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Exploring the Role of Nutrition and Physiology in Basketball Performance: A Literature Review

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Abstract: Basketball is a high-intensity sport that requires exceptional physical performance, including strength, speed, and endurance. Beyond technical skills, physiological factors such as nutrition play a crucial role in optimizing performance. Articles were sourced from Scopus, PubMed, and Google Scholar, using keywords such as "nutrition," "physiology," "basketball performance," and "athlete performance." The findings highlight the importance of tailored nutrition plans and the need for ongoing education in sports nutrition to support the physiological demands of basketball. Proper nutrition supports muscle strength, endurance, and recovery after intense training or competition. This literature review explores the relationship between nutrition, physiology, and basketball performance. Key macronutrients like carbohydrates, proteins, and fats are essential for energy, muscle repair, and recovery, while micronutrients such as B vitamins, calcium, and magnesium contribute to overall health and performance. Maintaining fluid balance and electrolytes is vital to prevent performance decline, given the high intensity of the game. Physiological factors like body composition, aerobic capacity, and metabolism influence how the body utilizes nutrients during play. Moreover, adequate nutrition knowledge among athletes and coaches is essential to maximize performance and minimize injury risk. This review aims to synthesize current research findings to provide evidence-based nutritional strategies and physiological insights that can improve endurance, enhance performance, and support recovery in basketball players.

Keywords: Nutrition; Basketball; Injury Prevention; Recovery

Introduction

Badminton is one of the most popular sports Basketball is a high-intensity sport that demands exceptional physical performance, with players required to sprint, jump, and demonstrate incredible strength and agility to cope with the pressures of the game (Agustiawan et al., 2025; Putra et al., 2024). In addition to technical skills and game strategies, physiological factors, including nutrition, play a vital role in supporting athletes to achieve optimal performance. Proper nutrition can support muscle strength, endurance, and an efficient recovery process after intense training or competition. Therefore, understanding the relationship between nutrition, physiology, and performance in basketball is essential for improving athletic outcomes (Lasri et al., 2024).

As a dynamic sport involving explosive movements like sprints, jumps, and rapid directional changes, basketball requires athletes to have an efficient energy system and a body that is well-prepared for the physical demands of the game (Tomáš et al., 2014). The body's metabolic processes play a crucial role in meeting the high energy requirements during a game. Energy derived from food directly influences physical performance, both in the short term (such as energy during a match) and in the long term (such as post-training recovery) (Mielgo-Ayuso & Fernández-Lázaro, 2021). As a result, an appropriate nutrition strategy, encompassing macronutrient (carbohydrates, protein, and fats) and micronutrient intake, can be a key differentiator in enhancing basketball players' performance (Sousa et al., 2013).

The importance of nutrition in sports is widely recognized, but in the context of basketball, the study of how dietary intake affects physical performance is still

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evolving (Dion et al., 2025). Basketball players face the challenge of meeting their energy needs, as the sport requires a combination of explosive strength and sustained endurance over prolonged periods. Research suggests that the timing of meals and the type of foods consumed greatly impact energy levels, stamina, and mental focus during a game. Moreover, physiological factors such as body composition and metabolism play an important role in an athlete's performance. Each individual has a different physiological response to specific foods, influenced by factors such as age, sex, fitness level, and genetics. Therefore, a deeper understanding of how the body responds to various food types during physical activity, as well as how nutrition plans can be tailored to the specific needs of basketball players, is crucial in developing optimal training and dietary programs (Douligeris et al., 2023).

In the development of nutritional strategies for basketball athletes, carbohydrates are often considered the primary energy source. Basketball is a sport that requires endurance, speed, and explosive strength, making carbohydrates vital for maintaining muscle glycogen levels throughout the game. Research shows that proper carbohydrate intake can extend the time before fatigue sets in, improve athletes' ability to perform anaerobic activities (such as sprints), and accelerate recovery post-game (Dion et al., 2025). In addition to carbohydrates, protein also plays a key role in muscle repair and growth. In high-intensity sports like basketball, protein is necessary to repair muscle tissues damaged during training or competition, as well as to support the development of stronger muscles. Fats also play an important role in an athlete's diet, although their contribution is more limited compared to carbohydrates and protein. Fats serve as an essential reserve energy source, particularly for prolonged activities of lower intensity. Additionally, fats are crucial for other body functions, including the absorption of vitamins and the regulation of hormones (Illahi et al., 2023; Rifki et al., 2024). However, fat intake must be balanced to prevent excess body fat accumulation, which could hinder performance.

In addition to macronutrients, micronutrients such as vitamins and minerals are also vital in maintaining health and performance. For example, B vitamins are involved in energy metabolism, while calcium and magnesium are important for bone health and muscle function. Dehydration and electrolyte imbalances can negatively affect basketball performance, considering the high intensity and long duration of games. Therefore, maintaining proper fluid balance and electrolyte levels through adequate water intake and sports drinks is essential to prevent performance decline and injury (Dion et al., 2025; Esen et al., 2022; Mihajlovic et al., 2023).

On the other hand, physiological factors like body composition, aerobic capacity, and metabolic systems also influence how the body utilizes the nutrients consumed (Gratwicke et al., 2021; Sousa et al., 2013). Athletes with lower body fat percentages and higher muscle mass tend to have more efficient metabolisms, which can support their performance across different aspects of the game. Proper training and diet plans can help increase muscle mass without accumulating excess body fat, which could hinder agility and speed. Understanding the optimal timing and types of foods to consume before, during, and after a game or training session is also crucial for designing an effective nutrition strategy. For example, consuming carbohydrate-rich foods 3-4 hours before a game can help ensure optimal muscle glycogen levels. Additionally, consuming protein immediately after training or competition can aid in muscle recovery and prevent excessive muscle breakdown.

Nutrition and body physiology play a significant role in supporting basketball performance. Therefore, it is important to conduct in-depth studies on how nutrition can be optimized to enhance the performance of basketball players, as well as how physiological factors interact with food intake to achieve the best results. By considering these aspects, coaches and athletes can design appropriate diet plans and training programs that maximize performance in basketball.

Method

This literature review explores the role of nutrition and physiology in enhancing basketball performance. Articles were sourced from databases such as Scopus, PubMed, and Google Scholar, using keywords like "nutrition," "physiology," "basketball performance," and "athlete performance." The aim is to synthesize current research findings to provide evidence-based nutritional strategies and physiological insights that optimize performance, improve endurance, and minimize injury risks for basketball players. For more details, see the Figure 1.

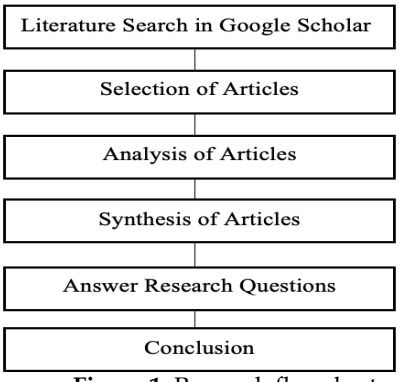

Figure 1. Research flowchart

Results and Discussion

The table below summarizes key findings from the literature review on the role of nutrition and physiology in enhancing basketball performance and preventing

injuries. It includes the Author, Topic, and Results of various studies examining how different nutritional strategies and physiological factors impact recovery, and injury prevention in basketball players. It offers valuable insights into effective nutrition and training practices, serving as a useful reference for athletes, coaches, nutritionists, and sports trainers.

Table 1. Summary of Data Descriptions

Author	Topic	Results
(Douligeris et al., 2023)	The Effect of Acute Pre-Workout Supplement Ingestion on Basketball-Specific Performance of Well-Trained Athletes.	The study found significant improvements in counter-movement jump (CMJ), agility, and Running-Based Anaerobic Sprint Test (RAST) performance in the pre-workout supplement (PWS) group compared to the placebo group. However, no differences were observed in sprinting, aerobic performance, or blood lactate levels.
(Boumosleh et al., 2021)	Sports nutrition knowledge and perceptions among professional basketball athletes and coaches in Lebanon-a cross-sectional study.	The study found that approximately 80% of Division I Basketball (D1B) players and 54% of coaches in Lebanon had inadequate nutrition knowledge (NK). This inadequacy was independently associated with a lack of nutrition education among the players.
(Esen et al., 2022)	Practical Nutrition Strategies to Support Basketball Performance during International Short-Term Tournaments: A Narrative Review.	The study emphasizes the need for effective nutritional strategies to enhance recovery and performance during short-term basketball tournaments. It highlights the importance of carbohydrate and protein intake, hydration, and the use of specific ergogenic aids to support players' physiological demands.
(Zimmermann et al., 2022)	Electrical and Structural Adaption of Athlete's Heart and the Impact on Training and Recovery Management in Professional Basketball Players: A Retrospective Observational Study.	The study analyzed 27 professional basketball players, revealing that those with an early repolarization (ER) pattern had higher peak performance and left ventricular mass index compared to those without. No significant differences in heart rate or QTc intervals were found between the two groups.
(Escribano-Ott et al., 2024)	Beyond creatine: evaluating guanidino acetic acid as a novel ergonutritional aid for basketball players.	The study involved 31 semi-professional basketball players and compared the effects of guanidinoacetic acid (GAA), creatine monohydrate (CRM), and placebo. Significant improvements were observed in female players' anaerobic performance with GAA, particularly in Counter Movement Jump (CMJ) and Handgrip (HG) tests.
(Escribano-Ott et al., 2022)	A glimpse of the sports nutrition awareness in spanish basketball players.	The study revealed that Spanish basketball players, regardless of age or level, exhibited insufficient knowledge of sport-specific nutrition. Key barriers identified included a lack of professional support and difficulties in time management, which hindered proper nutritional practices among players.

The findings from the literature review on the role of nutrition and physiology in enhancing basketball performance and preventing injuries provide valuable insights into how various nutritional strategies and physiological factors can optimize performance, improve recovery, and reduce injury risks for basketball players. The table below summarizes key studies that focus on different aspects of nutrition and physiological factors, offering a comprehensive view of the current research landscape. The study by Douligeris et al. (2023) explored the effects of acute pre-workout supplementation (PWS) on basketball-specific performance in well-trained athletes. The results showed significant improvements in performance in several physical tests, including counter-movement jump (CMJ), agility, and the Running-Based Anaerobic Sprint Test (RAST) for the PWS group when compared to the placebo group. However, there were no significant differences observed in sprinting, aerobic performance, or blood lactate levels.

These findings emphasize the importance of pre-workout supplementation, particularly in enhancing explosive movements such as jumping and agility, which are crucial in basketball. While the supplementation did not improve aerobic performance, it is likely that the immediate effects on anaerobic performance, such as jumping and sprinting, can have an immediate positive impact on a player's game performance. For basketball players, this is important because much of the game relies on short bursts of energy, such as fast breaks and vertical jumps for rebounds and shots. However, it is also important to note that the impact of pre-workout supplements on long-term performance may require further

investigation, particularly in relation to recovery and injury prevention.

Boumosleh et al. (2021) conducted a cross-sectional study examining sports nutrition knowledge among professional basketball players and coaches in Lebanon. The study revealed that a significant percentage of Division I basketball players (80%) and coaches (54%) had inadequate knowledge of nutrition, with the lack of education being an independent factor contributing to this gap. The study highlighted that inadequate nutrition knowledge among players and coaches could negatively impact their performance and overall health. This finding underscores the critical need for proper nutrition education at all levels of basketball, especially among professional players and coaching staff. A lack of nutrition awareness can result in suboptimal performance, recovery, and potentially higher injury rates. Nutrition knowledge is not only about understanding macronutrients and micronutrients but also about knowing when and how to fuel the body to maximize energy levels and recovery. This is particularly relevant in basketball, where players must maintain high levels of energy during games and rapid recovery post-game. To bridge this gap, teams and coaches could benefit from integrating sports nutrition education into their training programs, enabling athletes to make informed decisions regarding their diet and supplementation.

Esen et al. (2022) focused on practical nutrition strategies for basketball players during international short-term tournaments, where quick recovery and sustained performance are critical. The study emphasized the importance of carbohydrate and protein intake, hydration, and the use of specific ergogenic aids to support players' physiological demands during tournaments. Carbohydrates are particularly important as they provide the primary fuel source for high-intensity activities, while protein helps in muscle recovery and repair.

The study also pointed out the significance of hydration strategies and the potential use of ergogenic aids, such as caffeine or creatine, which can improve performance during intense physical exertion. During short-term tournaments, where games are often played in quick succession, the need for rapid recovery is intensified. Therefore, having a tailored nutritional strategy for each player, including pre-game fueling, in-game hydration, and post-game recovery, becomes crucial to ensure they remain at peak performance. For basketball players, these strategies are essential to maintain performance through back-to-back games, where muscle fatigue and dehydration can quickly lead to suboptimal performance. Nutritional strategies should be integrated into pre- and post-game routines to support not only energy levels but also cognitive functions like decision-making, which are critical in high-pressure situations like those encountered in tournaments.

Zimmermann et al. (2022) conducted a retrospective observational study analyzing the cardiac adaptation of professional basketball players and its impact on training and recovery management. The study found that players with an early repolarization (ER) pattern on their electrocardiogram (ECG) had a higher peak performance and left ventricular mass index compared to those without this pattern. However, there were no significant differences in heart rate or QTc intervals between the two groups. This study sheds light on the physiological adaptations of basketball players' hearts in response to the intense physical demands of the sport. The heart's ability to adapt and respond to training loads is essential for maintaining high levels of endurance, especially during intense periods of play. Athletes with more efficient cardiovascular systems can perform at higher intensities without experiencing early fatigue. This also has implications for recovery, as better cardiovascular adaptation can help players recover faster between training sessions and games, leading to less overall fatigue and a reduced risk of overtraining. Additionally, understanding the cardiac health of basketball players is crucial for designing individualized training programs. Monitoring heart health, particularly in relation to physical exertion and recovery, should be an essential component of training regimens for high-intensity sports like basketball.

Escribano-Ott et al. (2024) evaluated the effects of guanidino acetic acid (GAA), a compound closely related to creatine, as a potential ergogenic aid for basketball players. The study found that GAA supplementation led to significant improvements in anaerobic performance, particularly in the Counter Movement Jump (CMJ) and Handgrip (HG) tests for female players. The effects of GAA were comparable to those of creatine monohydrate (CRM), suggesting that GAA could be a valuable alternative for improving explosive power in basketball. This study provides a new avenue for sports nutrition research, suggesting that GAA may offer a viable alternative to traditional creatine supplementation. Since basketball requires repeated bursts of explosive power—such as jumps and quick changes in direction—ergogenic aids like GAA could offer significant performance benefits. For players looking to improve vertical jump height or overall power, GAA may be an effective supplement to incorporate into their nutrition regimen.

The study by Escribano-Ott et al. (2022) explored sports nutrition awareness among Spanish basketball players. The study found that many players, regardless of their age or skill level, exhibited insufficient knowledge of sport-specific nutrition. Barriers to better nutrition included a lack of professional support and challenges with time management. These issues hindered players' ability to follow proper nutrition practices. This finding highlights the importance of ongoing education and professional support for athletes, particularly in sports like basketball where high levels of

physical demand and performance are required. A player's diet can significantly affect their performance, and improving nutrition awareness can directly impact their ability to sustain energy levels and prevent injuries. Teams and organizations should consider hiring nutritionists or integrating more focused nutrition education into their training programs to help players better understand the link between nutrition and performance.

The findings from the studies discussed above reveal the significant role of nutrition and physiological factors in enhancing basketball performance and preventing injuries. Proper nutrition, including appropriate macronutrient intake (carbohydrates, proteins, fats), micronutrient support, hydration strategies, and the use of ergogenic aids, is crucial for optimizing performance, improving recovery, and reducing the risk of injuries. However, nutrition knowledge among athletes and coaches remains a critical area for improvement, as many players still lack sufficient understanding of how diet impacts their performance.

Physiological factors such as cardiovascular health and body composition also play an integral role in determining a player's ability to perform at a high level and recover effectively. Tailoring nutrition plans and training regimens to individual needs based on physiological assessments can help players maintain peak performance while minimizing fatigue and injury risk. In conclusion, it is vital for coaches, athletes, and nutritionists to collaborate closely to ensure that basketball players are not only well-trained but also well-nourished to meet the intense demands of the game. By integrating nutrition and physiological principles into their daily routines, basketball players can enhance their performance and ensure long-term health and success in the sport.

Conclusion

In conclusion, nutrition and physiology play crucial roles in enhancing basketball performance and preventing injuries. Proper macronutrient intake, hydration, and ergogenic aids, along with a focus on cardiovascular health and body composition, are essential for optimizing athletic performance. However, many players and coaches lack adequate nutrition knowledge, highlighting the need for better education. Tailoring nutrition plans to individual needs can significantly improve performance, recovery, and overall health in basketball.

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Author Contributions
Each author contributed to this literature review in various ways. Muhamad Ramos conceptualized the study, designed the methodology, and conducted the literature search. He was also responsible for drafting and revising the introduction and methodology sections. Ronni Yenes played a key role in the data analysis and interpretation of the research findings. He assisted in writing and revising the results and discussion sections, and reviewed the manuscript for coherence and clarity. Eri Barlian led the review and analysis of the selected literature, focusing on the role of nutrition and physiology in basketball performance, particularly in relation to recovery and injury prevention. He also contributed to the writing of the methodology and results sections. Hendri Neldi provided valuable insights into the physiological aspects of basketball performance, especially regarding cardiovascular health, body composition, and training adaptations. He contributed significantly to the analysis and interpretation of relevant studies. Lastly, Yovhandra Ockta assisted in synthesizing findings related to nutrition strategies for performance enhancement and recovery, and contributed to the discussion section. All authors contributed to the conceptualization, writing, and revision of the manuscript, and they all read and approved the final version for submission.

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The content of this article does not create a conflict of interest.

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