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## Nutritional advice for badminton players: A brief study

**Dr. Shalini Menon and Kuwar Praveen Singh**

### Abstract

Badminton is the most popular racquet sport worldwide. It is an indoor racket sport that requires a combination of power, agility, and quick reaction. Players must move swiftly around a court to receive the shuttle and make returns. Although scientific study on badminton is developing, there has been no thorough evaluation of nutrition for the sport. The study provides guidelines for daily carbohydrate, protein, and fat intake, along with hydration methods. Iron, magnesium, and vitamin d are key micronutrients for badminton players, with recommended intakes specified. Caffeine, creatine, and beta-alanine are examples of ergogenic aids that may increase badminton performance. Nutritional techniques for competition preparation, post-training recovery, and travel are also discussed.

**Keywords:** Racquet sport, indoor sport, and diet

### Introduction

Badminton is an indoor racquet sport requiring strength, endurance, agility, mental awareness, and quick reactions. Badminton courts are rectangular courts used for badminton, a racket-based sport. Courts are typically divided in half by a badminton net and marked for both singles and doubles games, with boundary widths differing between the two match types. Badminton courts should be surfaced with play-safe flooring materials such as wood, synthetic, and rubber. Badminton courts are 44' (13.4 m) long, but double courts are 20' (6.1 m) broad, but single courts are reduced to 17' (5.18 m), reducing by 1.5' (.46 m) on each side. A center line divides the width of the service court, and a 6.5' (1.98 m)'short service line' separates it from the net. Doubles games additionally require a 'long service line' that is 2.5' (.76 m) from the back boundary. Clearances of 2 feet (.61 meters) should be provided all around the badminton court.

Badminton was originated in India around the 1860s as a game known as 'Poona.' When British army leaders went home, they imported the game and played it on country estates in England, where they defined the rules for competitive play.

The International Olympic Committee (IOC) recognizes the Badminton World Federation (BWF) as the international badminton governing body. As the International Badminton Federation was established in 1934, Badminton was first included in Summer Olympics in 1972 as a demonstration sport. In 1992, badminton makes its Olympic debut in Barcelona.

### Guidelines for badminton players' diets

#### • Carbohydrates

Carbohydrates are primarily used by muscles as fuel, particularly during high-intensity activity. Badminton players should time their daily carbohydrate intake to correspond with their energy requirements for training and competition, particularly on days when they must train hard or with high training intensity. Body mass and exercise load should be taken into consideration when setting daily carbohydrate intake guidelines. In-season carbohydrate recommendations for badminton players vary from 5 to 8 g/kg of body weight per day, depending on gender, duration and intensity of exercise, and environmental factors. This is because badminton is primarily an aerobic sport with moderate intensity requirements.

Badminton Players should also think about the kinds of carbohydrates they consume. Because this sport primarily requires quick thinking, mental focus, and blood glucose regulation, athletes should try to keep their blood sugar levels stable both before and during competition by timing their meals and snacks properly.

For prolonged fuel release, players may benefit from eating meals and snacks with a low to moderate Glycemic Index (GI) before competition.

#### ▪ **Protein**

A daily protein consumption of between 1.2 and 2.0 g/kg times one's body weight is recommended by the Joint Position Statement on Nutrition and Athletic Performance to facilitate protein turnover, muscle repair, re-modeling, and metabolic adaptation. Training and playing badminton both call for irregular sprints around the court that involve strong rapid waves of movement. Hence, badminton players should aim for a daily protein intake ranging from 1.6 to 2.0 g/kg of body weight per day during pre-season and in season, like the protein requirements of football and power sports. During the off-season, the training load of badminton players is low and recommended protein intakes should be reduced to 1.2 g/kg of body weight per day.

#### ▪ **Fat**

Fat is a key component of the diet of athletes because it provides energy, essential fatty acids, and serves as a carrier for fat-soluble vitamins into the body. The World Health Organization recommends limiting total fat intake to 30% of total energy, with less than 10% coming from saturated fat. Badminton player's fat consumption should follow public health guidelines and be tailored to their training level and body composition goals. It is not suggested for Badminton players to ingest less than 20% of their total energy intake due to potential reduction in critical fat-soluble vitamins and fatty acids. As a general guideline, the American College of Sports Medicine (ACSM) recommends that athletes consume approximately 20% to 35% of their total daily calories from fat.

#### ▪ **Fluid and Hydration**

It is important to maintain optimal hydration status during exercise as hypo-hydration can adversely impact exercise performance and increase physiological strain, especially in hot environments.

The types of fluids to take vary according to the duration and intensity of the workout. Athletes who engage in high-intensity activity for over an hour should ingest a carbohydrate-electrolyte drink. Additional calories and electrolytes to restore those lost through perspiration. For athletes competing in several events or matches, it's recommended to consume carbohydrate-electrolyte drinks during breaks and after matches to improve hydration and fuel replenishment. For short-duration or low-intensity matches or training, water or electrolyte water is sufficient. During post-exercise recovery, players should strive to ingest 125% of their projected sweat loss (measured by changes in body weight) during two to four hours, especially if they have another match within the same day.

To be as hydrated as possible before, during, and after exercise, players should create customized hydration regimens with a sport nutritionist. By weighing themselves before and after exercise, players may keep track of their sweat losses. They can then adjust their fluid intake schedules according to their unique sweat rates.

#### ▪ **Key Micronutrient Requirements**

Minerals and vitamins are vital for the body's defense against

oxidative damage, immune system support, energy metabolism, hemoglobin formation, and bone health. Regular exercise may raise the turnover of b-group vitamins because it boosts energy expenditure. Regular exercise causes the body to sweat more, which increases the loss of minerals like zinc and magnesium. Because of this, athletes may need to consume more micronutrients, particularly those who train for extended periods of time or at high intensities that demand a lot of energy expenditure. To make sure they get all the micronutrients they need, badminton players should try to eat a wide range of foods, particularly fruits and vegetables.

B-group vitamins are necessary for energy metabolism, but since they are frequently added to staple foods like bread and rice, it is rare that a person would be vitamin deficient. Therefore, iron, magnesium, and vitamin D are the micronutrients that table tennis players should be more concerned about.

#### ▪ **Iron**

Iron is necessary for the synthesis of energy and the generation of the oxygen-carrying molecules hemoglobin and myoglobin. In athletes, an iron shortage can impair immune system performance and endurance as well as the body's ability to carry oxygen. One of the most common deficiencies among athletes is iron deficiency, which is particularly common among female players, vegetarians, and regular blood donors. For this reason, it is important to check and track the iron status of female badminton players, vegetarians, and frequent blood donors on a regular basis. Aim to eat iron at a level that is marginally higher than the Recommended Daily Intake (RDA) for badminton players. Male and female RDAs for iron are 8 mg and 18 mg, respectively.

#### ▪ **Magnesium**

Magnesium is a necessary component for numerous enzyme processes and is crucial to both aerobic and anaerobic energy production. Additionally, magnesium controls calcium's cellular transport, which is necessary for the contraction of smooth and skeletal muscles. Exercise performance appears to benefit from increased dietary magnesium intake in those who are magnesium deficient, but not in those who have an acceptable magnesium status. A growing body of research indicates that athletes may not be getting enough magnesium from their diets. Athletes who play badminton should try to meet their daily intake of magnesium, which is 400-420 mg for men and 310-320 mg for women.

#### ▪ **Vitamin D**

While it has long been known that vitamin D is essential for preserving healthy bone density and controlling calcium levels, new research indicates that vitamin D is also critical for controlling skeletal muscle function and immunological and inflammatory responses. Athlete's levels of vitamin D may have an impact on their physical performance.

Following eight weeks of 5000 IU per day of vitamin D3 supplementation, professional soccer players from the country of England with low serum vitamin D concentrations also demonstrated significant improvements in their 10 m sprint times and vertical jumps, but not in their 1-RM (repetition maximum) bench and squat tests. Reports from all over the world show that vitamin D deficiency is common, even in sunny nations

**Table 1:** Practical strategies to achieve nutritional recommendations for badminton players

Nutrient	Practical Strategies to Achieve Recommended Intake
Carbohydrates.	<ul style="list-style-type: none"> <li>When it comes to carbohydrates, try to choose low-to-moderate GI foods. The GI of the majority of entire fruits, including bananas, apples, berries, etc., is low to moderate.</li> <li>Drink carbohydrate-electrolyte drinks while exercise to sustain blood glucose levels during in-season/moderate training sessions.</li> <li>Eat meals (like milk) that are high in both protein and carbohydrates to maximize your body's ability to recuperate</li> <li>After exercise.</li> </ul>
Protein	<ul style="list-style-type: none"> <li>Protein should be consumed in three main meals and two snacks throughout the day.</li> <li>Eggs, milk, lean meats, and soy products are among the suggested sources.</li> <li>The ideal amount of protein to consume per kilogram of body weight is 0.3 g.</li> <li>Before going to bed, consume slow-release protein, such as casein, to aid in muscle repair and synthesis.</li> <li>The recommended protein dosage before bedtime is 25-40 g.</li> </ul>
Fat	<ul style="list-style-type: none"> <li>Limit your consumption of foods high in saturated fat, such as animal fat and skin, and opt instead for low-fat options.</li> <li>Omega-3 and omega-6 fatty acids are examples of polyunsaturated fat, which is recommended and can be found in</li> <li>Foods like nuts, seeds, and seafood.</li> </ul>
Fluid and Hydration	<ul style="list-style-type: none"> <li>The player must make sure he is fully hydrated before starting any exercise.</li> <li>When participating in several matches in a single day or during intense training sessions, stay hydrated with carbohydrate-electrolyte drinks.</li> <li>During light training sessions, stay hydrated by drinking</li> <li>Electrolyte drinks.</li> </ul>
Vitamins and minerals	<ul style="list-style-type: none"> <li>Iron, eat red meats at least twice a week; for better absorption, vegans should pair dark leafy greens with citrus-based dishes.</li> </ul>
	<ul style="list-style-type: none"> <li>Magnesium. Frequent intake of whole grains, nuts, seeds, and dark leafy greens.</li> <li>Vitamin D, Oral supplementation and routine monitoring are necessary for this nutrient. Get regular sunshine exposure.</li> </ul>

### Energetic Nutritional Supplements

Supplements that can give athletes a competitive edge through improving body composition and energy metabolism are known as nutritional ergogenic aids. While there is growing evidence that lutein and zeaxanthin may enhance badminton players performance, caffeine and creatine are ergogenic aids that may help players perform better during contests. The characteristics of each energetic supplement and how they relate to badminton are covered in the section that follows.

#### Coffee

Coffee, tea, cola drinks, and energy drinks are popular ways to get caffeine, a naturally occurring substance in several plants. It is demonstrated to improve a variety of exercise performance techniques, such as mental alertness, high-intensity team sports, endurance, and strength-power performance. By acting as an adenosine receptor antagonist and reducing the effects of fatigue, caffeine seems to have an ergogenic effect on the central nervous system. Caffeine may therefore be important in workouts where mental and physical performance are significantly impacted by focus, reaction speeds, and technical/tactical skills. Caffeine may be beneficial for badminton because the game depends largely on quick reaction times and speed. Players are expected to play numerous matches a day during competitions, particularly if they are competing in various events. Additionally, it has been demonstrated that caffeine enhances performance during several days of simulated badminton competition. The European Food Safety Authority recommends a safe and

effective caffeine dose of 3.0 to 4.0 mg per kg of body mass to boost physical performance and minimize perceived exertion during exercise.

#### Creatine

Creatine is mostly found in skeletal muscles and is made up of the amino acids methionine, glycine, and adrenaline. As far as skeletal muscles are concerned Creatine is present in the form of phosphocreatine (PCr), which provides a quick source of phosphate for the regeneration of ATP, an energy source during intense activity. Supplementation boosts intramuscular PCr reserves, enhancing high-intensity exercise performance and boosting recovery rates Creatine supplementation may help improve performing skills after sleep loss. Badminton players may benefit from an acute amount of creative supplementation before tournaments if they had insufficient sleep before travel or were anxious due to competition demands.

#### Beta-Alanine

Beta-alanine, a non-proteinogenic amino acid, is a precursor to carnosine production. Ingestion of beta-alanine has regularly been proven to raise muscle carnosine levels, which act as an intracellular buffer. High-intensity activities, particularly those involving anaerobic metabolic pathways, produce and accumulate lactic acid. Supplementing with beta-alanine can increase high-intensity exercise performance and delay tiredness by buffering exercise-induced acidity.

**Table 2:** Nutritional ergogenic aids beneficial for badminton, evidence and recommendations for consumption.

Nutritional Ergogenic Aid	Relevant Studies Showing Improved Exercise Performance	Recommendation For Intake
Caffeine	<ul style="list-style-type: none"> <li>Consuming 300 mg (4.0 mg/kg<sup>-1</sup> body mass) of caffeine during 2.5 hours of strenuous exercise improved both cognitive function and physical performance afterward.</li> <li>Caffeine intake of 3.0 and 4.5 mg/kg<sup>-1</sup> body mass for two days enhanced exercise performance by 4% on the first day and 5% on the second.</li> </ul>	<ul style="list-style-type: none"> <li>Caffeine should be taken at a dose of 3.0-4.0 mg/kg<sup>-1</sup> body weight 60 minutes before activity.</li> <li>It can be taken on consecutive days during competitions.</li> <li>Before competition, individuals might test the effects of caffeine to identify their best dose and strategy.</li> </ul>
Creatine	<ul style="list-style-type: none"> <li>Supplementing with creatine can improve ATP regeneration and delay fatigue during sprints lasting 6 to 30 seconds with short</li> </ul>	<ul style="list-style-type: none"> <li>For 3-5 days, take 0.3 g/kg<sup>-1</sup>/day of creatine or 20 g/day<sup>-1</sup> for 5-7 days, followed by 0.03 g/kg<sup>-1</sup>/day<sup>0</sup></li> </ul>

	recovery intervals (30 to 2 minutes).	2-5 g/day <sup>-1</sup> for maintenance. <ul style="list-style-type: none"> <li>▪ For 4 weeks, take 3-5</li> <li>▪ G/day<sup>-1</sup> of creative.</li> </ul>
Beta-alanine	<ul style="list-style-type: none"> <li>▪ Supplementing with 6.4 g of beta-alanine per day for 4 weeks increased repeated sprint performance.</li> </ul>	<ul style="list-style-type: none"> <li>▪ To reduce side effects, consume low-release goods.</li> </ul>

## Specific Nutrition Strategies

### A. Nutritional Management during travel and Jet Lag

National travel can be difficult for players since travel stress and physiological changes produced by extended journeys might interfere with training and preparation for competition, as well as increasing the risk of injury. And International travel may delay players' training and increase their risk of injury due to stress and physiological disturbances caused by time zone changes. To avoid disrupting the circadian cycle, adjust protein and carbohydrate consumption during mealtimes. Consuming a protein-rich breakfast boosts plasma tyrosine levels and brain absorption, leading to increased dopamine and norepinephrine production. A carbohydrate-rich evening meal with a high glycemic index can cause athletes to feel lethargic and sleepy, as serotonin is the precursor to melatonin, which induces sleep.

### B. Nutritional Strategies for Competition

During competition, players may need to play many matches per day or across multiple days. Carbohydrate drinks (e.g., commercial sports drinks) or gels are recommended for players engaging in numerous matches in a single day to preserve motor skill competence and prevent cognitive function deterioration from exhaustion. To prepare for competitions, players should avoid hunger and drink enough of water. To prepare for a match, players should have a meal containing 1 to 2 g of carbohydrate per kilogram of body weight three to four hours before, and replenish glycogen and energy levels with low-moderate GI snacks one to two hours before the competition. To improve digestion, choose familiar foods with low fat and spice levels, such as bananas and oat-based cereal bars. Players should follow the recuperation techniques provided below. During back-to-back matches, players should consume carbohydrate drinks and gels to sustain glycogen levels.

### C. Nutritional Strategies for recovery

Recovery diet aims to replenish nutrients and fluids lost during exercise and improve physiological preparedness for future workouts. The recovery meal or snack should be tailored to the time and intensity of the activity, as well as the upcoming exercise session. Nutritional recovery focuses on restoring muscle and liver glycogen stores, replacing fluid and electrolytes lost through sweat, promoting protein synthesis for muscle repair and adaptation, and reducing the negative effects of exercise, such as immune disruption and inflammation. To recover from the first training session, athletes who train twice a day should eat or snack right afterward. To recover from exercise, athletes should consume carbohydrate at 1.0 to 1.2 g per kilogram of body weight at regular intervals for up to 4 hours. They should also consume protein-rich foods with 0.3 g/kg<sup>-1</sup> of body weight. The recovery meal should include carbohydrates, quality protein (0.3 to 4 g/kg body weight), and fruits and vegetables for minerals and antioxidants.

## Limitations

Most of the badminton-related research was conducted among players from India. As a result, current information may be common of Asian players.

## Conclusions

Nutrition has the potential to improve badminton performance according to current understanding of the sport's demands. Sport nutrition professionals collaborate with coaches and players to guarantee proper nutrition for training and competition.

## Future nutrition study on badminton should consider the following

- Identifying physiological and strength testing that can better reflect the requirements of badminton game play.
- Investigating optimal body composition variation limitations for training and competition.
- Assess the nutritional status and quality of elite badminton players.
- The prevalence of vitamin D insufficiency or deficiency among badminton players.
- Lutein and zeaxanthin can improve badminton performance.

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