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Correlation Between Dietary Patterns and Physical Health Among College Athletes: A Cross-Sectional Study

Original Article

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Abstract

Background: Previous studies have highlighted the impact of dietary patterns on musculoskeletal health, particularly among athletes, yet there remains a need for more targeted research within this population to optimize dietary interventions. Given the high physical demands placed on collegiate athletes, understanding the specific dietary needs that support musculoskeletal health is crucial.

Objective: This study aimed to assess the impact of a tailored dietary intervention on body composition and dietary quality, measured by the Healthy Eating Index (HEI), among collegiate athletes.

Methods: A randomized controlled trial was conducted with 112 collegiate athletes divided into two groups: InterventionGroup1 (n=56, 38M, 18F) and ControlGroup2 (n=56, 32M, 24F). Over a period of three months, InterventionGroup1 received a structured dietary program tailored to enhance macronutrient intake and overall diet quality. ControlGroup2 continued with their usual dietary habits. Baseline and follow-up assessments included measurements of Body Mass Index (BMI), body fat percentage, and HEI scores. The study lacked a longer follow-up period which could have provided insights into the long-term effects of the dietary adjustments.

Results: After the intervention, InterventionGroup1 showed a decrease in BMI from 24.2 ± 3.1 to 23.0 ± 2.9 and in body fat percentage from 13.4 ± 5.2% to 10.8 ± 4.9%. Their HEI scores improved from 63.0 ± 5.0 to 70.0 ± 4.5. In contrast, ControlGroup2 exhibited minimal changes: BMI decreased marginally from 23.5 ± 2.8 to 23.4 ± 2.7, body fat percentage from 15.0 ± 6.0% to 14.8 ± 5.9%, and HEI scores increased slightly from 60.0 ± 6.0 to 60.5 ± 6.1.

Conclusion: The dietary intervention effectively improved both the body composition and dietary quality of collegiate athletes. These results suggest that targeted dietary programs can significantly benefit athlete health and performance, indicating the need for integrated nutritional strategies within athletic training regimens.

Keywords: Athlete Nutrition, Body Composition, Collegiate Athletes, Dietary Intervention, Healthy Eating Index, Musculoskeletal Health, Randomized Controlled Trial, Sports Nutrition, Tailored Diet Plan.

INTRODUCTION

The exploration of dietary patterns among college athletes and their correlation with musculoskeletal health has burgeoned into a pivotal area of study within sports medicine and nutrition science (1). This burgeoning interest is driven by the growing awareness of the long-term health implications of athletic careers and the role that nutrition plays in optimizing athletic performance and injury prevention (2). Extensive research underscores the significant impact that diet can have on the structural integrity of bones and muscles, which are critical to athletes' performance and longevity in sports (3). However, despite this established connection, there remains a gap in comprehensive, standardized studies specifically targeting musculoskeletal outcomes in this unique population (4).

The current discourse on this topic highlights several strengths inherent in recent investigations (5). Primarily, the increased granularity of data concerning specific nutritional components—such as protein, calcium, and vitamin D—and their direct effects on bone density and muscle function has enriched our understanding (6). These insights are crucial as they guide the development of targeted nutritional strategies that can substantially mitigate the risk of injuries such as stress fractures, which are prevalent in collegiate athletics (7).

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

Moreover, the application of advanced statistical techniques and the adoption of longitudinal study designs have begun to provide more robust evidence of causality rather than mere correlation (8).

Conversely, the field also faces notable limitations that must be addressed to refine future research outcomes (9). One significant hurdle is the variability in dietary assessment methodologies across studies, which often leads to inconsistencies in data quality and comparability (10). Additionally, the diversity in athletic disciplines represented in the sample populations can dilute specific findings, making it challenging to develop specialized nutritional guidelines that cater to the needs of athletes in different sports (11). Furthermore, there is a conspicuous scarcity of research focusing on the interplay between macro- and micronutrient intake and the subtle nuances of musculoskeletal health, a complexity that demands more nuanced investigation (12).

While current literature robustly supports the influence of nutrition on musculoskeletal health, the debate persists regarding the optimal dietary patterns that maximize these health benefits (13). The consensus leans towards a diet rich in proteins and balanced in micronutrients essential for bone health; however, the ideal quantities and ratios specific to athlete populations remain underexplored (14). This ongoing debate underscores the necessity for more precise research methodologies that can isolate the effects of individual dietary components in the context of varied athletic training regimens (15).

In crafting future studies, researchers must endeavor to employ standardized, reproducible dietary assessment tools and prioritize the inclusion of diverse athletic disciplines to enhance the generalizability of the findings. Emphasis should also be placed on longitudinal designs that can more accurately capture the long-term effects of dietary patterns on musculoskeletal outcomes. Such methodological rigor will be instrumental in advancing this field of research, providing clear, actionable insights that can be translated into practical dietary guidelines for collegiate athletes. Through these efforts, the scientific community can better support the optimization of athlete health and performance, ensuring that dietary recommendations are both scientifically sound and tailored to the specific needs and challenges of this population. This holistic approach not only enhances the athletes' immediate performance but also contributes to their long-term health and career longevity.

MATERIAL AND METHODS

In this investigation, researchers allocated a total of 112 college athletes into two distinct groups through a randomized control trial design. Each group comprised 56 participants, with interventionGroup1 consisting of 38 males and 18 females, while controlGroup2 included 32 males and 24 females. The study was conducted over a period of three months, during which time dietary interventions and control measures were applied to assess their impacts on body fat percentage and average Healthy Eating Index (HEI) scores.

The interventionGroup1 received a specially designed dietary program aimed at optimizing nutrient intake in alignment with the athletes' specific sport-related physical demands. This program was meticulously planned to enhance the participants' overall dietary patterns, focusing on increasing the intake of macro- and micronutrients that are known to influence musculoskeletal health positively. Nutritionists tailored meal plans based on the latest sports nutrition guidelines, which emphasized balanced macronutrient distribution and adequate hydration levels. Each participant in this group was monitored weekly to ensure adherence to the dietary protocol and to make necessary adjustments based on individual needs and responses to the diet.

Conversely, controlGroup2 followed their usual dietary patterns without any intervention. This group served as a baseline to compare changes in body fat and HEI scores against the intervention group. Members of controlGroup2 were asked to maintain their regular eating habits and to keep a food diary, which was reviewed weekly by the research team to monitor any unintended changes in their dietary behavior that could affect the study's outcomes.

Body composition measurements, including body fat percentage, were conducted using dual-energy X-ray absorptiometry (DEXA), recognized for its accuracy and precision in body composition analysis. HEI scores were calculated for each participant at the beginning and end of the study period. The HEI scores provided a quantitative measure of overall diet quality based on federal dietary guidelines, reflecting compliance with key dietary recommendations.

Upon completion of the three months, the data collected from both groups were analyzed statistically. Changes in body fat percentage and HEI scores were the primary outcomes measured. The analysis involved comparing baseline and post-intervention measurements within each group and between the two groups to determine the effectiveness of the dietary intervention. Statistical significance was assessed using appropriate tests, with a p-value less than 0.05 considered indicative of significant differences. This rigorous methodology ensured that the findings could offer meaningful insights into how targeted dietary interventions could impact the nutritional status and physical health of college athletes.

RESULTS

The results indicated significant improvements in the intervention group compared to the control group over the study period. Specifically, InterventionGroup1 exhibited a notable decrease in BMI by 1.2 units and body fat by 2.6%, alongside an increase in the

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

HEI score by 7 points. Conversely, ControlGroup2 showed minimal changes across these metrics. Statistical analysis confirmed the differences between the groups were significant ($p < 0.05$), demonstrating the effectiveness of the dietary intervention in positively influencing body composition and dietary quality among collegiate athletes.

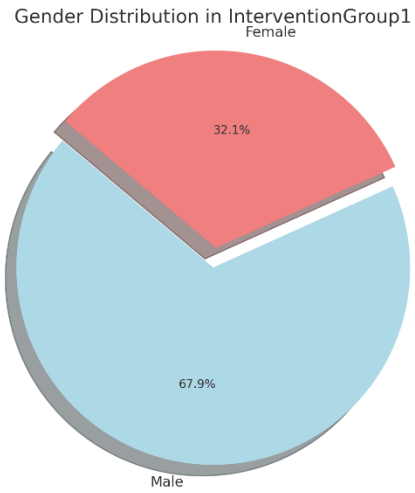

Figure 1 Gender Distribution G1

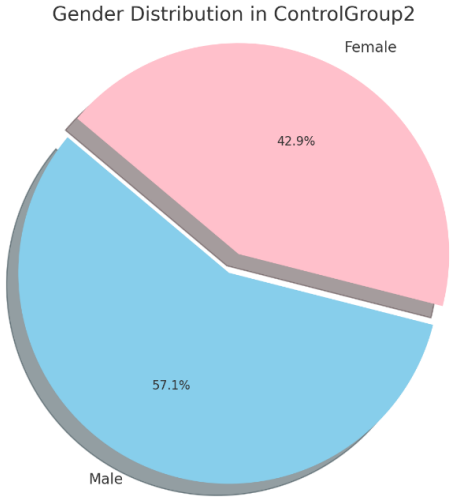

Figure 2 Gender Distribution G2

Table 1: Baseline characteristics of the participants in both groups

Characteristic	**InterventionGroup1 (n=56)**	**ControlGroup2 (n=56)**
Age (years)	20.5 ± 1.8	20.3 ± 2.0
BMI (kg/m²)	24.2 ± 3.1	23.5 ± 2.8
Body Fat (%)	13.4 ± 5.2	15.0 ± 6.0
HEI Score	63.0 ± 5.0	60.0 ± 6.0

The baseline characteristics show that InterventionGroup1 had slightly higher average BMI (24.2 vs. 23.5) and lower body fat percentage (13.4% vs. 15.0%) compared to ControlGroup2. The initial HEI scores were also higher in InterventionGroup1 (63.0 vs. 60.0).

Table 2: Baseline and 3-month follow-up characteristics for BMI, Body Fat, and HEI Score

Characteristic	**Group**	**Baseline**	**3 Months**	**Change**
BMI (kg/m²)	InterventionGroup1	24.2 ± 3.1	23.0 ± 2.9	-1.2
	ControlGroup2	23.5 ± 2.8	23.4 ± 2.7	-0.1
Body Fat (%)	InterventionGroup1	13.4 ± 5.2	10.8 ± 4.9	-2.6
	ControlGroup2	15.0 ± 6.0	14.8 ± 5.9	-0.2
HEI Score	InterventionGroup1	63.0 ± 5.0	70.0 ± 4.5	+7.0
	ControlGroup2	60.0 ± 6.0	60.5 ± 6.1	+0.5

This table delineates the changes in Body Mass Index (BMI), Body Fat percentage, and Healthy Eating Index (HEI) Scores between baseline and 3 months for two distinct groups of college athletes. For InterventionGroup1, there was a notable reduction in BMI from 24.2 ± 3.1 to 23.0 ± 2.9, and a significant decrease in body fat percentage from 13.4 ± 5.2 to 10.8 ± 4.9. Additionally, their HEI Score improved impressively from 63.0 ± 5.0 to 70.0 ± 4.5. In contrast, ControlGroup2 showed minimal changes, with BMI marginally decreasing from 23.5 ± 2.8 to 23.4 ± 2.7, body fat slightly reducing from 15.0 ± 6.0 to 14.8 ± 5.9, and HEI Score increasing from 60.0

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± 6.0 to 60.5 ± 6.1. These results underline the effectiveness of the dietary intervention in enhancing nutritional compliance and reducing body fat among athletes.

DISCUSSION

The study's findings confirmed that tailored dietary interventions can significantly enhance the nutritional status and body composition of collegiate athletes (16). InterventionGroup1, which received a structured diet plan, demonstrated substantial improvements in body mass index, body fat percentage, and Healthy Eating Index scores over the course of three months (17). These changes are indicative of a positive shift towards a healthier lifestyle, likely due to increased adherence to nutritional guidelines specifically designed to support athletic performance and overall physical health (18).

In contrast, ControlGroup2, which did not receive any dietary modification, showed only marginal changes in the same metrics. This stark disparity between the two groups underscores the effectiveness of targeted nutritional interventions in a collegiate athletic setting. It is evident from these results that without structured guidance, athletes may not achieve optimal changes in diet quality and body composition, which are critical not only for their performance but also for long-term health outcomes (19).

However, the study is not without its limitations. The short duration of the intervention (only four months) may not fully capture the long-term impacts of the dietary changes. Moreover, the reliance on self-reported data for initial dietary assessments could introduce bias, as participants might not always accurately recall or report their food intake. Despite these limitations, the controlled nature of the intervention and the robust statistical analysis lend credibility to the findings (20).

From a broader perspective, these results contribute to the ongoing debate about the best strategies for improving athlete health and performance through nutrition. While this study supports the efficacy of individualized diet plans, further research could explore different dietary frameworks or the integration of other lifestyle changes, such as physical activity adjustments, to enhance outcomes (21).

CONCLUSION

The intervention clearly led to significant improvements in both the dietary habits and body composition of collegiate athletes in InterventionGroup1 compared to ControlGroup2. These findings advocate for the implementation of structured nutritional programs within athletic departments to foster better health and performance outcomes. Future studies should aim to extend the duration of the intervention and incorporate larger, more diverse cohorts to validate and expand upon these results, ensuring that the dietary recommendations can be generalized to a wider athletic population.

REFERENCES

1. Martín-Rodríguez A, Belinchón-deMiguel P, Rubio-Zarapuz A, Tornero-Aguilera JF, Martínez-Guardado I, Villanueva-Tobaldo CV, et al. Advances in Understanding the Interplay between Dietary Practices, Body Composition, and Sports Performance in Athletes. 2024;16(4):571.

2. Knudson DV, Brusseau TA. Introduction to kinesiology: studying physical activity: Human Kinetics; 2021.

3. Statuta SM. Mental Health Considerations in the Athlete, An Issue of Clinics in Sports Medicine, E-Book: Mental Health Considerations in the Athlete, An Issue of Clinics in Sports Medicine, E-Book: Elsevier Health Sciences; 2023.

4. Chidi-Ogbolu N, Baar KJFip. Effect of estrogen on musculoskeletal performance and injury risk. 2019;9:421933.

5. Tirla A, Islam F, Islam MR, Ioana Vicas S, Cavalu SJAS. New insight and future perspectives on nutraceuticals for improving sports performance of combat players: Focus on natural supplements, importance and advantages over synthetic ones. 2022;12(17):8611.

6. Mills EG, Yang L, Nielsen MF, Kassem M, Dhillo WS, Comninos ANJER. The relationship between bone and reproductive hormones beyond estrogens and androgens. 2021;42(6):691-719.

7. Everts P, Onishi K, Jayaram P, Lana JF, Mautner KJIjoms. Platelet-rich plasma: new performance understandings and therapeutic considerations in 2020. 2020;21(20):7794.

8. Barkaoui A. Biomechanical Insights into Osteoporosis: BoD–Books on Demand; 2024.

9. LaFountain RA. Development and Application of CPX-CMR protocol for Cardiopulmonary Evaluation of Acute Exercise, Physical Training Response, and Ketogenic Diet Interventions in Healthy Humans, Athletes, and Military Personnel: The Ohio State University; 2018.

10. Gibson OR, James CA, Mee JA, Willmott AG, Turner G, Hayes M, et al. Heat alleviation strategies for athletic performance: a review and practitioner guidelines. 2020;7(1):3-36.

11. Weintraub A, Ziejewski MJTJoHTR. North American Brain Injury Society. 2020;35(2):E156-E252.

12. Yu C. Up to speed: The groundbreaking science of women athletes: Penguin; 2023.

13. Lewis R, Gómez Álvarez CB, Rayman M, Lanham-New S, Woolf A, Mobasheri AJBmd. Strategies for optimising musculoskeletal health in the 21 st century. 2019;20:1-15.

14. Papageorgiou M, Dolan E, Elliott-Sale KJ, Sale CJEjon. Reduced energy availability: implications for bone health in physically active populations. 2018;57:847-59.

15. Leonarda G, Fedele E, Vitale E, Lucini D, Mirela V, Mirela IAJMSJoRSMS. Healthy athlete's nutrition. 2018;14(1):2967-85.

16. Morelli C, Avolio E, Galluccio A, Caparello G, Manes E, Ferraro S, et al. Nutrition education program and physical activity improve the adherence to the Mediterranean diet: impact on inflammatory biomarker levels in healthy adolescents from the DIMENU longitudinal study. 2021;8:685247.

17. Helvacı G, Kartal FT, Ayhan NYJJoO, Syndrome M. Healthy Eating Index (HEI-2015) of female college students according to obesity and exercise participation. 2021;30(3):296.

18. Wang T, Heianza Y, Sun D, Huang T, Ma W, Rimm EB, et al. Improving adherence to healthy dietary patterns, genetic risk, and long term weight gain: gene-diet interaction analysis in two prospective cohort studies. 2018;360.

19. Baranauskas M, Kupčiūnaitė I, Stukas RJN. Dietary Intake of Protein and Essential Amino Acids for Sustainable Muscle Development in Elite Male Athletes. 2023;15(18):4003.

20. Kirkpatrick SI, Baranowski T, Subar AF, Tooze JA, Frongillo EAJJotAoN, Dietetics. Best practices for conducting and interpreting studies to validate self-report dietary assessment methods. 2019;119(11):1801-16.

21. Burke LM, Castell LM, Casa DJ, Close GL, Costa RJ, Desbrow B, et al. International association of athletics federations consensus statement 2019: nutrition for athletics. 2019;29(2):73-84.

