

Nutritional Practices Among Professional Indoor and Beach Volleyball Players: A Brief Review

Review

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Abstract

This narrative review explores the under-researched area of nutritional practices and knowledge among professional beach and indoor volleyball players. By reviewing 13 relevant articles, the review delves into the dietary intake, nutrition education, and sports supplement use of indoor and beach volleyball players. The findings underscore a need to understand volleyball players' distinct nutritional requirements. Indoor and beach volleyball players need help meeting recommended carbohydrate and protein intakes. Additionally, further research is warranted to establish the direct influence of supplements on volleyball performance.

Key Words: diet, creatine, supplements, training

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Introduction

Volleyball was created in 1895 by William Morgan. ¹ It has become one of the most popular sports worldwide in recent years. ² Indoor and beach volleyball demands a blend of aerobic and anaerobic activities, necessitating the athlete to possess muscular strength, power, flexibility, agility, and aerobic fitness to excel in the sport. However, indoor volleyball is characterized by longer match durations, ³ and 6 players on the court, while beach volleyball has 2 players and no substitutions. Given the international popularity of volleyball, there has been an increase in research studies examining players' external output profiles and physiological responses during beach volleyball competitions. ^{4,5} In contrast, very few studies have been conducted regarding the nutritional needs of indoor and beach volleyball players. Optimizing player's nutritional intake during practice and tournaments is paramount, considering volleyball competitions' high physical and physiological demands. Since the literature is minimal regarding volleyball nutrition practices and most studies assessing recreational and elite athletes' current nutrition knowledge demonstrate scores below average, ⁶ this review aims to investigate the current literature regarding nutrition practices and knowledge of professional volleyball players.

Searches were limited to the English language and human studies that examined volleyball players' (beach or indoor) nutrition. The publication period for the studies cited is 2001 to 2023. A search of Google Scholar and EBSCO databases was conducted using the keywords: beach volleyball nutrition, beach volleyball dietary intake, beach volleyball hydration, beach volleyball ergogenics, beach volleyball and creatine, beach volleyball and protein, beach volleyball and carbohydrates, beach volleyball and beta-alanine, and volleyball nutrition.



Thirteen articles were identified as relevant and used in this review. Inclusion criteria included original research studies (observational, cross-sectional, randomized controlled trials) conducted on adolescents and adults with a minimum age of 14 years who were indoor or beach volleyball athletes. Our selection criteria required that these studies were published in peer-reviewed journals. Excluded from our review were abstracts, conference posters, reviews, and unpublished theses. For this review, athletes were defined as individuals actively participating in competitive indoor or beach volleyball through training and competition. Reference lists from included articles were also reviewed for background information.

Identified studies investigated dietary intake, energy balance, macronutrient distribution, supplementation practices, fluid balance, hormonal responses, lipid profiles, knowledge levels, and the effects of educational programs and supplementation on volleyball players' performance and body composition. These areas are subdivided into nutrition intake studies (Table 1), nutrition education, and supplements (Table 2).

The investigation into the distinct nutritional requirements of indoor and beach volleyball players still needs to be developed, with only a few studies dedicated to this topic.^{1,7-15} Physiological demands and energy systems must be determined to analyze a specific sport's nutritional and macronutrient needs. Physiologically, beach volleyball is characterized by frequent bouts of high-intensity sprints, vertical jumps, and change of direction movement. The average match duration in beach volleyball ranges from 30 to 64 minutes,¹⁶ the average vertical jumps per match are 219 ($\pm$ 7.4),¹⁶ and the work-to-rest ratio averages 1:5, 10-20 seconds of work to 50-100 seconds of rest.¹⁶ Indoor Volleyball is characterized by speed, high-intensity sprints, agility, and vertical jumps (depending on the player's position).¹⁷ However, while indoor volleyball is characterized by its intermittent nature, a robust aerobic capacity is crucial, particularly in multiset matches where sustaining consistent performance levels over an extended duration is essential.¹⁷ A study by Sheppard and colleagues³ revealed average rallies of 3-40 seconds, work-to-rest ratio of 12 seconds or less, average match duration of 90 minutes, average vertical jump (per set) for middle blockers 5-35, outside hitters, 2-29, and setters 12-32.³

Nutrition Intake

Upon examining pertinent studies focusing on beach volleyball and indoor volleyball nutrition, the carbohydrate (CHO) intake average for those athletes accounts for approximately 4.01 g/kg/day and protein for 1.6g/kg/day.^{1,7,8,11,13,15} There is no specific recommendation for beach or indoor volleyball athletes; however, Kerssick et al.¹⁸ recommend that athletes engaged in moderate to high-volume training (approximately 2–3 hours per day of vigorous exercise, performed 5–6 times per week) typically necessitate a dietary intake of 5–8 g/kg/day. Moreover, Burke et al.¹⁹ has indicated that athletes involved in high-volume intense training (around 3–6 hours per day of vigorous training across 1–2 daily sessions, spanning 5–6 days per week) might need to consume approximately 8–10 g/day of carbohydrates, to maintain muscle glycogen levels effectively.

Studies by Zapolska et al. and Ayuso et al. revealed volleyball players' average training volume between 15.5 and 25 hours per week, across 1-2 daily sessions.^{8,12} Therefore, taking the average value of the studies provided within this review, carbohydrate values notably fall short of the recommended 5-10 g·(kg·day) range. Several studies highlight the requirement for increased protein intake among individuals participating in exercise to maximize their training adaptations.²⁰⁻²² There is novel evidence suggesting higher protein intakes (>3.0 g/kg/d) may positively affect body composition, which is a valid concern for athletic populations.²⁰ Although the average protein intake of 1.6g/kg/day falls within the recommended range of 1.4–2.0 g protein/kg body weight/day (g/kg/d),²³ more investigations should be done within the volleyball population to understand and match their specific needs.

In regards to micronutrients, Papadopoulou¹⁵ and Zapolska⁸ showed that participants did not meet the recommended daily allowances (RDAs) for various micronutrients, including calcium, iron, folic acid, magnesium, zinc, as well as vitamins A, B1, B2, and B6. Since studies regarding micronutrient intake were limited within this population, the average intake of vitamins and minerals is not included in this review.

In summary, current research indicates a need for a more comprehensive understanding of the nutritional requirements of indoor and beach volleyball players. With limited studies, indoor and beach volleyball players need more specific recommendations for carbohydrate and protein intakes.

Table 1. Volleyball players' nutrition intake.

	Papadopoulos et al (n = 65 F)	Madison et. al (n=58; 15M,43F)	Almeida et. al (n =25 F)	Mielgo et. al (n =22 F)	Zapolska et. al (n =17 F)	Sesbreno et.al (n=22 M)
Total Energy (kcal/day)	1648 ± 780	1968± 734	3945 ± 633	2835 ±178	1909 ± 560	3034 ± 1345
Carbohydrates (g/day)	195±88	241±99	418±77	301±36	221.5±101	325±105
Protein (g/day)	62±26	77±33	151 ±25	140±18	113.5±28	161±34
Fats (g/day)	73±49	81±29	118±26	114±16	69.9±25.9	119±37
Mean Body Mass (kg)	64.2 ± 7.2	62..9 ± 8.5	64.35±6.12	69.3 ± 9.0	74.7± 9.0	93.3±8.0

Data are Means ± SD

*Values expressed as daily intake

**F = females; M= Males

Nutrition Education

In a systematic review assessing general and sports nutrition knowledge from recreational and elite athletes from several sports disciplines, the mean scores across various nutrition knowledge questionnaires were 45%-65%²⁴. A 2006 study by Zetou and colleagues,¹⁰ investigating 47 male beach volleyball players regarding fluid, supplements, and general nutrition intake during a tournament, found that most athletes needed to be made aware of how to manage their fluid balance and specific nutrition needs before their games⁹. Shelley et al.²⁵ assessed 77 volleyball players' nutrition knowledge via the Sports Nutrition Knowledge Questionnaire (SNKQ) and revealed a mean score of 40.22 ± 8.3, with 70 or higher considered an adequate score. A quasi-experimental intervention study by Valliant et al.²⁶ analyzed average total energy, carbohydrate, protein, and fat from a 3-day food diary, performed an individualized nutrition education intervention, and compared pre and post-nutrition intake and knowledge. Carbohydrate, protein, total energy intake, and nutrition knowledge significantly improved.²⁶ The research findings underscore the evident knowledge gaps among athletes regarding nutrition, emphasizing the importance of targeted interventions to enhance their understanding and application of optimal dietary practices.

Supplements

The consumption of ergogenic nutritional supplements to enhance athletic performance has recently increased substantially.²⁷ Notably, incorporating ergogenic aids among elite athletes has surpassed the 90% threshold,¹⁸ thereby highlighting the substantial extent to which these aids are employed. Specifically, within volleyball, the primary supplements investigated among this population are caffeine,²⁸ creatine,²⁹ and β hydroxy β methylbutyrate (HMB).³⁰ Caffeine, a widely consumed psychoactive substance,³¹ has long dominated sports supplement research.³¹ Its efficacy in enhancing vertical jump height among soccer,³² basketball,³³ has been well-established. In volleyball, caffeine has exhibited the potential to enhance athletic performance by augmenting speed, power, intermittent sprinting capabilities, jumping prowess, and passing accuracy.²⁸ However, it is essential to acknowledge that Fernández-Campos et al.³⁴ found no performance enhancement in volleyball players with caffeine consumption, prompting additional field studies to establish a definitive and direct correlation between caffeine and volleyball performance.

Creatine, one of the most popular performance supplements³⁵, is an effective ergogenic aid that increases high-intensity exercise capacity and lean body mass during training.³⁵ Multiple studies substantiate the potential of both short-term and long-term creatine supplementation to enhance performance in high-intensity sports.³⁶ Regarding volleyball players, Lamontagne-Lacasse²⁹ examined the effect of 4-week creatine monohydrate supplementation on spike and



block jumps, showing significant improvements for both performance parameters. Secondly, a review study by Sieron et al.³⁷ revealed that supplementation with creatine can improve professional volleyball players' performance, measured as spike jump and repeated block jump, during a 4-week protocol.

HMB has gained popularity as a supplement for fostering fat-free mass and strength gains. Porta et al.³⁰ highlighted its potential for enhancing both anaerobic and aerobic capacity, coupled with heightened anabolic hormonal response and reduced catabolic and inflammatory response among elite volleyball players. Notably, HMB supplementation exhibited substantial enhancements in muscle mass, strength, and anaerobic attributes in elite male and female volleyball players. However, the enduring impact of HMB supplementation across extended training periods necessitates further investigation.³⁸

Table 2: Studies on supplementation with volleyball players.

Supplement	Intervention	Outcomes
Creatine	parallel, randomized, double-blind 4-week CMS. 12 male VB players. 1–4, 10 g/d on days 5–6, and 5 g/d on days 7–28	Participants improved SJ and repeated BJ performance.
Caffeine	double-blind and randomized study, (3mg/kg) energy drink. 13 elite FVB players.	caffeinated energy drink significantly increased ball velocity and jump height in all measures
HMB	randomized, double-blind, placebo-controlled study; 28 elite VB players (3 g/day).	Increase in FFM, strength, peak and mean anaerobic power.
Most common supplements	observational cross-sectional study. 88 athletes, Italian National Championship.	Vitamins B and C (39.2%), protein (46.8%), caffeine (36.9%), sports drinks (45.5%), energy drinks (36.7%), and carbohydrates (22.4%)

Practical Application

Very few studies have examined volleyball players' (beach and indoor) nutrition, underscoring the need for more research. Comprehensive knowledge of the nutritional requirements of volleyball players, particularly beach volleyball athletes, must be improved in the literature. This review shows indoor and beach volleyball players struggle to meet recommended carbohydrate intake. These findings highlight the urgent need for targeted nutritional interventions to optimize the health and performance of volleyball players. Additionally, athletes' nutrition knowledge and supplementation practices require improvement through educational programs. The prevalent use of ergogenic supplements, such as caffeine, creatine, and HMB, presents potential, but further research is needed to establish their direct impact on volleyball performance. Overall, this review emphasizes the significance of tailored nutrition strategies for indoor and beach volleyball players to enhance their well-being and athletic achievements.

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