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## Sports nutrition

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### Abstract

Sports nutrition is the practical science of hydrating and fueling before, during and after exercise. Nutrition is an important part of sports performance for young athletes, in addition to allowing for optimal growth and development. Macronutrients, Micronutrients and fluids in the proper amounts are essential to provide energy for growth and activity. To optimize performance, young athletes need to learn what, when and how to eat and drink before, during and after activity. 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 substance: 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 an 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.

**Keywords:** Nutrition, sports nutrition

### 1. Introduction

A nutritious diet is one that meets all of the body's macro and micronutrient demands on a daily basis. That being said, there doesn't exist one perfect diet for everyone. Certainly, many diet books would have you believe that everyone can follow a particular nutrient prescription to attain optimal nutrition and body weight, but if that were the case, there would only be one diet book and only one diet. It's unreasonable to assume that a pregnant 32-year-old female, a 75-year-old man with hypertension, and a 22-year-old college football star all have the same nutrient requirements. Nutrient intakes are based on individual factors, including a person's size and activity level, the types of activities performed, and genetic predisposition. Additionally, an individual's diet should reflect adequate food variety for nutrient balance, be palatable while meeting the daily demands of stress placed on the body, and contribute to an acceptable quality of life. Nutrition for sport performance goes one step further. When the body is placed under excessive strain as a result of training at competitive levels, the demand for nutrients surpasses that of normal homeostasis. The term homeostasis refers to the natural state of balance within the body with all systems functioning properly. Heavy performance demands disrupt the natural homeostatic condition, because the body is bombarded with significant stressors. As a result, an athlete's body needs more electrolytes and water to preserve.

### 2. Benefits of sports nutrition

- Allows you to train harder longer.
- Delays onset of fatigue.
- Improves Body composition and strength.
- Enhances concentration
- Prepares the body for the next day's work out.
- Helps maintain healthy immune function.
- Reduces the potential for injury.

- Reduces the risk of heat cramps and GI distress.
- Helps to prepare for high performance activities.
- Helps keep the body hydrated and replaces critical minerals lost to sweat.

### 2.1 Factors influencing nutritional requirements

Differing conditions and objectives suggest the need for athletes to ensure that their sports nutritional approach is appropriate for their situation. Factors that may affect an athlete's nutritional needs include type of activity (aerobic vs. anaerobic), gender, weight, height, body mass index, workout or activity stage (pre-workout, intro-workout, recovery), and time of day (e.g. some nutrients are utilized by the body more effectively during sleep than while awake). Most culprits that get in the way of performance are fatigue, injury and soreness. A proper diet will reduce these disturbances in performance. The key to a proper diet is to get a variety of food, and to consume all the macro-nutrients, vitamins, and minerals needed. According to Eblere's article (2008), it is ideal to choose raw foods, for example unprocessed foods such as oranges instead of orange juice. Eating foods that are natural means the athlete is getting the most nutritional value out of the food. When foods are processed, the nutritional value is normally reduced.

### 2.2 Gender

There are obvious physical differences between male and female anatomy, while physiology is the same for the most part, how they metabolize nutrients will vary. Men have less total body fat but tend to carry most of their fat in the adipose tissue of their abdominal region. Adipose tissue is indirectly mediated by androgen receptors in muscle. On the other hand, women have more total body fat that is carried in the subcutaneous layer of their hip region. Women metabolize glucose by direct and indirect control of expression of enzymes.

### 2.3 Anaerobic exercise

During anaerobic exercise, the process of glycolysis breaks down the sugars from carbohydrates for energy without the use of oxygen. This type of exercise occurs in physical activity such as power sprints, strength resistances and quick explosive movement where the muscles are being used for power and speed, with short-time energy use. After this type of exercise, there is a need to refill glycogen storage sites in the body, although they are not likely fully depleted.

To compensate for this glycogen reduction, athletes will often take in large amounts of carbohydrates, immediately following their exercise. Typically, high-glycemic-index carbohydrates are preferred for their ability to rapidly raise blood glucose levels. For the purpose of protein synthesis, protein or individual amino acids are ingested as well. Branched-chain amino acids are important since they are most responsible for the synthesis of protein. According to Lemon *et al.* (1995) <sup>[2]</sup> female endurance runners have the hardest time getting enough protein in their diet. Endurance athletes in general need more protein in their diet than the sedentary person. Research has shown that endurance athletes are recommended to have 1.2 to 1.4 g of protein per kg of body weight in order to repair damaged tissue. If the athlete consumes too few calories for the body's needs, lean tissue will be broken down for energy and repair. Protein deficiency can cause many problems such as early and extreme fatigue, particularly long recovery, and poor wound healing. Complete proteins such as meat, eggs, and soy provide the athlete with

all essential amino acids for synthesizing new tissues. However, vegetarian and vegan athletes frequently combine legumes with a whole grain to provide the body with a complete protein across the day's food intake. A popular combination being rice and beans. Research on endurance sports nutrition where the types of carbohydrates come from will be explained. The advises for carbohydrates to be unprocessed and/or whole grains for optimal performance while training. These carbohydrates offer the most fuel, nutritional value, and satiety. Fruits and vegetables contribute important carbohydrate foundation for an athlete's diet. They provide vitamins and minerals that are lost through exercise and later needed to be replenished. Both fruits and vegetables improve healing, aid in recovery, and reduce risks of cancer, high blood pressure, and constipation. Vegetables offer a little more nutritional value than fruits for the amount of calories, therefore an athlete should strive to eat more vegetables than fruits. Dark-colored vegetables usually have more nutritional value than pale colored ones. A general rule is the darker the color the more nutrient dense it is. Like all foods, it is very important to have a variety. To get the most nutritional value out of fruits and vegetables it is important to eat those in their natural, unprocessed form with no other nutrient (sugar) added.

Often in the continuation of this anaerobic exercise, the product from this metabolic mechanism builds up in what is called lactic acid fermentation. Lactate is produced more quickly than it is being removed and it serves to regenerate  $\text{NAD}^+$  cells on where it's needed. During intense exercise when oxygen is not being used, a high amount of ATP is produced and pH levels fall causing acidosis or more specifically lactic acidosis. Lactic acid build up can be treated by staying well-hydrated throughout and especially after the workout, having an efficient cool down routine and good post-workout stretching.

Intense activity can cause significant and permanent damage to bodily tissues. In order to repair, vitamin E and other antioxidants are needed to protect muscle damage. Oxidation damage and muscle tissue breakdown happens during endurance running so athletes need to eat foods high in protein in order to repair these muscle tissues. It is important for female endurance runners to consume proper nutrients in their diet that will repair, fuel, and minimize fatigue and injury. To keep a female runner's body performing at its best, the ten nutrients need to be included in their diets.

### 2.4 Aerobic exercise

Aerobic exercise is also known as cardio because it is a form of cardiovascular conditioning. This includes exercises such as running, cycling, swimming and rowing. Athletes involved in aerobic exercise are typically looking to increase their endurance. These athletes are training their slow twitch muscle fibers to be better at taking in oxygen and getting it to their muscles. This is done by two mechanisms, glycolysis and aerobic respiration. Slow twitch muscles are smaller in diameter and are slow to contract. These fibers don't store much glycogen, instead they use lipids and amino acids to generate energy. With a high concentration of myoglobin that stores oxygen, the slow twitch muscle fibers have plenty of oxygen to function properly. These factors help make slow twitch muscle fibers fatigue resistant, so athletes can have endurance in their sport. There are many options for supplements that athletes can take to assist with endurance like glycerol and guarana.

### **Energy supplements**

Athletes sometimes turn to energy supplements to increase their ability to exercise more often. Common supplements to increase an athlete's energy include: Caffeine, Guarana, Vitamin B12, and Asian ginseng. Caffeine, a common energy supplement, can be found in many different forms such as pills, tablets or capsules, and can also be found in common foods, such as coffee and tea. Caffeine is used to improve energy and increases metabolism. Guarana is another supplement that athletes take to enhance their athletic ability, it is frequently used for weight loss and as an energy supplement.

Caffeine has been around since the 1900s and became popularly used in the 1970s when its power of masking fatigue became highly recognized. Similarly, the caffeine found in energy drinks and coffee shows an increased reaction performance and feelings of energy, focus and alertness in quickness and reaction anaerobic power tests. In other words, consuming an energy drink or any drink with caffeine increases short time/rapid exercise performance (like short full-speed sprints and heavy power weight lifting). Caffeine is chemically similar to adenosine, a type of sugar that helps in the regulation of important body processes, including the firing of neurotransmitters. Caffeine takes the place of adenosine in your brain, attaching itself to the same neural receptors affected by adenosine, and causing your neurons to fire more rapidly, hence caffeine's stimulating effects.

Carbohydrates are also a very common form of energy supplements, as all sugars are carbohydrates. Products like Gatorade and PowerAde are formulated with simple sugars such as sucrose and dextrose. Carbohydrates are necessary as they maintain blood glucose levels and restore muscle glycogen levels.

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