

# Role of Nutrition in Sports

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## Abstract

The awareness of nutrition playing an important role for sportspersons and athletes. Many factors can impact the performance of a sports person during competition which may be related to different domains. The most commonly encountered nutritional related problem among sports person is their failure to consume sufficient total of food energy. Food is composed of six basic substances: carbohydrates, proteins, fats, vitamins, minerals and water. Each one of these has specific function in providing nourishment for the body. For the sportsman, it is of critical importance to recognise what each does to his body under the physical, mental and emotional strains of competition. The duration and the intensity of the exercise involved in a given sports will determine the principal source of energy used in meeting the work demands of that particular sports. The certain nutrition and dietary approaches to enhance the sports performance and also nutrition is essential for an athletes good performance. The athlete's diet should be high in carbohydrates, moderate in proteins and low in fat.

Adolescents taking part in sports have high demands of nutrients due to additional needs of increased physical activity besides growth, development and wellness. The health and nutritional status may be compromised in this population due to lack of proper nutritional counseling. Also misinformation about healthy and nutritious foods by the media targeting school going children can be quite hazardous. The purpose of this review paper is to represent the nutritional needs of adolescents and athletes participating in different games and also to empower and teach adolescents and athletes to know about the importance of nutrition during participation in games and sports.<sup>1</sup>

**Keywords:** Physical activity; Nutrition counseling; Food and health

## Introduction

Sports nutrition is a specialization within the field of nutrition that partners closely with the study of the human body and exercise science. Sports nutrition can be defined as the application of nutrition knowledge to a practical daily eating plan focused on providing the fuel for physical activity, facilitating the repair and rebuilding process following hard physical work, and optimizing athletic performance in competitive events, while also promoting overall health and wellness. The area of sports nutrition is often thought to be reserved only for “athletes,” which insinuates the inclusion of only those individuals who are performing at the elite level. In this text, the term athlete refers to any individual who is regularly active, ranging from the fitness enthusiast to the competitive amateur or professional. Differences may exist in specific nutrient needs along this designated spectrum of athletes, creating the exciting challenge of individualizing sports nutrition plans. To fully understand and subsequently apply sports nutrition concepts, professionals instructing athletes on proper eating strategies first need to have a command of general nutrition as well as exercise science. The second step is to gain the knowledge of how nutrition and exercise science are intertwined, understanding that physical training and dietary habits are reliant on each other to produce optimal performance. The final step can be considered one of the most critical—the practical application of sports nutrition knowledge to individual athletes participating in a sport or physical activity. Sports nutrition professionals must be able to teach athletes by putting “book” knowledge into practice with actual food selection and meal planning, while keeping in mind the challenges presented by busy schedules of exercise, competitions, work, school, and other commitments. It is this third step that many professionals lack after graduating from an undergraduate or graduate program in sports nutrition, dietetics, exercise science, or athletic training.

Sports Nutrition can be defined as the application of nutrition knowledge to a practical daily eating plan providing the fuel for physical activity, facilitating the repair and building process following hard physical work and achieve athletic performance in competitive events, while also promoting overall health and wellness. The basic concept for sports nutrition for athletes requires proper eating strategies and need to have a command of general nutrition as well as exercise science. The second step is to gain the knowledge of how nutrition and exercise science are intertwined, emphasize that physical training and dietary habits are reliant on each other in order to produce optimal performance<sup>[3]</sup>. The final step is the practical application of sport nutrition knowledge on the individual sports person who is participating in any sport or physical activity<sup>[4]</sup>. Why study sports nutrition? An athlete challenges his body on a regular basis through physical training and competitions. In order to keep up with requirement of his activity or sport, he requires enough fuel for his body on day to day basis<sup>[5]</sup>.

### **Importance of sports nutrition :**

Participating in endurance sports requires optimal nutrition, with specific focus on dietary modifications. Targeted fitness development at an early age, especially in adolescence is deemed the foundation for leading an active lifestyle, avoiding potential overweight, reducing motor deficiencies and thus improving the general quality of life<sup>[6]</sup>. At the time of final performance an athlete is supposed to be well nourished, uninjured, fit, focused and ready to compete. Sports nutrition is not just about calories to achieve weight or body composition goals; nor is it all about protein for muscles or carbohydrates for fuel. Nutritional and eating habits have been of specific interest in sports, especially given their impression on athletic performance. General recommendations need to be suggested by sports nutrition experts to accommodate the specific requirements of individual athlete regarding health, sports, nutrient, food choices and body weight and body composition<sup>[7]</sup>. Athlete challenges their bodies on a regular basis through tough physical training and competitions. In order to keep up with demand for stamina of their activity or sport, athlete needs adequate fuel for their body on day to day basis. Nutrition is important for an athlete because it provides energy required to perform the activity. The food they take leaves an impact on strength, training, performance and recovery. Not only the type of food is important for sport nutrition but also the time is equally important for what they eat throughout the day. It also has an impact on their performance level and their body ability to recover after workout. An athlete needs to pay close attention about when, what and how much does he eat or drink prior to a game or match<sup>[8]</sup>. The role of nutrition in sports performance is very important. Proper nutrition must be available prior, during and post competition. Greany and Jeukendrup stated that from fueling to recovery, muscle building weight and making optimal nutrition ensure the best platform for success in any sport<sup>[9,10]</sup>. Meals eaten after and before the exercise are the most important in nutrition but we should really be very careful with all that the athlete intake in his body. As a general rule of thumb an athlete should eat about two hours before any exercise and the meal should be high in carbohydrates, low in fat and low to moderate in protein. Carbohydrates are the main source of energy that provides power to an athlete in exercise regime. Protein is required to develop muscle growth.

### **What are the basic nutrients**

Food and beverages are composed of six nutrients that are vital to the human body for producing energy, contributing to the growth and development of tissues, regulating body processes and preventing deficiency and degenerative diseases. The six nutrients are classified as essential nutrients. They are carbohydrates, proteins, fats, vitamins, minerals and water. The body requires these nutrients to function properly however the body is unable to endogenously manufacture them in the quantities needed on a daily basis<sup>[11]</sup>.

### **Carbohydrates:**

The main role of carbohydrates is to provide energy.

When they are digested, carbohydrates are broken down into glucose to provide readily available energy for the body to use quickly and effectively. Carbohydrates are the most important form of fuel for exercise and sports activities. The body can store carbohydrates in the muscles and liver as glycogen, and use these stores as a source of fuel for the brain and muscles during physical activity. The correct food choices can help ensure the body has enough energy for activity, as well as help aid recovery.

Starchy foods are an important source of carbohydrates in our diet. Wholegrain varieties also provide fibre, which is important for digestive health, and a range of vitamins and minerals including B vitamins, iron, calcium and folate. Good sources of carbohydrates in the diet include:

- Bread
- Breakfast cereals and porridge oats
- Pasta, noodles
- Rice
- Couscous
- Potatoes (with skins) and other starchy vegetables (e.g. sweetcorn)
- Beans and pulses

Competitive sports people and athletes may require more carbohydrates than an average gym user to match the intensity of their activity level. Estimated carbohydrate needs are outlined and depend on the intensity and duration of the exercise sessions:<sup>[12]</sup>

| Duration of sport or exercise sessions | Recommended intake (per kg body weight per day)* |
|--|--|
| 3-5 hours per week                     | 4-5g   |
| 5-7 hours per week                     | 5-6g   |
| 1-2 hours per day                      | 6-8g   |
| 2 + hours per day                      | 8-10g  |

## Protein:

Protein is also important for health and physical activity. The main role of protein in the body is for growth, repair and maintenance of body cells and tissues, such as muscle.

Different foods contain different amounts and different combinations of amino acids (the building blocks of proteins). Essential amino acids are those that the body cannot make itself and so are needed from the diet. The full range of essential amino acids needed by the body (high protein quality) is found in:

- Animal sources – meat, fish, eggs, milk, cheese and yogurt.
- Plant sources – soy, tofu, quinoa and mycoprotein e.g. Quorn
- As some high protein foods can also be high in saturated fat, it is important to choose lower fat options, such as lean meats or lower fat versions of dairy foods.
- Most vegans get enough protein from their diets, but it is important to consume a variety of plant proteins to ensure enough essential amino acids are included. More information on vegetarian and vegan diets is available [here](#).
- The protein requirements of a normal adult are **0.75g** per kilogram of body weight per day. For strength and endurance athletes, protein requirements are increased to around **1.2-1.7g** of protein per kilogram of bodyweight per day. If you are participating in regular sport and exercise like swimming/running or go to the gym on a regular basis, then your protein requirements may be slightly higher than the general sedentary population, in order to promote muscle tissue growth and repair. However, most people in the UK consume more than the recommended amount of protein, so increasing your protein intake is generally unnecessary<sup>[13]</sup>

## Fats:

Fat is an essential nutrient for the body, but it is also a rich source of energy. Consuming too much fat can lead to excess energy intake which can lead to weight gain over time. It is important to follow current healthy eating guidelines, ensuring fat intakes are no more than 35% of total energy intake from food, with saturated fat intakes not exceeding 11% of total energy intake from food. Fats in foods typically contain a mixture of saturated and unsaturated fatty acids, but choosing foods which contain higher amounts of unsaturated fat, and less saturated fat, is preferable. Most of us eat too much saturated fat so to cut back on intakes, limit foods such as:

- Pastries, cakes, puddings
  - Chocolate and biscuits
  - Some savoury snacks
  - Cream, coconut cream and ice-cream
  - Hard cheeses including cheddar
  - Butter, lard, ghee, suet, palm oil and coconut oil
  - Processed meats like sausages, ham, burgers and fatty cuts of meat
- Fried foods including fried chips<sup>[14]</sup>

## Vitamin :

Vitamins are a large class of nutrients that contain carbon and hydrogen, as well as possibly oxygen, nitrogen, and other elements. There are two main requirements for a substance to be classified as a vitamin. First, the substance must be consumed exogenously because the body cannot produce it or cannot produce it in sufficient quantities to meet its needs. Second, the substance must be essential to at least one vital chemical reaction or process in the human body. Vitamins do not directly provide energy to the body; however, some vitamins aid in the extraction of energy from macronutrients. Vitamins are involved in a wide variety of bodily functions and processes that help to keep the body healthy and disease free. Vitamins are classified as either water soluble (B vitamins and vitamin C) or fat soluble (vitamins A, D, E, and K), depending on their method of absorption, transport, and storage in the body. Vitamins are found in nearly all foods, including fruits, vegetables, grains, meat and beans/alternative, milk/alternative, and some fat<sup>[15]</sup>

## Minerals

Minerals are also a large group of nutrients. They are composed of a variety of elements; however, they lack carbon. Minerals have a role in the structural development of tissues as well as the regulation of bodily processes. Physical activity places demands on muscles and bones, increases the need for oxygen-carrying compounds in the blood, and increases the loss of sweat and electrolytes from the body, all of which hinge on the adequate intake and replacement of dietary minerals. Minerals are categorized into major minerals (calcium, sodium, potassium, chloride, phosphorus, magnesium, and sulfur) and trace minerals (iron, zinc, copper, selenium, iodine, fluoride, molybdenum, and manganese) based on the total quantity required by the body on a daily basis. Similar to vitamins, minerals are found in a wide variety of foods, but mainly are concentrated in the meat and beans/alternative and milk/alternative groups<sup>[16]</sup>

## Water:

Forming a category of its own, water deserves to be highlighted because of its vital roles within the body. The human body can survive for a long duration without any of the micro and macro nutrient but not without water. The body is made of 55-60% water, representing a nearly ubiquitous presence in bodily tissues and fluids. In athletics, water is important for temperature regulation, lubrication of joints and the transport of the nutrients to active tissues. It regulates the body's temperature, cushion and protects vital organs, aids the digestive system, acts within each cell to transport nutrients and dispel waste [4].

The amount an individual sweats varies from person to person and depends on:

- Intensity and duration – longer and higher intensity exercise can cause greater sweat loss.
- Environmental temperature – in hot, humid conditions sweat loss can increase.
- Clothing – the more clothing that is worn, the quicker you are likely to heat up which may cause greater sweat loss.
- Genetics – some people are just more likely to sweat than others<sup>[17]</sup>

## The Goal of Sports Nutrition

Active adults and competitive athletes turn to sports nutrition to help them achieve their goals. Examples of individual goals could include gaining lean mass, improving body composition, or enhancing athletic performance. These sport-specific scenarios require differing nutritional programs. Research findings indicate the right food type, caloric intake, nutrient timing, fluids, and supplementation are essential and specific to each individual. The following are different states of training and competitive sport benefiting from sports nutrition:

### Eating for Exercise/Athletic Performance

Training programs require a well-designed diet for active adults and competitive athletes. Research shows a balanced nutrition plan should include sufficient calories and healthy macronutrients to optimize athletic performance. The body will use carbohydrates or fats as the main energy source, depending on exercise intensity and duration. Inadequate caloric intake can impede athletic training and performance.<sup>[18]</sup>

### Eating for Endurance

Endurance programs are defined as one to three hours per day of moderate to high-intensity exercise. High-energy intake in the form of carbohydrates is essential. According to research, target carbohydrate consumption for endurance athletes ranges from 6g to 10g per kilogram of body weight per day. Fat is a secondary source of energy used during long-duration training sessions. Endurance athletes are more at risk for dehydration. Replacing fluids and electrolytes lost through sweat are necessary for peak performance.<sup>[19]</sup>

### Eating for Strength

Resistance training programs are designed to gradually build the strength of skeletal muscle. Strength training is high-intensity work. It requires sufficient amounts of all macronutrients for muscle development. Protein intake is especially vital to increase and maintain lean body mass. Research indicates protein requirements can vary from 1.2g to 3.1g per kilogram of body weight per day.



## Eating for Competition

Preparing for a competitive sport will vary in sports nutrition requirements. For example, strength athletes strive to increase lean mass and body size for their sport. Endurance runners focus on reduced body weight/fat for peak body function during their event. Athletic goals will determine the best sports nutrition strategy. Pre and post-workout meal planning are unique for each athlete and essential for optimal performance.

## Sports Nutrition for Special Populations and Environments

Sports nutrition covers a wide spectrum of needs for athletes. Certain populations and environments require additional guidelines and information to enhance athletic performance.

- **Vegetarian athlete:** A vegetarian diet contains high intakes of plant proteins, fruits, vegetables, whole grains, and nuts. It can be nutritionally adequate, but insufficient evidence exists on long-term vegetarianism and athletic performance. Dietary assessments are recommended to avoid deficiencies and to ensure adequate nutrients to support athletic demands.
- **High altitude:** Specialized training and nutrition are required for athletes training at high altitude. Increasing red blood cells to carry more oxygen is essential. Iron-rich foods are an important component for this athlete as well. Increased risk of illness is indicated with chronic high altitude exposure. Foods high in antioxidants and protein are essential. Fluid requirements will vary per athlete, and hydration status should be individually monitored.
- **Hot environments:** Athletes competing in hot conditions are at greater risk of heat illness. Heat illness can have adverse health complications. Fluid and electrolyte balance is crucial for these athletes. Hydration strategies are required to maintain peak performance while exercising in the heat.
- **Cold environments:** Primary concerns for athletes exercising in the cold are adequate hydration and body temperature. Leaner athletes are at higher risk of hypothermia. Modifying caloric and carbohydrate intake are important for this athlete. Appropriate foods and fluids that withstand cold temperatures will promote optimal athletic performance<sup>[20]</sup>

## Roles of a Sports Dietitian

Athletes and active adults are seeking guidance from sports professionals to enhance their athletic performance. Sports dietitians are increasingly hired to develop nutrition and fluid programs catered to the individual athlete or teams. A unique credential has been created for sports nutrition professionals: *Board Certified Specialist in Sports Dietetics* (CSSD). Sports dietitians should have knowledge in the following areas:

- Clinical nutrition
- Nutrition science
- Exercise physiology
- Evidence-based research
- Safe and effective nutrition assessments
- Sports nutrition guidance
- Counseling for health and athletic performance
- Medical nutrition therapy
- Design and management of effective nutrition strategies
- Effective nutrition programming for health, fitness, and optimal physical performance<sup>[21]</sup>.

## Conclusion

Diet is of great importance to athletes, the key to achieving an optimal sports diet in relationship to peak performance and good health is balance. Athletes must fuel their bodies with the appropriate nutritional foods to meet their energy requirements in competition, training and recovery. If these nutritional needs are not met, there is an increased risk of poor performance and health issues. The use of a nutritional supplement within established guidelines is safe, effective and ethical. Hundreds of studies have shown the effectiveness of creatine monohydrate supplementation in improving anaerobic capacity strength and lean body mass in conjunction with training, but still there is sports specific variation in the food fads and practices indicating the strong influence on coaches and peers. It is vital to educate the sportsmen about the dietary pattern. Failure to consume right diet during competition due to false belief in markets and constant fear of eating prohibited foods may hamper performance. Finally the future of nutritional supplement looks bright in regard to the areas of transport mechanism, improved muscle retention as well as treatment of numerous clinical maladies through supplementations.

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