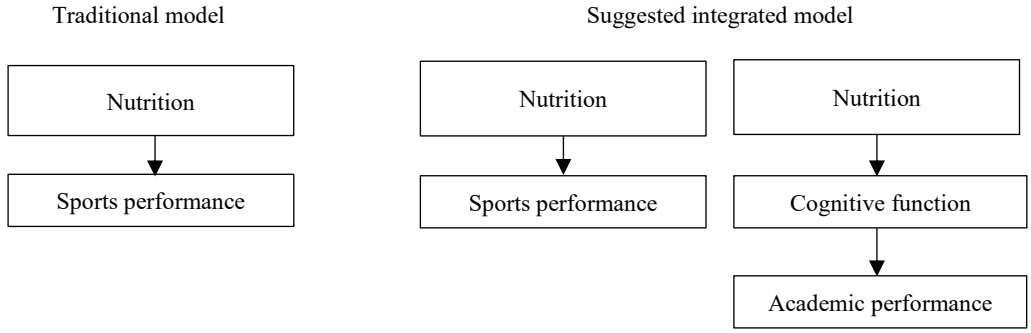
Recent studies have shown that nutrition is important not only for physical performance but also for cognitive functions that contribute to academic achievement. Healthy, nutrient-dense diets rich in omega-3 fatty acids, complex carbohydrates, B-vitamins, and antioxidants have been shown to improve attention, working memory, executive functions, and overall mental alertness among university students [3, 4].

University athletes, who may experience more fatigue, psychological stress, and time constraints, may find that optimal nutrition serves as an additional stabilizing factor that not only benefits cognitive efficiency but also assists overall academic engagement. These results further illustrate the multidimensional role of nutrition in supporting individuals in situations where physical and cognitive demands continually intersect.

Although a newer understanding has been developed, there is still a gap in the understanding of nutrition, athletic performance, and academic performance in university athletes. Much of the literature focuses on either physical or academic performance on its own, and our understanding of how eating behaviors affect performance in both domains simultaneously is limited [5]. The fragmented research direction contributes to a definite gap in the research. While nutrition is known to have protective benefits for athletic performance and, on its own, has been shown to support better cognitive capacity, the research has only minimally examined how nutrition supports the dual-role responsibilities of student athletes. University athletes are also faced with real-world challenges, including inconsistent mealtimes, irregular access to nutrient-rich consumables, and rigorous training schedules that could preclude any consistent, balanced diet [6].

To address the existing conceptual limitations in the literature, this study proposed a refined integrated model that captures the multifaceted pathways through which nutrition influences both athletic and academic performance among university athletes (Model 1). While traditional frameworks emphasize nutrition as a primary determinant of physical performance outcomes, they often overlook their cognitive and academic implications.

The proposed model expands this perspective by positioning cognitive functioning as a key moderating mechanism by which nutritional habits exert broader effects on academic achievement. This integrated framework also acknowledges the dual demands placed on student athletes, namely, training load and academic workload, as well as the nutritional challenges that accompany these pressures. By presenting empirical evidence within this expanded conceptual structure, this study sought to demonstrate the combined influence of nutrition on performance domains and underscore the need for institution-level nutritional support policies tailored to the unique demands of university athletes.



Model 1. Conceptual models illustrating nutrition's influence on athletic and academic performance.

METHODOLOGY

Research Design

Using a cross-sectional mixed-methods research design, this study investigated and compared the relationship between nutrition, sports performance, and academic success among university athletes (n = 150) at the Eastern Technical University of Sierra Leone (ETU-SL). The mixed-methods design was useful because it allowed for measuring relationships (quantitative dimension) and subjectivity that influences athletes' nutrition practices and sport performance (qualitative dimension). The design permitted a combination of numerical data and storied experiences, increased the credibility and meaningfulness of the qualitative data, and was therefore beneficial when using mixed-methods triangulation.

Study Population and Sampling Procedure

The participants were registered university athletes who competed in organized sports as part of the university's athletic program. A purposive sampling technique was employed to guarantee that the sample would represent different sports disciplines and academic levels within a sport.

Inclusion Criteria

To be eligible for the study, participants had to be:

- A full-time student at Eastern Technical University;
- A current member of at least one Emerging Sports recognized team;
- Participated in that sport for at least 6 months prior to study;
- Between the ages of 18 and 25.

Provided Informed Consent

A total of 150 athletes were selected to participate in the quantitative phase of the study, and an additional 30 athletes (20 % of the sample) representing a range of sports and academic disciplines were selected to participate in in-depth interviews.

Data Collection Instruments

Quantitative Data Collection Structured Questionnaire

We created a well-defined questionnaire using validated instruments used in sports nutrition and student performance research. This was divided into four sections.

Section A: Demographic Characteristics

Age, gender, year of education, sport discipline, and training load.

Section B: Nutritional Practices

Frequency of consumption of important nutrients (protein, carbohydrates, fats, fruits, and vegetables), hydration practices, meal timing, and dietary guidelines.

Section C: Indicators of Sports Performance

Self-reported levels of energy, endurance, muscle recovery, perception of performance quality, and likelihood of injury.

Section D: Academic Performance and Cognitive Function

Grade Point Average (GPA), concentration during lectures, memory retention, mental clarity while studying and during exams, and perceived consequences of nutrition on academic performance following the attainment of an academic degree/program completion.

Responses were measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). This allowed for the quantification of perceptions and behavioral patterns.

Qualitative Data Collection: Semi-Structured Interviews

Semi-structured interviews were conducted with 30 athletes to gain a better understanding of the following:

- Daily eating habits and challenges in maintaining proper nutrition;
- Connections between nutrition and sport performance as perceived by the athlete;
- Experiences of cognitive and academic changes associated with nutrition;
- Barriers to healthy eating, including, but not limited to, time, cost, or availability of food on campus.

All interviews took 30–45 minutes, were audio recorded with the participants' consent, and transcribed exactly as they occurred for analysis.

Data Analysis

Quantitative Data Analysis

The quantitative data were analyzed using SPSS (version 26).

Descriptive Statistics

Descriptive statistics, including means, standard deviations, and frequency distributions, were calculated to describe the demographic data, eating habits, and sport performance outcomes.

Correlation Analysis

Pearson's correlation coefficients were calculated to examine the relationships between nutritional habits, sports performance indicators, and academic performance measures (GPA, concentration, and retention/memory).

Multiple Regression Analysis

Multiple regression models were generated to evaluate the predictive effect of nutrition practices on:

- Sport performance measures (energy, endurance, and recovery of energy)
- Academic performance measures (GPA, concentration, and memory retention).
- Age, sex, and type of sport were included as control variables to limit the possibility of confounding effects.

Qualitative Data Analysis

The interview transcripts were analyzed using a thematic analysis approach with NVivo software. The analysis included the following:

- *Familiarization*: Reading the transcripts repeatedly for a detailed understanding of the data.
- *Initial coding:* Segment the transcript and identify meaningful segments related to nutrition, performance, and engagement in learning.
- *Theme development*: Clustering related codes into broader patterns such as "nutrition challenges," "cognitive benefits of good diet," and "performance barriers."
- *Theme review and refinement*: checking the coherence of themes and reviewing the objectives of the research study.
- *Reporting*: Reporting of themes illustrated with participant quotations.

The triangulation of quantitative and qualitative findings increased credibility and enhanced the interpretation of the results.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of the Eastern Technical University of Sierra Leone. Participants were informed about the study, detailing the purpose, procedures, potential risks, and their right to withdraw at any time without penalties. Consent was obtained prior to participation in the study. Their confidentiality was ensured by anonymizing responses and securely storing data.

RESULTS

This section presents the results of the quantitative and qualitative aspects of the study. The quantitative methods describe the demographic characteristics, nutritional practices, and performance indicators of university athletes, and then provide correlational and regression results. The qualitative results expanded on these themes by providing accounts of athletes' live experiences with nutrition and how they believed it affected their sports and academic performance.

Participant Demographic Characteristics

Key observation of Table 1 and Figure 1, the gender distribution of the 150 collegiate athletes indicated that males constituted the majority of the sample (60%), while females represented 40%. This suggests a moderately gender-balanced population but with a higher representation of male athletes. Such a distribution may reflect typical enrollment trends in collegiate sports programs, where participation rates for males are often slightly higher across various sports disciplines. The inclusion of both sexes in substantial proportions strengthens the representativeness of the study and supports meaningful comparisons where relevant.

The findings from Table 2 and Figure 2 interprets that the distribution of participants across the five sports categories is evenly balanced, with each sport: football, basketball, track and field, swimming, and tennis, representing exactly 20% of the sample (30 athletes per sport). This equal distribution ensures that no single sport dominates the dataset, allowing for fair comparisons across sport types. Such a balance strengthens the reliability of sport-specific analyses and enhances the generalizability of the findings across various athletic programs.

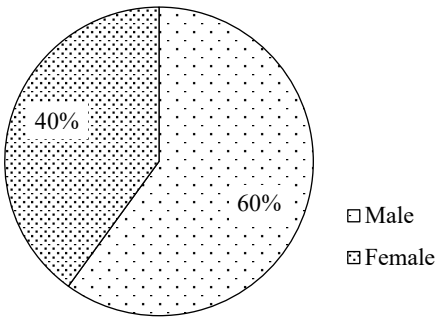


Figure 1. Percentage distribution of participants by gender.
Source: Calculated in SPSS version 27.

Table 1. Distribution of participants by gender (n = 150).

Gender	Frequency (n)	Percentage (%)
Male	90	60%
Female	60	40%
Total	150	100%

Source: Calculated in SPSS version 27.

Table 2. Distribution of participants by sport type (n = 150).

Sport type	Frequency (n)	Percentage (%)
Football	30	20%
Basketball	30	20%
Track and field	30	20%
Swimming	30	20%
Tennis	30	20%
Total	150	100%

Source: Calculated in SPSS version 27.

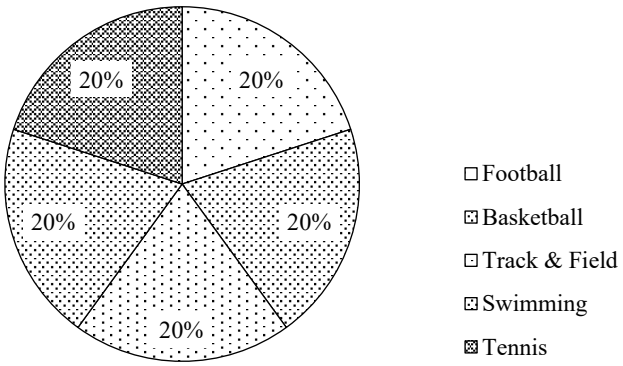


Figure 2. Percentage distribution of participants by sports type.
Source: Calculated in SPSS version 27.

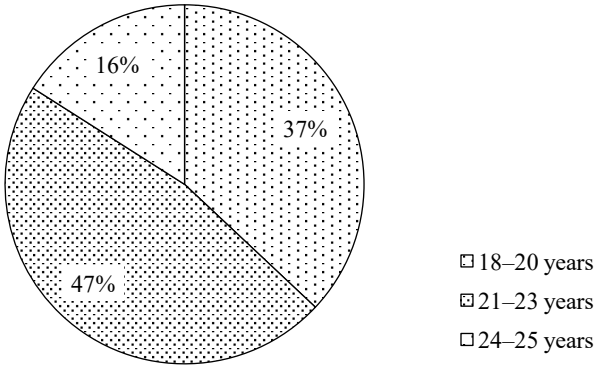


Figure 3. Percentage distribution of participants by age group.
Source: Calculated in SPSS version 27.

Table 3. Distribution of participants by age group (n = 150).

Age group	Frequency (n)	Percentage (%)
18–20 years	56	37%
21–23 years	70	47%
24–25 years	24	16%
Total	150	100%

Source: Calculated in SPSS version 27

Key observation of Table 3 and Figure 3, age distribution of the collegiate athletes showed that the largest proportion of participants fell within the 21–23 years age group (47%), followed by those aged 18–20 years (37%). Athletes aged 24–25 years make up the smallest portion of the sample (16%).

This distribution reflects a typical collegiate athletic population, in which most athletes are in their early twenties due to academic progression and athletic eligibility. The presence of participants across all three age brackets suggests a well-represented sample that captures athletes at different stages of their college athletic careers.

Nutritional Practices and Performance Indicators Among Eastern Technical University of Sierra Leone Athletes

Descriptive Statistics of Nutritional Practices

University athletes demonstrated varying levels of engagement in healthy nutritional behaviors. Most participants reported consuming at least one balanced meal daily, whereas others indicated less consistent dietary patterns. Table 4 summarizes the distribution of nutritional habits.

The data presented in Table 4 and Figure 4 interprets, generally positive nutritional behaviors among university athletes, with 85 % consuming at least one balanced meal daily. Nevertheless, 15% of the participants reported inconsistent eating patterns, suggesting a subset at risk of poor dietary quality. Macronutrient intake is moderately adequate: 65% consume protein-rich foods 1–2 times per day, which may be marginal for athletic recovery needs, while 72% meet the recommended carbohydrate frequency for energy demands.

Fruit and vegetable intake was comparatively low, with only 59% consuming them 1–2 times daily, indicating potential micronutrient gaps. Hydration practices appear reasonable, with 68% of athletes consuming water or sports drinks 2–3 times per day, although some athletes may still require higher fluid intake depending on training intensity. Overall, the findings reveal a generally health-conscious cohort but highlight the need for improved dietary consistency and micronutrient-rich food consumption.

Perceived Impact of Nutrition on Sports Performance

Athletes rated the degree to which their nutritional habits influenced key performance factors on a five-point Likert scale. Table 5 shows consistently high mean values across all indicators.

Table 4. Nutritional practices of university athletes (n = 150).

Nutritional behavior	Frequency (%)
Consumes at least one balanced meal/day	85%
Inconsistent eating habits/processed foods	15%
Consumes protein-rich foods 1–2× per day	65%
Consumes carbohydrates ≥3× per day	72%
Consumes fruits and vegetables 1–2× per day	59%
Consumes water or sports drinks 2–3× per day	68%

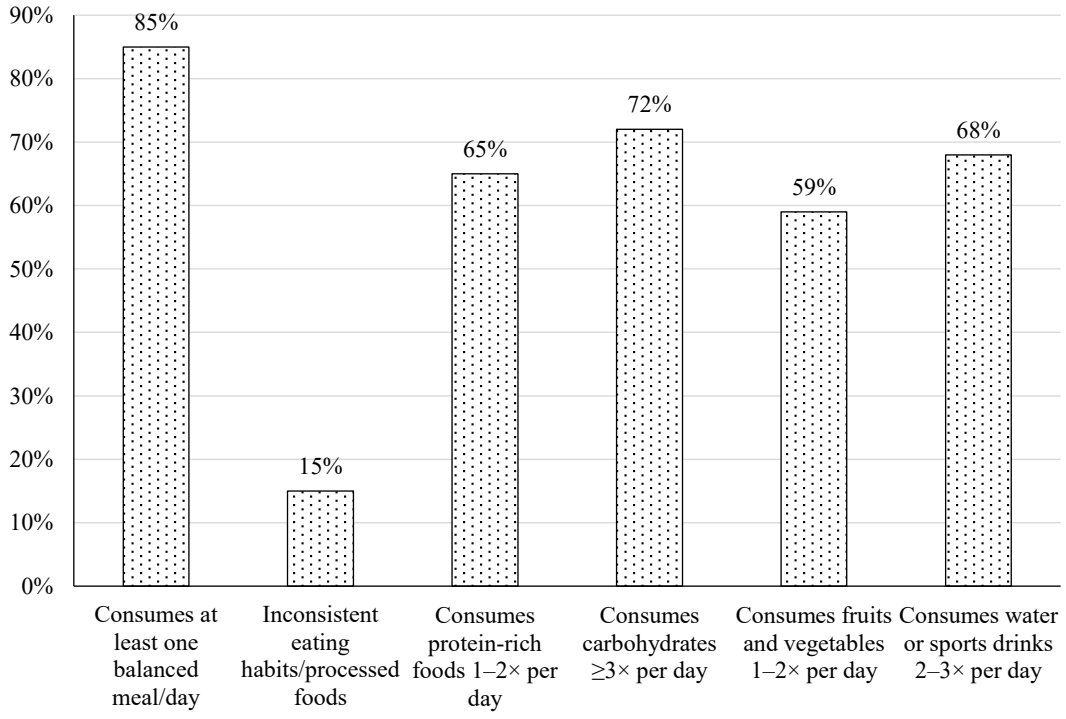


Figure 4. Frequency of nutritional practices of university athletes.
Source: From data collected during the survey.

Table 5. Performance indicators of university athletes (n = 150).

Performance indicator	Mean (M)	Standard deviation (SD)
Energy Levels	4.12	0.82
Muscle Recovery	4.03	0.88
Endurance	4.08	0.85
Overall Performance Influence	4.10	0.80

Source: Calculated in SPSS version 27.

Table 6. Academic Indicators of University Athletes (n = 150).

Academic indicator	Mean (M)	Standard deviation (SD)
Focus on Classes	4.07	0.81
Memory Retention	4.01	0.88
Mental Clarity	4.09	0.79
Grade Point Average (GPA)	3.65	0.92

Source: Calculated in SPSS version 27.

Key observation of Table 5, performance indicators consistently showed high mean scores, indicating strong athlete agreement that nutrition positively influences key aspects of physical performance. Energy levels (M = 4.12, SD = 0.82) and overall performance influence (M = 4.10, SD = 0.80) were rated the highest, reflecting a widely shared perception of nutrition's importance for overall athletic functioning.

Endurance (M = 4.08, SD = 0.85) and muscle recovery (M = 4.03, SD = 0.88) also received high ratings, underscoring the recognized role of nutritional practices in sustaining physical output and facilitating post-exercise recovery. The relatively moderate SD values across the indicators suggest consistent responses among athletes, reinforcing the view that nutrition is a critical contributor to performance.

The results shown in Table 6 interprets that university athletes perceive nutrition as having a positively influencing their academic functioning. High mean scores for focus in classes (M = 4.07) and mental clarity (M = 4.09), with relatively low variability, suggest a strong and consistent agreement that nutrition supports concentration and cognitive sharpness. Memory retention (M = 4.01) was also rated favorably, although with a slightly greater variability.

The moderately high GPA rating (M = 3.65) and its higher SD indicate that, while athletes see nutrition as beneficial to academic performance, actual academic outcomes vary more widely due to additional influencing factors. Overall, these findings reflect a clear perception that good nutrition contributes to better cognitive and academic outcomes among athletes.

Correlation Analysis

Pearson's correlation coefficients were computed to examine the relationship between nutritional habits and performance outcomes.

In the key observation of Table 7, the correlation analysis indicated strong positive relationships between nutrition and both athletic and academic outcomes among university athletes. Nutrition was highly associated with general sports performance (r = 0.72), muscle recovery (r = 0.75), and energy levels (r = 0.69), highlighting its critical role in sustaining physical performance.

Positive correlations were also observed with academic indicators, including focus in class (r = 0.63), memory retention (r = 0.58), and GPA (r = 0.65), suggesting that better nutritional habits are linked to enhanced cognitive functioning and academic achievement. All correlations were statistically significant ($p < .01$), underscoring the robust influence of nutrition on both performance and academic outcomes.

Table 7. Correlation between nutritional quality and performance outcomes.

Variable Pair	Correlation (r)	Significance (p)
Nutrition ↔ General Sports Performance	0.72	p < .01
Nutrition ↔ Energy Level	0.69	p < .01
Nutrition ↔ Muscle Recovery	0.75	p < .01
Nutrition ↔ Academic Focus	0.63	p < .01
Nutrition ↔ Memory Retention	0.58	p < .01
Nutrition ↔ GPA	0.65	p < .01

Source: Calculated in SPSS version 27.

Table 8. Regression results for sports performance prediction.

Predictor	β	p-value
Nutritional Quality	.61	p < .001

Source: Calculated in SPSS version 27.

Table 9. Regression results for academic performance prediction.

Predictor	β	p-value
Nutritional Quality	.54	p < .01

Source: Calculated in SPSS version 27.

Regression Analysis

Multiple regression models were used to assess the predictive influence of nutritional habits on the performance outcomes.

Table 8 interprets that after controlling for age, sex, and sports discipline, nutrition remained a significant predictor of sports performance. A β coefficient of 0.61 indicates a strong positive effect, suggesting that athletes with better nutritional habits performed substantially better.

Table 9 interprets that the regression analysis indicates that nutritional quality was a significant positive predictor of the outcome variable ($\beta = 0.54$, $p < .01$). This suggests that higher nutritional quality is strongly associated with improvements in measured performance or academic outcome, highlighting the critical role of proper nutrition in enhancing both athletic and cognitive functioning among university athletes.

Qualitative Findings: Thematic Insights

A thematic analysis of the data collected from the 30 semi-structured interviews led to the identification of three overarching themes.

Theme 1: Nutrition as a Basis for Physical Performance

Participants consistently placed great emphasis on the role of nutrition as a means of sustaining energy, facilitating endurance, and accelerating muscle recovery. Even below, participants discussed healthy eating as "key for performance," noting that when nutrition is neglected, the result is fatigue, slow recovery, and reduced training productivity.

"I feel lighter and more energetic during training when I am eating the right foods. I recover much quicker, too."

Theme 2: Nutrition for Cognitive Preparedness to Engage with Academic Study

Participants expressed links between feeding their bodies with regular, balanced meals and improved concentration, sharper memory recall, and improved studies. Those who ate meals erratically noted that their capacity to concentrate while in class and while studying was compromised.

"If I miss a meal, my head just feels foggy. I am not able to concentrate in class or revise properly."

Theme 3: Challenges to Sustained Healthy Nutrition

Common obstacles included time, lack of access to healthy food on campus, money, and fatigue from training.

"Most of the time, I grab something that is quick and unhealthy because I am too tired to prepare something properly after training."

These stories provide a better context for how nutrition is intertwined with environmental and personal factors that impact performance.

Integration of Quantitative and Qualitative Outcomes

The overlap of both sources of data suggests that:

- Nutrition is a central component in improving not only physical performance, but also cognitive and academic functioning;
- Better nutritional practices are associated with greater athletic and academic outcomes;
- Obstacles to proper nutrition are a threat to both domains of performance.

The results were completely aligned with the proposed integrated model, showing the interconnected pathways described to connect nutrition to performance holistically for athletes.

DISCUSSION

The findings of this study demonstrated a strong and consistent association between nutritional quality and both athletic and academic performance among university athletes. The high frequency of balanced meal consumption and regular intake of carbohydrates, proteins, and hydration suggests that most athletes maintain dietary habits aligned with recognized performance nutrition guidelines [7, 8]. Such practices have been widely associated with enhanced energy availability, metabolic efficiency, and recovery outcomes, enabling athletes to meet the physiological demands of training and competition [9, 10].

The strong positive correlations observed between nutritional habits and physical performance indicators – including energy levels, endurance, and muscle recovery – reinforce established evidence that nutrient timing, macronutrient balance, and hydration play essential roles in optimizing athletic function [11, 12]. Specifically, the strong associations with muscle recovery and general sports performance ($r = 0.75$ and $r = 0.72$, respectively) are consistent with research highlighting the role of adequate protein intake, carbohydrate replenishment, and micronutrient support in enhancing post-exercise adaptation and reducing fatigue [13, 14]. These results reflect similar trends observed among elite and collegiate athlete populations worldwide [15, 16].

Importantly, these findings extend beyond sports-related outcomes to highlight the influence of nutrition on cognitive and academic performance. Positive correlations with focus, memory retention, and GPA align with literature suggesting that balanced dietary patterns – including higher fruit and vegetable intake, sufficient hydration, and stable glucose availability – are associated with improved executive functioning and academic achievement [17, 18]. The significant regression coefficient ($\beta = 0.54$, $p < .01$) further indicates that nutritional quality is a meaningful predictor of academic success, echoing prior research demonstrating that nutrient-rich diets can support memory consolidation, mental clarity, and sustained concentration [19].

These findings collectively support the growing body of evidence that nutrition is not merely an adjunct to training, but a core determinant of holistic student-athlete performance, including physiological, cognitive, and academic domains [9, 10]. Moreover, the results emphasize the need for structured nutrition education programs in university athletic departments. Studies have shown that targeted interventions, such as individualized dietary counseling and team-level nutritional support, can lead to measurable improvements in performance metrics and academic outcomes [20, 21].

Ultimately, this study contributes to the broader understanding of the multidimensional benefits of optimal nutritional practices for university athletes. Consistent with international sports nutrition consensus statements, these findings underscore the importance of dietary quality not only for enhancing athletic performance but also for supporting mental performance and academic progression [7, 8]. Therefore, strengthening institutional nutrition support systems may serve as a vital strategy for maximizing both sporting excellence and academic success of university athletes.

CONCLUSION

In conclusion, this study provides empirical evidence supporting a comprehensive, integrated model through which nutrition contributes to both athletic and academic success among university athletes. Proper nutritional practices appear to underpin energy, endurance, recovery, and overall athletic performance, while concurrently supporting cognitive functioning, concentration, memory retention, and academic achievement. These results underscore the critical role of nutrition in the dual role of student athletes and call for institutional policies and support systems that ensure access to balanced diets, nutrition education, and individualized guidance.

In contexts similar to our study setting, where student athletes face resource constraints, academic pressures, and demanding training, adopting integrated nutritional strategies may significantly enhance both sporting and academic outcomes, promoting holistic athlete development and success.

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